DIABETES AND ASSOCIATED COMPLICATIONS IN ARIZONA:

1999 STATUS REPORT

A Report of the Surveillance Committee to the Arizona Diabetes Control Council

May 2002

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"It is time for all health professionals to treat diabetes aggressively. It is also time for patients to take their diabetes with utmost seriousness. And it is incumbent upon the health care system to provide the necessary resources for both to be successful. Compromise or acceptance of a disadvantageous and dangerous status quo in people with diabetes should not be tolerated any longer."

–American Diabetes Association. Position Statement on the Implications of the United Kingdom Prospective Diabetes Study. *Diabetes Care.* V22;suppl 1: Jan1999:s27-31.

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SUMMARY

Diabetes will place an immense burden onto Arizona's various health care delivery systems in the next decade. Currently, about 211,000 Arizonans or 4% of the population have been diagnosed with diabetes. In 1999, there were almost 60,000 hospitalizations of persons with diabetes, with hospital charges amounting to over $1billion. Hospitalization rates are rising, and the average hospital stay for a person with diabetes now costs nearly $18,000.

If the current diabetes prevalence rate remains steady, by the year 2020 there will be 295,000 diabetics in our state. However, measures of diabetes prevalence, incidence, mortality, hospitalization, and major risk factors indicate that current rates are worsening. The increase is seen among all ethnic and racial groups. This report contains county-specific information about the prevalence, mortality, and hospitalization of persons with diabetes. It also shows the distribution of diabetes educators, who are effective in encouraging optimal care of persons with diabetes.

Our state must plan now for the increased resources required to treat patients who already have the disease. In addition, we must encourage activities now that will delay the onset of complications and even prevent diabetes from occurring at all. Our state's health policy makers must be made aware of the findings in this report and act upon them, so that the state's burden of diabetes is lessened.

Programs specific to the high risk populations are needed to reduce the increasing incidence among these groups. Program activities must occur at many levels. Successful management of diabetes will require changes in physician practices, modification of health care delivery systems, new societal attitudes toward physical activity and nutrition, and the empowerment of patients who must take charge of their disease.

Continued monitoring of diabetes health indicators will reveal the direction that our control efforts are leading.

ABBREVIATIONS

AHCCCS	Arizona Health Care Cost Containment System (Arizona's Medicaid program)
ADA	American Diabetes Association
ADHS	Arizona Department of Health Services
AMMQEP	Arizona Managed Medicare Quality Enhancement Program
BMI	Body mass index
BRFS	Behavioral Risk Factor Survey
CDC	Centers for Disease Control and Prevention
CDE	Certified diabetes educator
CVD	Cardiovascular disease
DAR	Diabetes and Assistance Resources
DCCT	The Diabetes Control and Complications Trial
DM	Diabetes mellitus
ESRD	End-stage renal disease
FPG	Fasting plasma glucose
HSAG	Health Services Advisory Group, Inc.
HMO	Health maintenance organization
IHS	Indian Health Service
IGT	Impaired glucose tolerance
ITCA	Inter Tribal Council of Arizona, Inc.
LEAs	Lower extremity amputations
MS	Master of science
MSN	Master of science in nursing
MMWR	*Morbidity and Mortality Weekly Report* of the CDC
NHANES	National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
NIH	National Institutes of Health
RD	Registered dietitian
RPMS	Resource and Patient Management System (of the IHS)
VA	Veterans Administration
VAH	Veterans Administration Hospital
WIC	Supplemental Nutrition Program for Women, Infants, and Children

PURPOSE OF THIS DOCUMENT

This document examines the burden of diabetes and its complications in Arizona. Its purpose is to estimate the prevalence, costs, and complications among persons with this disease. This document looks at data sources and Arizona's future data needs. We examine not only the number of persons with disease, but also the risk factors that have been linked to diabetes so we can understand the future burden that Arizona is likely to encounter.

This document is written by the Surveillance Committee of the Arizona Diabetes Control Council which provides advice to the ADHS Diabetes Control Program and facilitates communication between other federal, state, and local agencies that participate on the Council. Its intent is to assist the various diabetes control projects and programs within Arizona to develop coordinated, comprehensive activities.

We ask readers to use this report to take action in their respective programs that will lessen the burden of diabetes in our state.

INTRODUCTION

What Is Diabetes?

"Diabetes mellitus is a group of chronic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Insulin is a hormone, produced by the pancreas, that helps the body metabolize glucose." [1,2] Insulin acts as the "key" which opens the "door" to cells and allows glucose in. Without insulin or if it is ineffective in the body, glucose builds up in the blood stream leading to serious complications.

Two Major Types of Diabetes Mellitus

Type 1 diabetes is an autoimmune disease that occurs when the pancreas fails to produce insulin. It is usually detected during an acute onset requiring hospitalization. Individuals with type 1 are usually thin, require insulin to survive, and are diagnosed at a young age. Between 5% and 10% of all individuals with diabetes have type 1 diabetes. They are dependent on daily insulin injections. **Type 2 diabetes** occurs when the body produces insulin but the insulin is either not effective, or is produced in such small quantities that it is ineffective. Individuals with type 2 are often overweight, inactive, and are diagnosed with diabetes as adults. Between 90% and 95% of all individuals with diabetes have type 2. Some ethnic groups such as African Americans, Hispanics and Native Americans have higher rates of diabetes than the general population. [3]

There are other types of diabetes mellitus including gestational diabetes which is usually first detected during pregnancy. Gestational diabetes occurs in 2% to 5% of pregnancies and is more prevalent in African Americans, Hispanics and Native Americans. [3]

Diabetes in the United States

According to 1998 United States estimates, approximately 10.3 million individuals (3.9% of the total population) have been diagnosed with diabetes. It is estimated that another 5.4 million individuals (2%) have diabetes, but are unaware of their condition, placing the prevalence of diabetes at approximately 5.9% of the total population. Every day, at least 2,186 persons in the US are diagnosed with diabetes. [3]

Diabetes is the seventh leading cause of death (sixth leading cause of death by disease) in the United States. [4] The causes of death in individuals with type 2 diabetes include cardiovascular disease, present in 55% of diabetes-related deaths; cerebrovascular disease, present in 10% of deaths; pneumonia and influenza, accounting for 4% of deaths. The remaining 31% of deaths are attributable to other causes. [5]

Diabetes causes over 3.5 million hospital admissions every year equaling 24.7 million days of hospital stay. Approximately 14% of all hospitalizations involve diabetes as a primary or secondary diagnosis. According to the Centers for Disease Control and Prevention diabetes costs the US $98 billion annually in medical care and lost wages: $44.1 billion for direct medical costs attributable to diabetes, and $54.1 billion in disability, work loss and premature mortality. [6] In individuals over 65 years of age alone, diabetes costs over $5 billion. [7] Over 5.8% of all health care dollars spent are expended for diabetes care, which directly affects only 3.8% of the total population. [4]

It is imperative to reduce costs, hospitalizations and mortality from diabetes and to improve the quality of life for individuals with diabetes. In 1995, House Speaker Newt Gingrich identified diabetes education as a means of reducing health care costs through the reduction of diabetic complications. A landmark study called The Diabetes Control and Complications Trial (DCCT) showed that in patients with type 1 diabetes, who have mean blood glucose levels controlled to near normal (defined at the time of the study as 150mg/dl and /or a HbA1c of 7.2%), complications have been reduced by up to 70% compared to those who have an elevated blood glucose level (200mg/dl and/or a HbA1c of 9%). [8]

A recent, large study of type 2 diabetes in Britain also has shown that tight control of glucose levels results in reduced rates of the complications of diabetes. [9]

ARIZONA DEMOGRAPHICS

According to the 1999 population estimates, the number of Arizona residents has grown to 4,924,350, a 35% increase from 1990. Several aspects of the population directly relate to efforts to control diabetes.

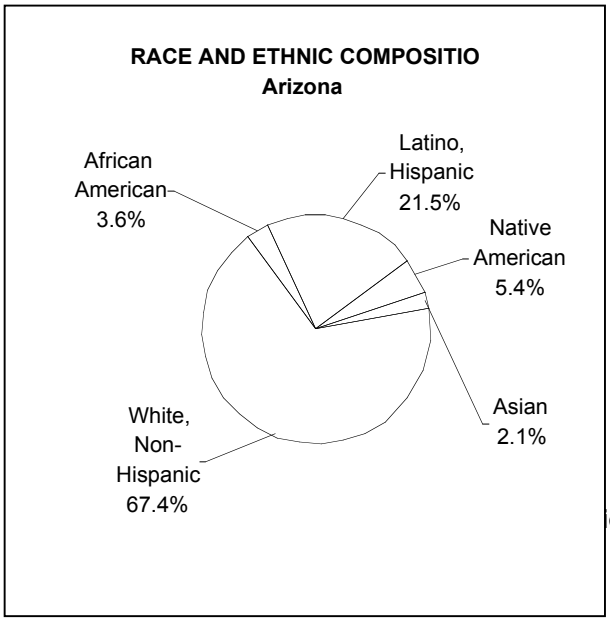
Ethnic Diversity

One of the most challenging characteristics of Arizona's population is its diversity of racial and ethnic groups (**Table 1, Figure 1**). Although four-fifths of the state is considered geographically rural, only 18% of the population lives in these rural areas. Many of these rural areas are home to the 21 federally recognized Native American tribes of Arizona. Many rural areas of the state carry an increased burden from diabetes because of their ethnic diversity. Hispanics comprise almost 31% of the residents in Cochise county, over 43% in Greenlee, nearly 51% in Yuma and about 81% in Santa Cruz county. Counties with the highest proportion of Native Americans are Apache and Navajo counties (76% and 47%, respectively), followed by Coconino, Graham, Gila and La Paz counties. [10]

Table 1. Population estimates. Source: *Arizona Health Status and Vital Statistics 1999*, ADHS.

	White, Non-Hispanic	African American	Latino, Hispanic	Native American	Asian	Total
Number	3,317,297	176,128	1,060,197	265,195	105,533	4,924,350
% of Total Population	67.4%	3.6%	21.5%	5.4%	2.1%	100%

The diverse ethnic make-up of Arizona challenges our health care agencies in terms of collecting data, and in developing programs. Future shifts in the ethnic composition and age distribution of our society will challenge all health care agencies to develop culturally appropriate programs that address the needs of these groups. Further, as a border state, the population of many Arizona cities fluctuates throughout the year due to influxes of migrant workers. Arizona is a "sunbelt" state that receives visitors during the winter months. These populations of migrant workers and winter visitors use health care and other resources provided by the state and federal government.



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Older Adults

Of the total 1999 population of Arizona, 57% of individuals are of working age (20-64 years of age), while 29% are under 20 years of age, and 14% are over 65 years of age (**Figure 2**). The working-age population economically contributes at least in part to the support of the non-working population.

Of persons age 65+ in 1999, most were White/Non-Hispanic (86.3%). The proportions in other groups were: African American (1.8%); Native American (2.1%); Asian (1.0%); and Hispanic (8.9%). [11] In 1990, one in every 6 seniors lived in poverty, many in rural counties. Although the majority of seniors are White, only 8.2% of White seniors lived in poverty. In contrast, 56.2% of Native Americans over the age of 65 lived in poverty. One in four or approximately 120,000 seniors live alone with lack of support systems. [12]

The number of individuals over the age of 65 in Arizona is increasing steadily. In 1999, there were 688,562 individuals (14% of the population) age 65 or older in Arizona. By the year 2020, the number of persons age 65 or older is expected to reach 1,296,878 persons or 18% of the total population. All seniors who were employed receive Medicare benefits supported predominately by the present working population. As the population continues to age, health care costs will continue to rise with a shrinking proportion of younger workers to "carry" the cost. Clearly, our state has a financial interest in reducing the prevalence of diabetes and its risk factors.

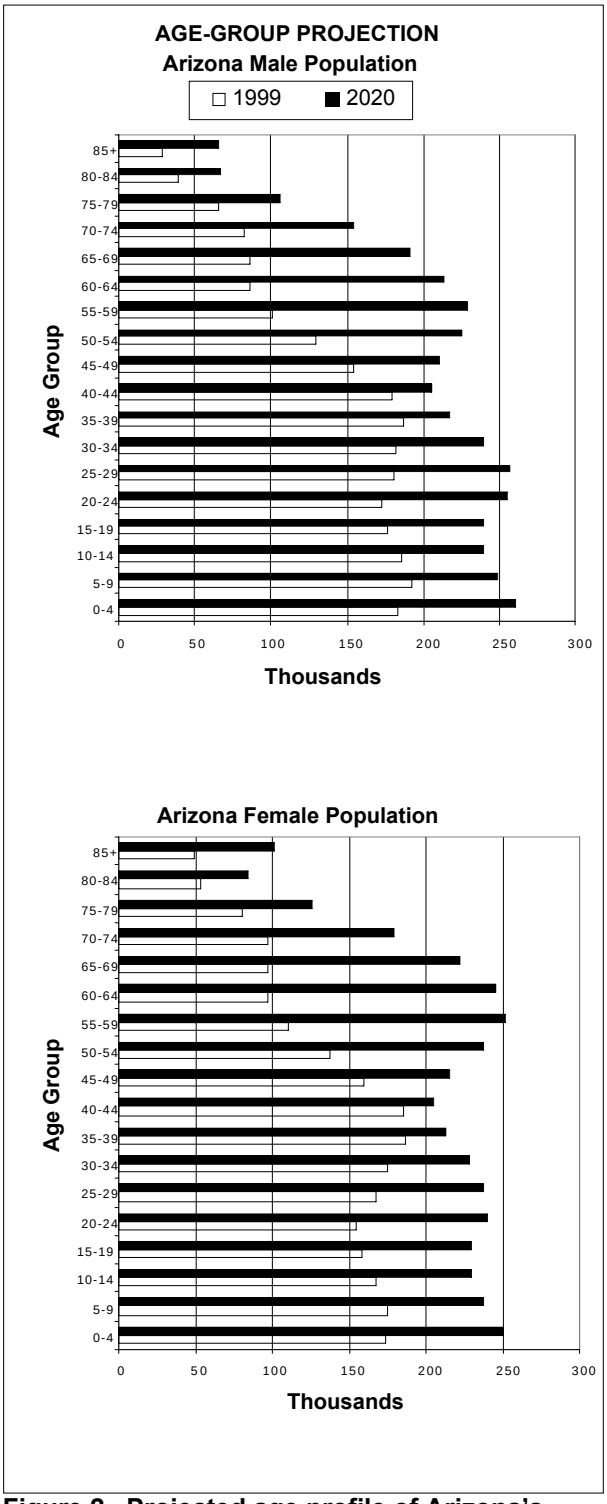

Figure 2. Projected age profile of Arizona's population, 1999 and 2020. Source: *Arizona Population Projections 1997 – 2050*, ADES Population Statistics Unit, February 1997.

DATA SOURCES

One of the objectives of the Arizona Diabetes Control Council is to identify existing data sources that can be used to monitor the occurrence of diabetes and its complications. This report identifies existing data sets that can contribute to the monitoring of diabetes and its complication. These include the Behavioral Risk Factor Survey (BRFS) diabetes subset, data bases maintained by the Indian Health Service, hospital discharge data sets, and managed care claims records. Supplemental data sources include data collected by the Health Services Advisory Group (overseeing the care provided to Medicare beneficiaries), and birth and death certificates. We assess some of these data sets regarding their usefulness, reliability and validity.

Behavioral Risk Factor Survey (BRFS)

The BRFS diabetes subset data has limited usefulness due to its small sample size, which affects its reliability and validity. Further, the survey is self-reported, only reaches individuals with telephone service, and reaches only a small number of diabetics in Arizona (e.g., 90 in 1999). There are biases in the BRFS diabetes subset data specific to Arizona. Due to the rural nature of our state and the fact that large numbers of border Hispanics and American Indians do not have phones many of the individuals most affected by diabetes are not surveyed. Groups which are at higher risk of having diabetes and complications of diabetes are under-counted, despite the current practice of over-sampling.

The Behavioral Risk Factor Survey (BRFS) is a random-sample telephone survey conducted annually in all fifty states by state health departments in collaboration with the Centers for Disease Control and Prevention (CDC). Each year, about 1,900 adult Arizonans (18 years and older) are interviewed. The BRFS survey includes questions on health issues such as diabetes, tobacco and alcohol use, physical exercise, diet, weight control, seat belt use, and use of preventive and other health care services.

Every year, around 60 of the 1,900 Arizona adults interviewed answer yes to “Have you been told by a doctor that you have diabetes?” Because of the small number of respondents with diabetes each year, the BRFS analysis in this report is based on combined data for six years (1994-1999).

Nevertheless, this data set is useful for making general statements concerning the incidence of complications and associated risk factor behaviors in the target population. It is also useful for looking at trends in behaviors in the overall population regarding physical activity, smoking, diet, and other behaviors which predispose a person to developing diabetes and its complications.

Indian Health Service Data

Within the Indian Health Service, data are collected on RPMS (Resource and Patient Management System) which is a comprehensive data collection and reporting system used in the day-to-day delivery of health care, as well as the periodic reporting and analysis of data. RPMS data from across all IHS areas are combined into a single database for overall IHS reporting and analysis. It is managed by the IHS Division of Community and Environmental Health.

In-patient discharge data are stored additionally in a series of databases also managed by the same IHS office. Tribes now are collecting data on diabetes, its complications, treatment, and prevention. As the number of tribes that choose self-determination in health care increases, the number of tribes taking over their own data collection will probably increase.

The **National Institutes of Health (NIH)** conduct research in Arizona in at least two Indian communities. Intensive research over the past 35 years among Pima Indians has produced valuable information about diabetes prevalence, risk factors, and the difficulty of achieving long term control. [13] Diabetes rates vary among the 21 tribes in Arizona, which are implementing their own diabetes control programs; their data will be valuable for purposes of comparing prevalence rates, and monitoring long term trends.

Inter Tribal Council of Arizona, Inc.

Nineteen tribes established the Inter Tribal Council of Arizona, Inc. (ITCA) to promote American Indian self-reliance through public policy development. ITCA provides an independent capacity to obtain, analyze, and disseminate vital information to the 21 tribes in Arizona. [14] Among their many programs, ITCA has established a tribal Epidemiology Center that compiles data on diabetes in American Indians. One source of their data is the RPMS of the IHS (described above). Currently, the ITCA Epidemiology Center maintains data files including the prevalence and complications due to diabetes for the following years: 1982 to 1986; 1995 and 1996; and IHS diabetes registry data for 1996.

ITCA provides nutritional services to women, infants, and children on the reservations in Arizona through its local tribal WIC programs. During the WIC visit, health information is recorded into the individual certification record. Some of the variables include the diagnoses of diabetes, glucose impairment in pregnancy and gestational diabetes, history of gestational diabetes; infants and children of diabetic mothers; diabetes in the family; and anthropometric measurements. ITCA's WIC program conducts analysis and produces local and state reports yearly. Information is sent to the CDC, Nutrition Surveillance System. [15]

Hospital Discharge Data

Hospital discharge data contains information about diabetes and its complications. This information is reported routinely to ADHS by all hospitals throughout the state, with the exception of Veterans Administration Hospital, Military Hospitals, and Indian Health Service Hospitals (which maintain their own data). Of the data currently available, hospital discharge data is the most accurate and reliable data on prevalence of complications of diabetes by gender, age, and payer type. It is also possible to generate statistics on specific physicians, areas in the state by zip code, county or other areas, and costs for each visit. In 1995, the ADHS system added components which identify the payers.

Federally managed hospitals now collect similar data regarding hospitalizations. Recently, the ADHS obtained some of these federal data, which help portray a more complete description of diabetes in the state. However, there are many differences in the data collected and reported by the various systems, and direct comparisons across health care delivery systems are not always possible.

Clinical Monitoring Systems

Diabetes is suitable for clinical management. In many respects the term "managed disease" describes the ideal approach. Monitoring the performance of clinicians can play a valuable role in managing diabetes successfully. At the present time, it is a fairly labor-intensive activity to review the charts of patients with diabetes to determine whether they have received the care recommended by the American Diabetes Association. However, many of the HMOs in Arizona have expressed interest in measuring and documenting the performance of their providers with regards to diabetes care. The IHS also has pioneered various indicators of performance and outcome with respect to diabetic patients within their health care delivery system.

The type of data that has been collected by managed care organizations includes: 1) demographic information on patients; 2) number and rate of newly diagnosed diabetics; 3) rate of complications including CVD, hypertension, lower extremity amputations, nephropathy and end stage renal disease, neuropathy, retinopathy and blindness, and circulatory complications; and 4) the education provided to patients.

In 1995, the Health Services Advisory Group, Inc (HSAG) published a report for the Arizona Managed Medicare Quality Enhancement Program (AMMQEP). [16] This report documented that the level of care provided to Medicare patients did not meet the recommended ADA guidelines. For example, only 12.6% of physicians monitored their patient's HgbA1c level at least every 12 months. Only 30% of patients received education regarding home glucose testing, diet, exercise, and medications. These types of studies can provide valuable information to HMOs about the clinical practices of their providers.

A comparison of data from HMOs can generate competition to provide a level of service that improves provider's adherence to guidelines. It is hoped that HMOs will make these data available to state and local surveillance systems.

Other Sources

At the current time, our Committee is unaware of other, major data sources that could be used in monitoring diabetes and progress in its control. We welcome any offers to supply data that would help us fill the gaps of the existing data sources.

THE BURDEN OF DIABETES IN ARIZONA

Characteristics of People with Diabetes

According to the Arizona Behavioral Risk Factor Survey (BRFS), 1994-1999, about 4% of all Arizonans reported that they were told they have diabetes. For 1999, this translates to at least 211,000 Arizonans with diabetes. It is difficult to obtain exact figures for diabetes prevalence because there is no systematic collection of information on the number of cases. Additionally, studies have shown that about one-third of all people with diabetes have not been diagnosed. [17]

Anyone can develop diabetes, but some population groups are at increased risk.

- Older adults are at increased risk for type 2 diabetes. The risk increases with age, especially after 55 for the overall population of Arizona (**Figure 3**).

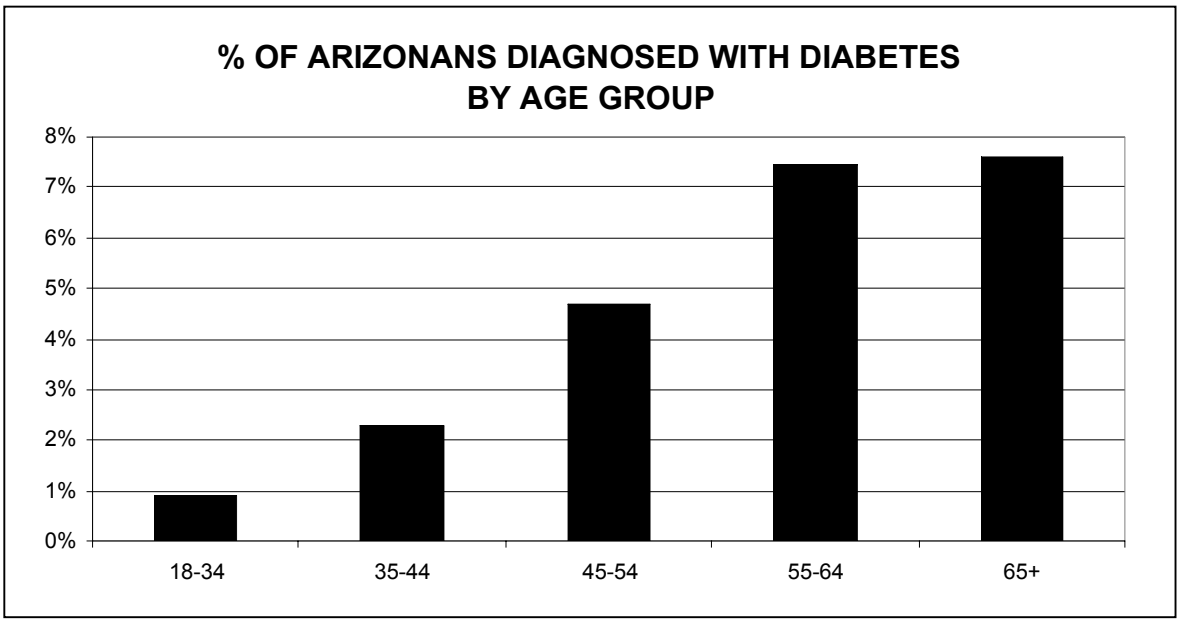

Figure 3. Percentage of Arizonans diagnosed with Diabetes, 1994-1998. Source: *Arizona BRFS*, 1994-1998. Data for 1999 by age group were not provided prior to printing.

- Family members of persons with diabetes are at greater risk of developing diabetes.

- Native Americans, African Americans, and Hispanics are more likely to develop type 2 diabetes than the population as a whole. Experts in the field believe that Native Americans are about four times as likely as the general population to develop diabetes. African Americans are also at increased risk, but few data are available to quantify this increased risk in Arizona. Arizona's BRFS data show that Hispanics are 2.12 times as likely as non-Hispanic Whites to be diagnosed with diabetes.

- Overweight or physically inactive persons are at greater risk for type 2 diabetes. However, these risks can be modified; one estimate is that at least 75% of type 2 diabetes can be prevented or delayed with weight loss and exercise. [18]

- Women with a history of gestational diabetes are more likely to develop type 2 diabetes later in life. Children born to mothers with gestational diabetes are more likely to be obese and to develop diabetes as adults.

- Socioeconomic factors are linked to diabetes, with higher rates noted among poorer, less educated, and unemployed persons (**Table 2**). These differences remain after adjusting for age. These associations are found in national data also and are not completely understood.

Table 2. Socioeconomic indicators by diabetes status, 1994-1999. Source: *Arizona BRFS,* Data analyzed by ADHS Office of Nutrition Services, September 2001.

Indicator	Respondents With Diabetes	Respondents Without Diabetes
Annual Income Under $20,000	19%	14%
Education Less Than High School Graduate	24%	11%
Not Employed	10%	5%

Risk Factors

The underlying cause or causes of type 1 diabetes are not known. From the studies conducted so far, factors linked to an increased risk include: viral infection, certain genetic patterns, season of the year, birth order, and nutrition. Breast feeding appears to be a protective factor for the child. However, no definitive cause has been identified. [19]

Similarly, the cause of type 2 diabetes is not known. However, several factors are strongly linked to its development: a maternal and familial history of diabetes, physical inactivity, intake of dietary fat, and weight gain. It has not yet been conclusively demonstrated that interventions regarding these factors actually can prevent or delay the development of type 2 diabetes. [20]

Nevertheless, the best advice that most clinicians give to patients is to adopt a physically active lifestyle, reduce intake of fat to no more than 30% of calories, and maintain an ideal body weight. From the public health perspective, there is abundant evidence that Arizonans are increasingly unlikely to follow this advice.

Arizonans with diabetes tend to be less active and more likely to be obese than those without diabetes (**Table 3**). Diabetics are less likely to be smokers; however, 14% still smoke and risk the accelerated damage to their blood vessels.

Table 3. Health indicators by diabetes status, 1994-1999. Source: *Arizona BRFS,* Data analyzed by ADHS Office of Nutrition Services, September 2001.

Indicator	Respondents With Diabetes	Respondents Without Diabetes
Sedentary Lifestyle	49%	36%
Overweight (BMI > 27.2 for females, >27.7 for males)	46%	22%
Smoking	14%	17%
High Blood Pressure	50%	17%
High Cholesterol	31%	29%

Recently, type 2 diabetes has been discovered with alarming frequency in children. Previously type 2 was virtually non existent in children. The reasons for this increase is not well understood. In Arizona, there is no consistent, unified source that collects public health data about the health and health risk behaviors of Arizona's children and adolescents. An available survey that monitors health risk behaviors among junior high schools (grades 6-8) and senior high schools (grades 9-12), is the Center for Disease Control and Prevention's "Youth Risk Behavior Survey" (YRBS). However, Arizona does not utilize this survey.

School-based health/physical education programs are required for grades 1 through 8. The interpretation of this requirement is up to the individual schools, as to whether they offer just health, or just physical education or a combination of both. Physical education does not necessarily imply that children are physically **active**. Health and physical education is not required for high school students. Yet, many of Arizona's high schools offer both. Schools are not required to report the height and weight of students nor to measure whether children are actually physically active. It is only when the children become adults that the state's public health system measures the risk factors for diabetes through the adult BRFS (described on page 12).

Diabetes Prevalence

There is no definitive source to determine the precise number of persons who have diabetes in Arizona. That is to say, there is no central registry of this common disease, nor is there a comprehensive data source that counts all cases in the state. Few counties have the resources to conduct studies of diabetes prevalence within their jurisdictions. One such survey was a Chronic Disease Needs Assessment conducted by Maricopa County among 1,000 participants, 50 years of age or older. The respondents were of low income and 33% were Hispanic. In this survey, 18% said had been told by a doctor that they had diabetes or "high blood sugar." We are not aware of other county-specific surveys of diabetes prevalence.

Several sources can **estimate** the number of diabetics: the Arizona Behavioral Risk Factor Survey (BRFS), the National Health Interview Survey (NHIS), and the National Health, Nutrition, and Examination Survey [17] (NHANES-3). Each of these surveys has various shortcomings that do not completely characterize the situation in Arizona; nevertheless, they provide a gross estimate of the prevalence in our state (**Table 4**). The estimate computations are presented in **Appendix A**.

Table 4. Estimated prevalence of diabetes in Arizona, 1999, using three data sources.

Survey Instrument	Statewide Estimated (Number)	Survey Methodology and Limitations
Arizona BRFS	**211,747**	The BRFS interviewed 11,341 state residents with telephones during 1994 – 1999; this estimates the number of Arizonans who say they **have been told** by a physician or other health care worker that they have diabetes. This fails to consider groups that have low or spotty telephone coverage. Undiagnosed persons also are not considered in this estimate.
NHIS	**155,744**	The NHIS was a random sample of US residents in 1994 that estimated the number of Americans who said they **have been told** by a physician or other health care worker that they have diabetes. Undiagnosed persons are not considered in this estimate.
NHANES-3	**190,805**	The NHANES-3 contained a probability sample of 18,825 US adults ≥ 20 years of age, conducted 1988 – 1994. This figure estimates the number who said they **have been told** by a physician or other health care worker that they have diabetes. A sub-sample gave blood for measurement of fasting plasma glucose; undiagnosed persona (estimated to be an additional 99,324 Arizonans) are not shown in this estimate.

Using the more conservative NHIS data, we have estimated the number of persons who would self-identify as having diabetes, by county (**Table 5**). These estimates are derived from national rates which probably underestimate the rate among Arizonans, given our higher number of Hispanics and Native Americans.

Table 5. Synthetic estimates of the number of known diabetics, 1999, using NHIS national prevalence rates.

County	Total	< 18	18 – 44	45 – 64	65 – 74	75+
Apache	1,456	39	308	617	280	211
Cochise	3,984	45	556	1,635	967	781
Coconino	2,983	48	697	1,420	515	304
Gila	1,949	18	167	696	595	473
Graham	974	15	168	377	220	194
Greenlee	252	4	37	114	50	46
La Paz	82	6	77	315	2,335	186
Maricopa	89,037	1,060	14,656	36,168	19,656	17,497
Mohave	6,203	46	512	2,172	2,005	1,468
Navajo	2,371	44	382	1,047	570	328
Pima	28,216	288	4,108	10,690	6,773	6,357
Pinal	5,433	60	682	2,188	1,397	1,106
Santa Cruz	1,066	18	165	438	240	204
Yavapai	6,820	44	511	2,311	2,149	1,804
Yuma	4,178	59	614	1,460	1,149	897
Arizona	**155,744**	**1,794**	**23,640**	**61,649**	**36,801**	**31,860**

Undiagnosed Diabetes in Arizona

Diabetes is often a silent disease present for 10 years or more before diagnosis. In this period before diagnosis, many changes occur to the small blood vessels that damage the major organs: retinopathy (eye damage); nephropathy (kidney damage that can lead to renal failure); damage to the coronary arteries; and impairment of the blood vessels and nerves in the feet and legs. Oftentimes, these complications are the first indication that diabetes is present.

It is now estimated that for every two persons diagnosed with diabetes there is another person who has it, but has not yet been diagnosed. Recently, the American Diabetes Association changed the criteria for diagnosing diabetes and a related condition called Impaired Glucose Tolerance (IGT). The threshold for diagnosis now has been lowered, and it is believed that more people with diabetes will be detected at an earlier stage of the disease. Earlier detection of diabetes provides the opportunity for tighter control of glucose levels and reduction of complications.

As noted in **Table 4**, we believe an additional 99,324 Arizonans have diabetes, but have not yet been diagnosed. Their lack of awareness means that they probably are not taking advantage of opportunities to delay the onset of complications of diabetes.

Complications of Diabetes

The elevated blood glucose levels associated with diabetes lead to pathologic changes in many organs throughout the body. [21] Many of these changes can be delayed or prevented by strictly monitoring and controlling the level of glucose in persons with type 1 diabetes. [7] Similar beneficial findings have been shown for persons with type 2 diabetes. [8] A model of earlier age screening and treatment, beginning at age 25, showed benefits in terms of fewer complications and improved quality of life. [22]

Psycho-social Problems

Like other chronic illnesses, diabetes leads to a wide range of psychological problems for patients and their family members. These problems include pain, hospitalization, changes in lifestyle and vocation, physical disabilities, and threatened survival. Direct physiological consequences can arise from any one of these factors, making it harder for patients to treat their diabetes and live productive, enjoyable lives. The magnitude of these psychological impacts has rarely been quantified.

Acute Glycemic Complications

Poorly controlled diabetics develop elevated glucose levels (hyperglycemia), sometimes to the point of coma, requiring hospitalization. Alternatively, if too much insulin is taken, the diabetic may suffer a life-threatening episode of low blood sugar (hypoglycemic coma or insulin shock). Of the Arizona nonfederal hospital admissions between 1995 and 1999 that list diabetes as a primary discharge diagnosis, 643 also identify hyperglycemia and 45 hypoglycemia as a diagnosis.

Periodontal Disease

This is a group of localized infections that affect the tissue surrounding and supporting the teeth (e.g., gingivitis, periodontitis). Poorly controlled diabetes invites or promotes periodontal disease. The magnitude of this problem has been poorly documented in Arizona.

Eye Disease

Diabetes is the leading cause of blindness in the United States in the working age-group, 20-74 years old. The damage to the eye is caused in large part by proliferative diabetic retinopathy and macular edema. The DCCT showed that retinopathy can be substantially prevented or delayed by good glucose control. An annual dilated eye exam may help prevent vision loss by leading to early detection of retinopathy. More than half of diabetic persons in the U.S. are not getting these yearly, dilated eye exams. [23] Timely treatment, usually by laser, is effective both medically and financially. It is estimated that at least 60% of the cases of blindness can be prevented. [24]

In Arizona, it is estimated that there are, at present, approximately 175,000 diagnosed diabetic persons over age 40. Of these, nearly 41,000 have some diabetic retinopathy, and close to 3,300 have proliferative retinopathy (the most serious form).

Additionally, it is estimated that there are 91,000 undiagnosed diabetic persons over age 40 in Arizona. Of these, approximately 7,200 have some form of diabetic retinopathy. Stated otherwise, about one-third of diabetes cases are undiagnosed and at greater risk of vision loss if they remain unrecognized and/or untreated.

Kidney Disease

Damage to blood vessels in the kidneys (nephropathy) can lead to progressive kidney failure, called end-stage renal disease (ESRD). The Intermountain End-Stage Renal Disease Network, Inc. tracks ESRD through a database of dialysis patients and kidney transplants. Each year, more than 1,000 Arizonans with diabetes progress to the point where renal failure requires dialysis. About 52% of the patients on renal dialysis have diabetes. Although 1999 data is not available, in 2000, there were 197 Arizonans with diabetes who received kidney transplants. There were 632 Arizonans who died of end stage renal disease related to their diabetes in 2000. [25] ESRD is estimated to cost $68,131 per year per patient. [22]

The DCCT showed that kidney disease can be reduced or prevented with good glucose control. Other preventive measures include blood pressure control by using a medicine called an ACE inhibitor. Early detection through annual screening for microalbuminuria can lead to earlier treatment, thereby slowing the progression of nephropathy so that patients may never need dialysis or a transplant.

Cardiovascular Disease (CVD)

Diabetics face a two to three fold increase in dying from these complications compared to persons without diabetes. In Arizona, 78.1% of the 1999 nonfederal hospitalizations that list diabetes as a primary discharge diagnosis also list CVD as a diagnosis. Modification of the risk factors for heart disease are especially important in diabetics: smoking, sedentary lifestyle, high blood pressure, cholesterol and lipids, and low dose aspirin therapy. Elevated blood pressure is particularly linked to development of CVD and nephropathy among diabetics.

Stroke

Cerebrovascular disease (paralytic stroke) is also common among diabetics, and the risk factors are similar to those of CVD. In Arizona, less than one percent of the 1999 nonfederal hospitalizations for diabetes as the primary diagnosis also had an associated diagnosis of stroke. Modification of the same risk factors for CVD also can reduce the risk for stroke.

Neuropathy

Damage to nerves can occur in diabetes, resulting in complications such as loss of sensation in feet, various types of painful neuritis, and impotence. There are no accurate measures of the prevalence of these complications in Arizona.

Foot Problems

Amputation of a toe, foot, or leg is a late-stage complication of diabetes. In Arizona, there were 824 diabetes-related lower extremity amputations (LEAs) among hospitalized patients at non-governmental hospitals in 1999. *Healthy People 2000* has estimated that half of all amputations can be prevented through interventions such as patient education, proper fitting shoes, and regular foot examination by the patient and doctor.

Among Native Americans in southern Arizona, the prevalence of lower extremity amputations in adults (age 18 or older) with type 2 diabetes was reported to be 10.3% in 1985-1986. [26] In a study published in 1993, the average annual age-adjusted incidence rates of all LEAs among diabetic subjects in the IHS Tucson Area (240.8 per 10,000) and Phoenix Area (203.1 per 10,000) were substantially higher than rates for the US (73.1 per 10,000), Navajo (74.0 per 10,000) and Oklahoma (87.3 per 10,000) IHS Areas. [27]

Currently, we are unable to produce similar data for other race or ethnic groups because no system is in place to monitor this problem. A few studies have looked at this topic and may be useful for the Committee's reference in the development of evaluation indicators. [28]

Emerging issues

Other interventions are now emerging to reduce co-morbidity among diabetics. These include vaccination against influenza, reduction of cigarette smoking, aspirin therapy to prevent heart disease, and lipid profile. The discovery and control of diabetes among young adults and children also will become a major issue in future years.

Summary of Complications

A summary of the prevalence of diabetes complications is shown in the following table, which has been compiled from various sources.

Table 6. Summary of diabetes complications, 1999, using data sources described in the preceding text.

DIABETES-RELATED CONDITION	NUMBER IN 1999	INFORMATION SOURCE
Lower Extremity Amputation	824	Arizona Hospital Discharge Data, 1999 (nonfederal facilities)
End Stage Renal Disease, new cases	867	Inter-Mountain Region
Blindness, new cases	900	Estimates, using NHANES-3
Hospitalizations, nonfederal facilities Hospitalizations for Diabetes as Primary Diagnoses Hospitalizations due to Cardiovascular Disease (CVD)	59,359 6,260 4,891	Arizona Hospital Discharge Data, 1999 (nonfederal facilities)

Diabetes and Pregnancy

Pregnancy can be complicated by either type 1 or type 2 diabetes or by gestational diabetes (which develops during the pregnancy). Uncontrolled diabetes increases the health risk for both the fetus and the mother. In pre-existing diabetes, preconception counseling is important to assure effective glucose control at conception and during the first trimester when major organ formation is taking place.

In 1999, about 2.2 percent of all births in Arizona were to mothers with diabetes, close to the national estimate of two to three percent. The percentage of Arizona mothers with diabetes has remained stable from 1989 to 1999. Gestational diabetes rates vary among racial and ethnic groups and run higher among those groups with higher diabetes rates overall (Native Americans, Hispanics, African Americans). The rate of both pre-existing and gestational diabetes during pregnancy increases steadily with age of the mother (**Figure 4**). During the past ten years, a decrease in the rate of newborns weighing over 4,000 grams is noted (**Table 7**).

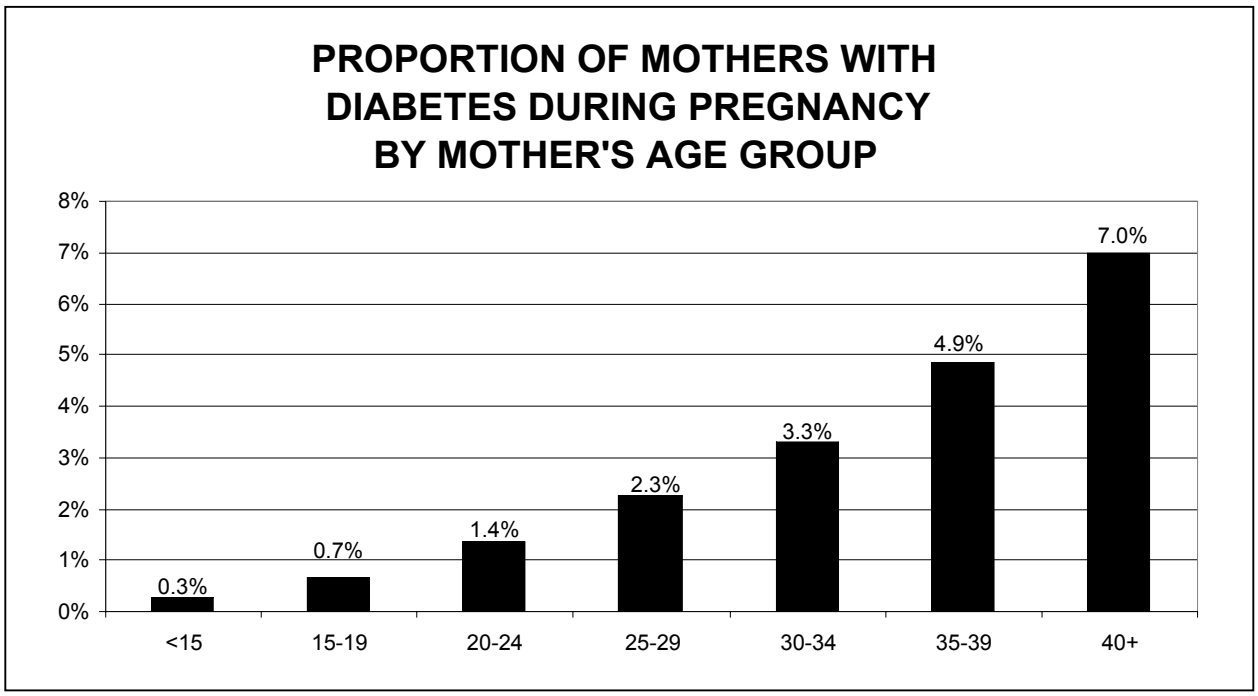

Figure 4. Percentage of mothers with diabetes (chronic or gestational) by mother's age group, 1989 – 1999, all races. Source: *Arizona Health Status and Vital Statistics 1989-1999*, ADHS.

Table 7. Births of infants over 4,000 grams, 1990 – 1999, all races. Source: *Arizona Health Status and Vital Statistics 1990-1999*, ADHS.

YEAR	NUMBER	RATE PER 1,000 LIVE BIRTHS
1990	6,837	99
1991	6,493	95
1992	6,247	91
1993	6,149	89
1994	6,348	90
1995	6,505	90
1996	6,506	94
1997	6,686	88
1998	6,900	89
1999	6,567	82

Among Native Americans receiving WIC services in 1998 through the Inter Tribal Council of Arizona, the rate of self-reported diabetes during pregnancy ranges from 2.7% to 5.1%, depending on the population served. [15] No response was provided for the year 1999.

HOSPITALIZATION DATA

Nonfederal facilities

The Hospital Discharge Data Base (HDDB) compiled by ADHS provides valuable information about the impact of diabetes in Arizona. This database contains data about discharges from nonfederal hospitals. As shown in **Table 8**, there were 59,359 diabetes-related discharges where diabetes (ICD-9-CM code 250.xx) was listed as one of the nine diagnoses that can be listed for a patient. The unit of analysis in this table is the number of discharges, not unique persons. Thus, a person discharged more than one time with diabetes or a diabetes-related illness can be counted several times. Diabetes-related discharges accounted for 284,029 days of hospital stay in 1999. As also shown in the table, the proportion of discharges that include diabetes as a primary or co-morbid condition now exceeds 10.6 percent.

Table 8. Hospital discharges for diabetes-related discharge diagnosis, nonfederal facilities only, 1991-1999. Source: HDDB, 1991-1999.

Year of Discharge	Diabetes Discharges (Number)	Diabetes Discharge Rate*	Average Length Stay (Days)	Total Charges	Deaths (Number)
1991	28,783	67.4	6.3	$327,563,452	939
1992	33,036	76.7	6.1	$402,768,934	1,067
1993	32,758	74.8	5.8	$429,237,924	1,081
1994	36,788	81.6	5.3	$493,820,743	979
1995	44,088	93.4	5.4	$669,148,220	1,345
1996	50,762	103.0	4.9	$775,551,399	1,407
1997	54,848	106.3	4.7	$881,891,382	1,688
1998	54,425	101.1	4.9	$925,712,245	1,349
1999	59,359	105.8	4.8	$1,065,316,017	1,440

On a population basis, discharges due to diabetes as the primary diagnosis also have increased year after year. During 1999 in Arizona, there were 6,260 hospital discharges with diabetes as the primary diagnosis (i.e., the first-listed diagnosis, and the primary illness treated during the hospital stay, ICD-9-CM code=250.xx). A 37% increase in hospitalization rates between 1991 and 1999 is shown in **Figure 5**.

The hospitalization rate differs considerably among Arizona's 15 counties (**Table 9**). Since 1991, Pima, Pinal, and Yuma counties have had discharge rates that are consistently higher than the state rate. Counties, such as Apache, Graham, and Greenlee demonstrate a marked percent increase in hospitalization rates since 1991 as well.

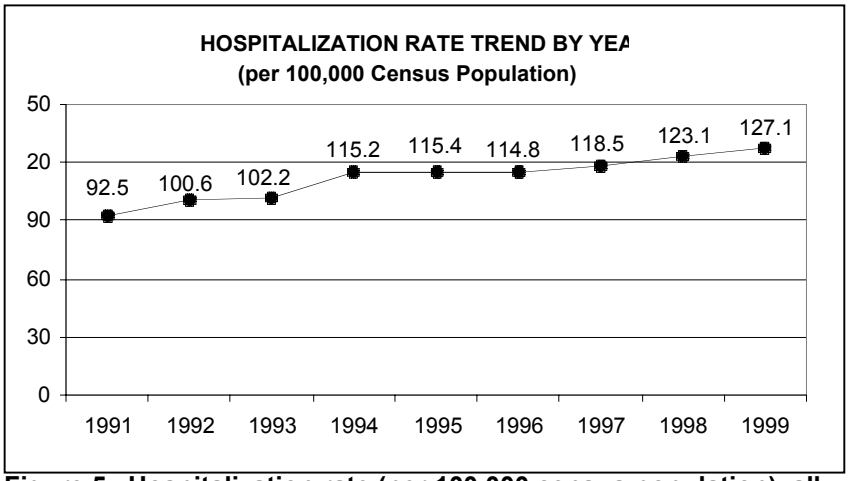

Figure 5. Hospitalization rate (per 100,000 census population), all counties combined, for diabetes as the primary discharge diagnosis, nonfederal facilities only, 1991-1999. Source: HDDB, 1991-1999.

Table 9. Hospitalization rate (per 100,000 census population) for diabetes as the primary diagnosis at discharge, nonfederal facilities only, 1991-1999. Source: HDDB, 1991-1999.

Counties	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Apache	12.8	17.5	21.8	19.8	45.7	47.8	76.3	87.4	58.3
Cochise	58.8	60.6	74.6	83.5	93.3	135.0	112.8	151.9	164.6
Coconino	63.3	74.3	86.4	80.3	85.0	73.0	91.1	104.4	97.7
Gila	80.2	61.5	82.8	145.4	166.7	103.5	166.5	156.6	109.7
Graham	14.7	32.6	38.7	55.4	317.4	133.2	196.5	279.5	167.8
Greenlee	60.1	103.7	22.5	99.9	163.2	53.6	112.7	241.1	281.8
La Paz	94.1	79.9	101.0	163.0	203.1	124.2	181.6	168.4	119.5
Maricopa	87.9	93.5	92.0	104.8	99.9	99.1	93.7	110.1	118.3
Mohave	128.2	115.5	97.2	99.5	110.6	118.8	123.5	124.8	121.0
Navajo	55.8	63.2	82.0	82.5	96.2	104.3	109.8	129.7	134.9
Pima	102.1	116.4	110.7	126.6	120.5	130.1	129.2	140.1	142.7
Pinal	151.5	178.1	223.9	257.2	141.6	243.8	192.9	216.3	208.6
Santa Cruz	80.1	119.9	182.1	146.7	112.7	157.0	170.6	119.0	117.6
Yavapai	72.3	90.2	77.0	95.5	93.0	113.4	107.0	111.1	98.8
Yuma	104.8	122.6	123.7	122.3	135.5	134.2	157.8	130.2	164.7
Arizona	**92.5**	**100.6**	**102.2**	**115.2**	**115.4**	**114.8**	**118.5**	**123.1**	**127.1**

Discharge rates differ markedly among race and ethnic groups. African Americans have the highest rate followed by Native Americans and Hispanics (**Figure 6**). Native Americans who were treated in nonfederal facilities are included in the figure; however, Native Americans seen only at IHS facilities are not included in the figure (see page 35). Similarly, veterans who received care only at V.A. facilities are not shown.

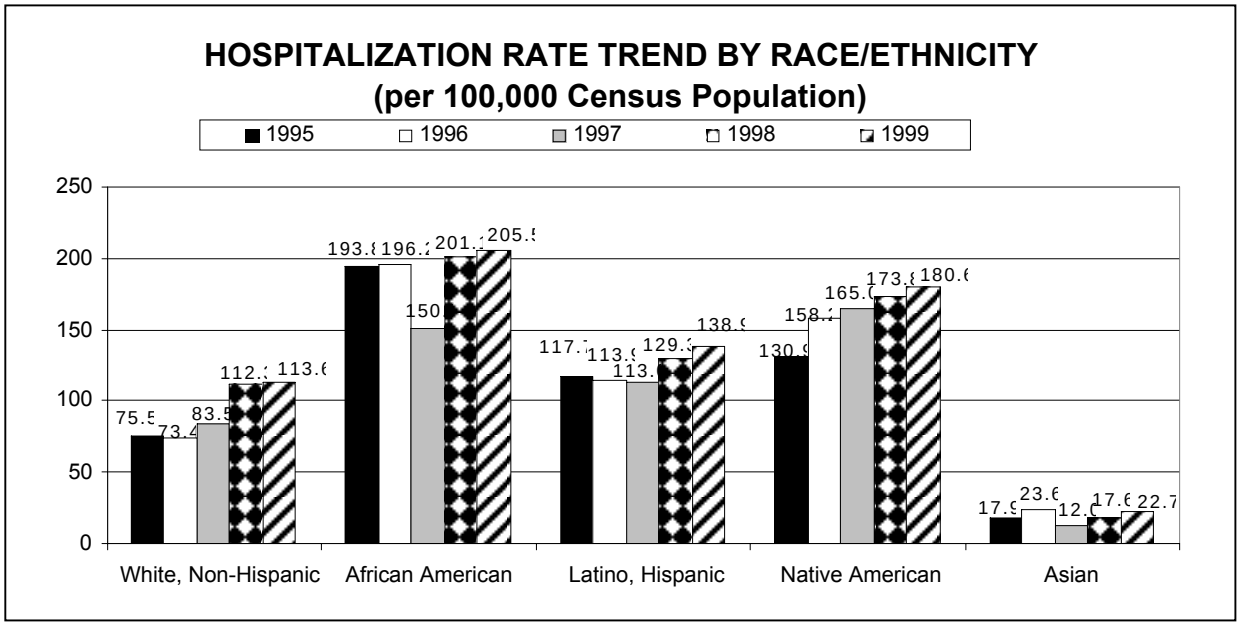

Figure 6. Hospitalization rate (per 100,000 census population) for diabetes as the primary discharge diagnosis, nonfederal facilities only, 1995-1999. Source: HDDB, 1995-1999.

Age-specific discharge rates, by race, for the HDDB reveal an expected pattern among the older age groups (**Figure 7**). However, we also see an elevated rate among Hispanics and African Americans.

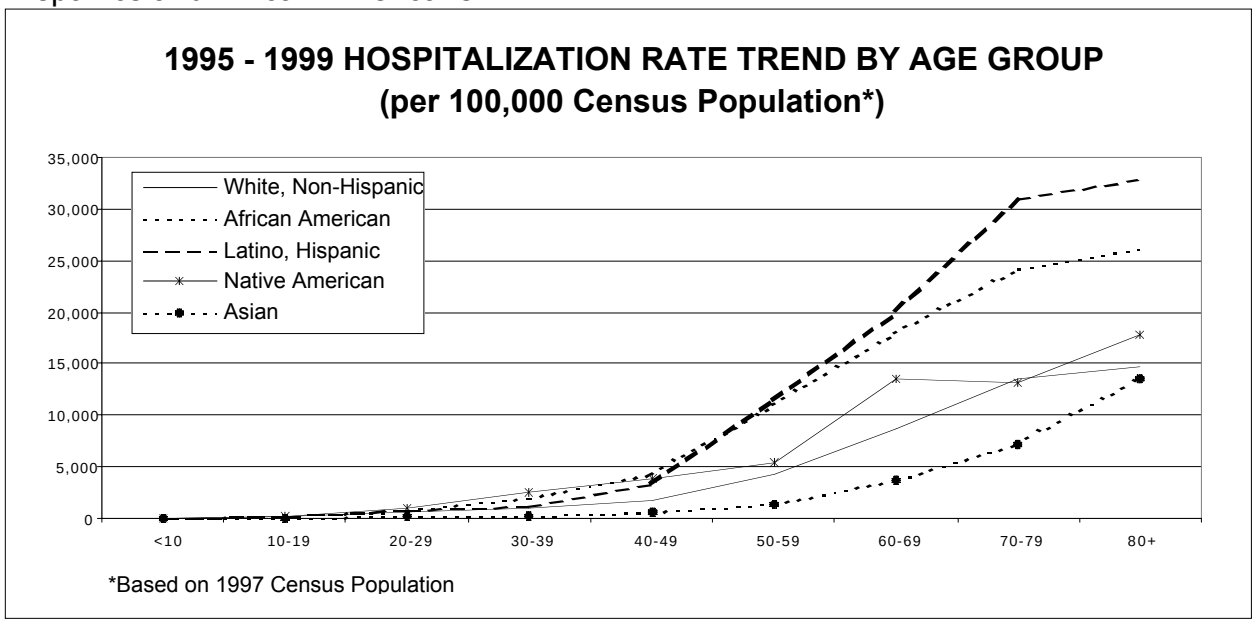

Figure 7. Age-specific hospitalization rates (per 100,000 census population), by race, for diabetes-related discharge diagnosis, nonfederal facilities only, 1995-1999. Source: HDDB, 1995-1999.

As calculated from **Table 8**, the average cost upon discharge has increased from $11,380 during 1991 to $17,947 in 1999. In 1999, AHCCCS incurred 11% (nearly $118 million) of the charges (**Figure 8**). Medicare paid 37.6% of all diabetes hospitalizations, totaling over $400 million. HMOs were the second largest payer with 15% of the cost, or almost $160 million. In most plans, employers share these costs with employees. These figures do **not** take into account the costs incurred among federal hospitals, such as IHS hospitals or the Veterans Administration hospitals.

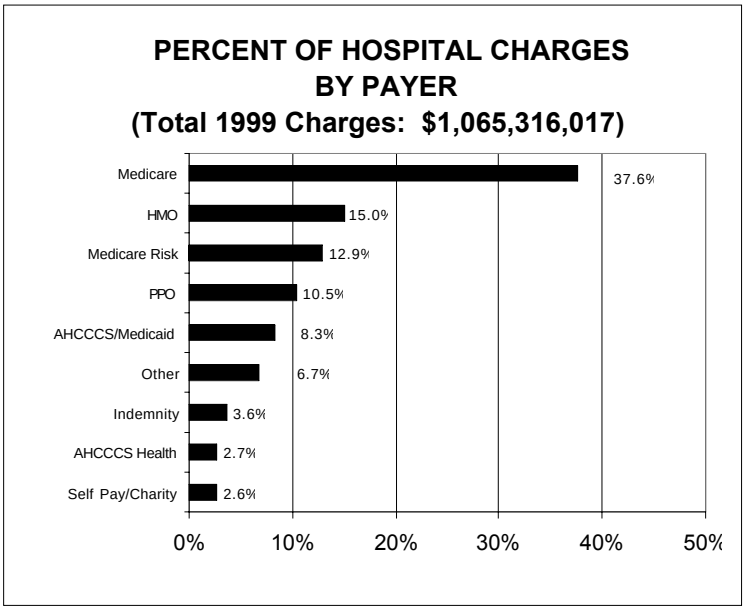

Figure 8. Payers of hospital charges for diabetes-related discharge diagnosis, nonfederal facilities only, 1999. Source: HDDB, 1999.

Diabetes is also a large problem in the population 21 years of age and younger. In 1999, diabetes-related discharges in persons age 15-19 accounted for 42% of the hospital charges for age 21 and younger. The average spent per discharge of persons age 21 and younger is $8,413. **Figure 9** shows hospital discharges and costs among children age 21 and younger at nonfederal facilities.

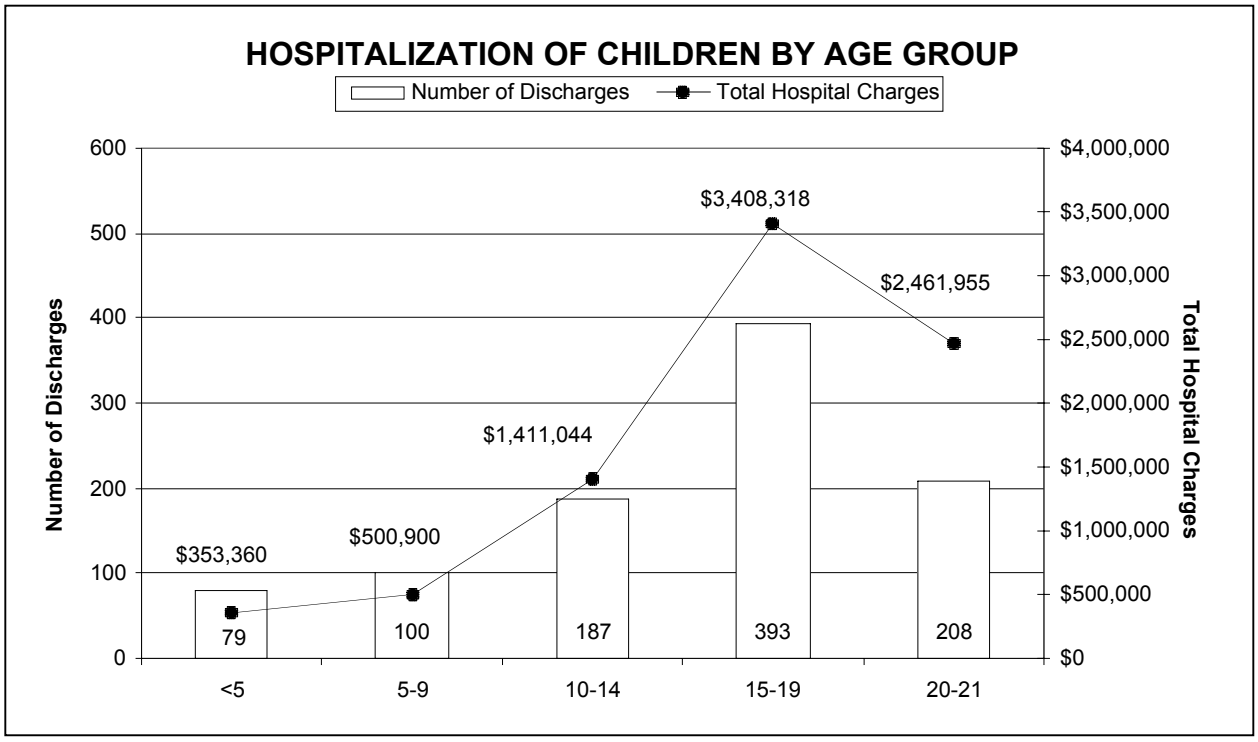

Figure 9. Hospital discharges for children age 21 and younger for diabetes-related discharge diagnosis, nonfederal facilities only, 1999. Source: HDDB, 1999.

The cost of hospitalization has risen dramatically. In 1999, hospital charges for the 59,359 discharges from nonfederal facilities exceeded $1 billion. Of the amount spent during 1999, the majority of the costs were spent for circulatory system complications ($407 million). The cost of other complications is shown in **Figure 10**.

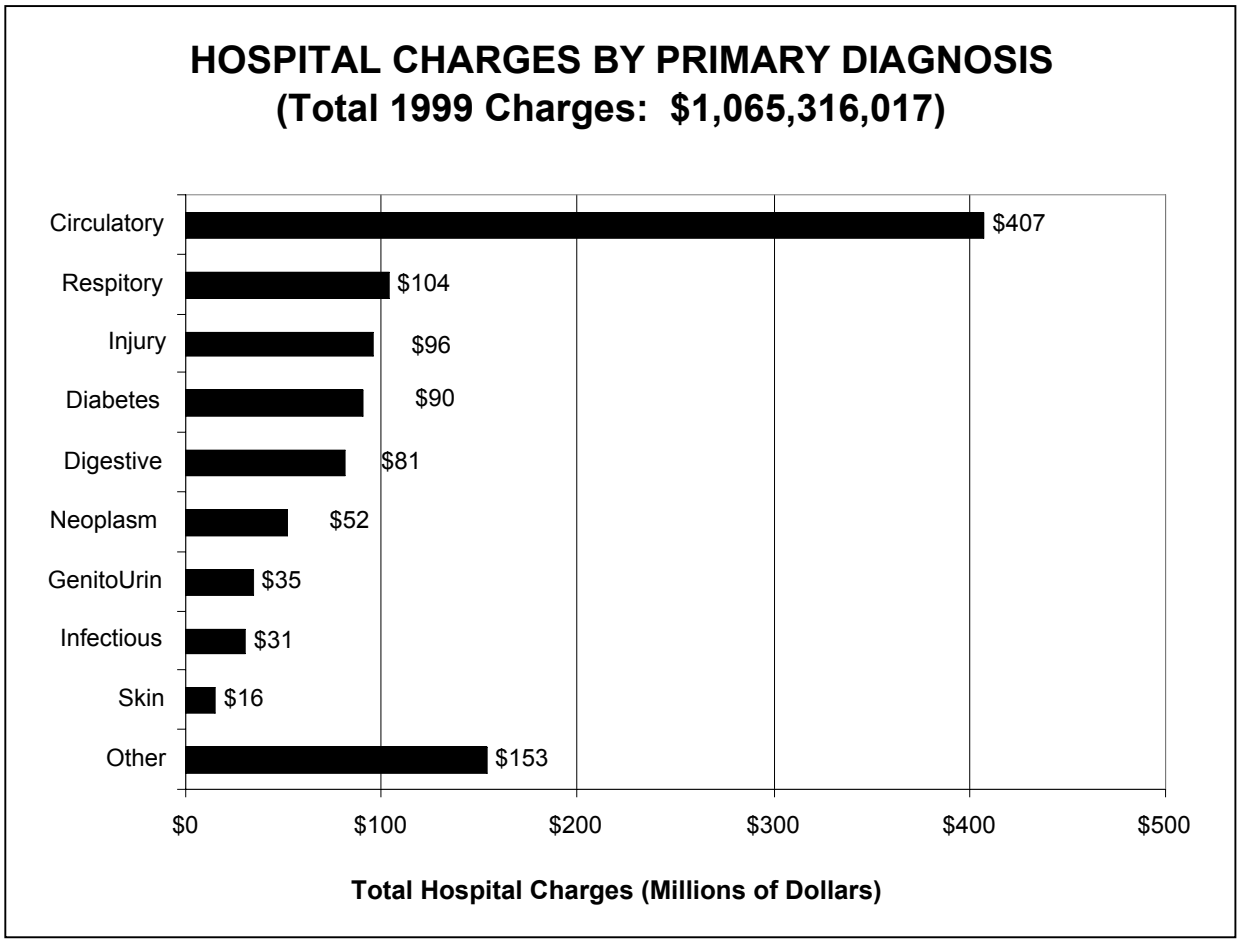

Figure 10. Hospital charges, by primary diagnosis, for diabetes-related discharge diagnosis, nonfederal facilities only, 1999. Source: HDDB, 1999.

Federal facilities

Federally managed facilities now collect hospitalization data in a manner similar to the HDDB described above. Until now, there has been little sharing of these data between the state and federal governments. There are many reasons for this, but mainly the health care systems function, for the most part, independently of each other. In general, the federal systems were established to serve persons to whom the federal government was obliged to provide comprehensive medical care. Examples of groups to whom federal hospital services are provided include military veterans with service-connected injuries, American Indians residing on federal reservations, and persons serving in the various branches of the armed forces. The eligibility criteria for receiving federal health care service are complex and have changed over the past decade.

Federal hospitals in Arizona are run by three distinct federal agencies; each agency also has multiple hospitals with their own geographic areas of coverage. This report does not have data from all the federal agencies or areas. However, the data below adds an important perspective about the burden of diabetes among persons who receive care at federal facilities.

Veterans Administration

The Phoenix Veterans Administration Medical Center VAMC serves veterans living mostly in central Arizona. About 30,114 eligible veterans live in Maricopa and Gila counties. About 36,973 veterans actually used the services of the Phoenix center in FY 99. For this report, the center has provided data about persons discharged from their facility with a diagnosis of diabetes between fiscal year 1994 and 1999. [29] Data from the Phoenix VAMC serves as a model for how federal data can provide a more accurate picture of diabetes in Arizona. Keep in mind, however, that the following data do not include services provided by the Tucson or Prescott VA centers.

Table 10. Discharge data for Arizona veterans with diabetes, FY 94 – FY 99. Source: Phoenix VAH, October 2001, from KLF MENU Planning Market Report.

Fiscal Year	Unduplicated Persons Discharged with Diabetes	Discharges for All Med. & Surg. Causes	Number of Discharges for Diabetes*	Diabetes Discharge Rate**	Average Length of Stay (Days)
1994	992	7,380	1,630	220.9	10.9
1995	1,026	7,500	1,662	221.6	10.3
1996	1,059	8,133	1,767	217.3	8.8
1997	974	7,424	1,605	216.2	6.7
1998	1,003	7,258	1,645	226.6	5.6
1999	920	6,179	1,545	250.0	6.6

*A person is counted more than once here if admitted multiple times. Consists of primary and secondary diagnoses of diabetes.

**Number of diabetes discharges per 1,000 discharges from all causes

The number of veterans discharged from the Phoenix hospital for a diabetes-related diagnosis is shown in **Table 10**. The rates shown above are not age-adjusted and thus are not comparable to the rates shown for non-federal hospitals.

The Phoenix VAH tends to draw most of its patients from Maricopa county; however, a significant number of patients come from other counties and even other states (**Figure 11**). A wide coverage area often poses problems in transportation to and from the hospital, and sometimes enters into decisions about length of stay in a hospital.

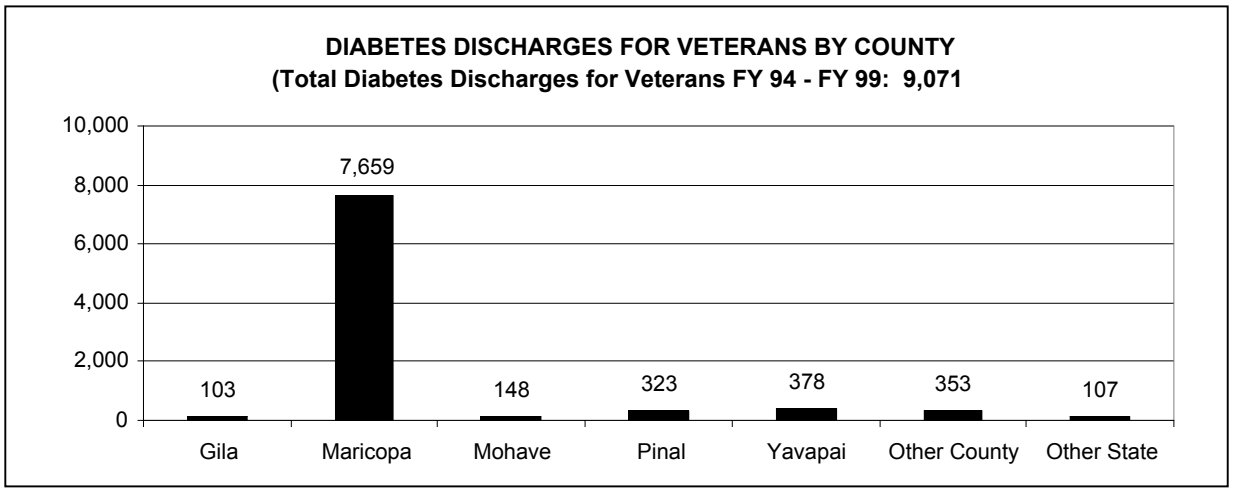

Figure 11. Hospital discharges for veterans, by county of residence, for diabetes-related discharge diagnosis, FY 94 – FY 99. Source: Phoenix VAH, October 2001.

The age distribution of veterans discharged from the Phoenix hospital for a diabetes-related diagnosis is shown **Figure 12**. In contrast to the nonfederal hospitals in Arizona, 97% of the persons discharged from the Phoenix VAH are male.

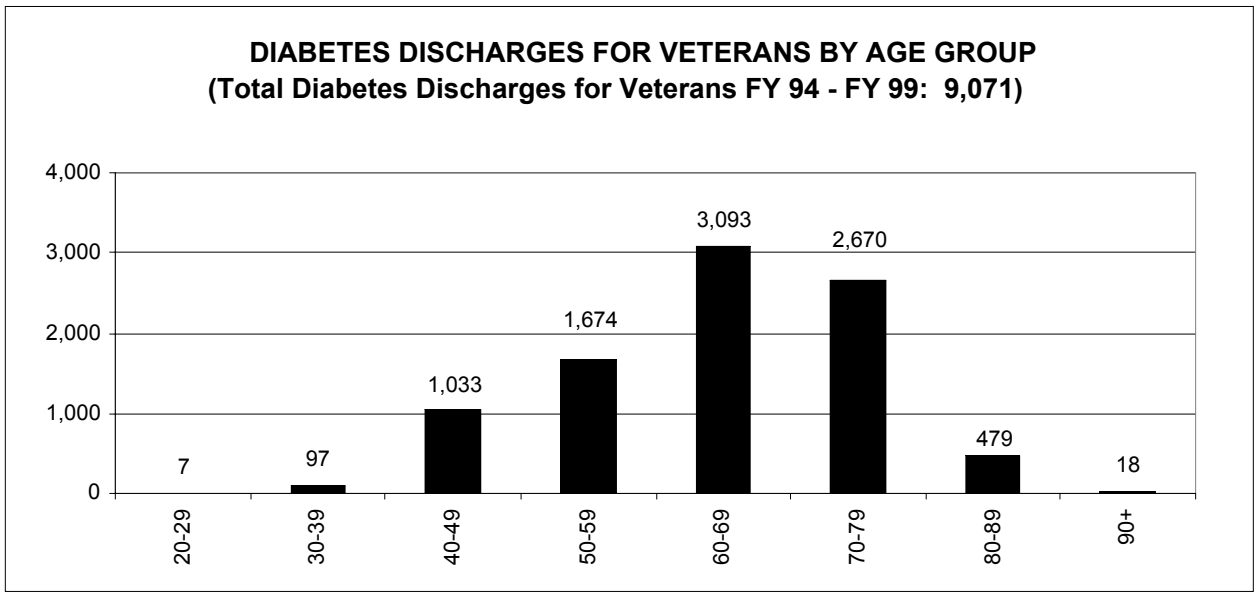

Figure 12. Hospital discharges for veterans, by age group, for diabetes-related discharge diagnosis, FY 94 – FY 99. Source: Phoenix VAH, October 2001.

The ethnic and race distribution of these veterans is shown in **Figure 13**. Since we do not have the ethnic and race distribution of the population served, it is difficult to draw definitive conclusions about this topic, except to say that there is a wide mix of ethnic and racial groups.

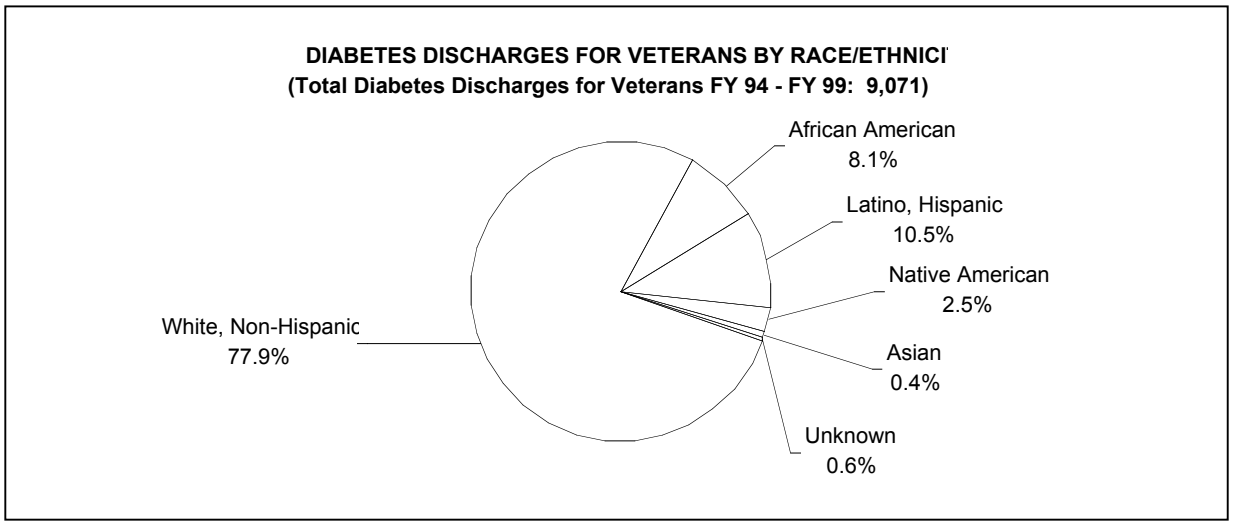

Figure 13. Hospital discharges for veterans, by race, for diabetes-related discharge diagnosis, FY 94 – FY 99. Source: Phoenix VAH, October 2001.

Indian Health Service

No response for 1999 was provided by IHS. However, previous data indicated a hospitalization rate for diabetes-related illnesses in 1996 of approximately 325 discharges per 100,000 users of IHS facilities in Arizona. [30]

Military facilities

Our Committee made no attempt to collect data from these facilities for this report.

FINANCIAL IMPACT IN ARIZONA

Comprehensive data concerning the financial impact of diabetes specific to Arizona can only be estimated. (The national impact was described earlier on page 9.) The cost associated with hospitalization obviously does not consider the outpatient charges. The American Diabetes Association has estimated the total cost of diabetes in Arizona to be $2.3 billion annually ($1.5 billion associated with direct medical costs and the remaining $763 million derived from indirect costs such as lost productivity. This equates to an average, total, economic cost per diagnosed person of $13,398 per year ($8,977 direct costs and $4,421 indirect costs). [31]

The increased application of optimal care will cause short term increases in the cost of diabetes. However, these short term increases will be offset by savings as complications are delayed or entirely prevented in the long term. Prevention of these complications through outpatient education, covered supplies through insurance or AHCCCS, and improved clinical practice behaviors, would cost only a fraction of the cost of being admitted to a hospital for care of these complications.

A recent study documented for the first time that improved glycemic control of patients with type 2 diabetes leads to substantial short-term benefits in terms of symptoms, quality of life, and economic savings. [32]

DIABETES RESOURCES IN ARIZONA

Diabetes educators have proven to be valuable additions to the team that delivers health care to diabetic patients. Diabetes education is provided by certified diabetes educators (CDE), and other health professionals, such as: family nurse practitioners, nutritionists, physicians, registered dietitians, and registered nurses. The distribution of diabetes educators across the state is shown in **Figure 14**. The Arizona Diabetes Control Council recognizes a shortage of diabetes educators, especially workers who have received formal CDE certification. Currently, there is no accepted standard for the ratio of the number of certified diabetes educators per number of diabetics. The development of a recommended ratio would be helpful in planning and delivering high quality diabetes education to the public.

Another human resource often times overlooked are lay health workers. These persons are also known as lay health advisors, *promotoras,* or community health representatives. The title differs according to the community in which they work. These lay health workers provide outreach activities that encourage utilization of primary and preventive care services. Lay health workers generally reside in the communities where they work and already have developed a level of trust with other community members. Lay health workers often are bilingual (which overcomes language barriers) and have been trained about various health related topics.

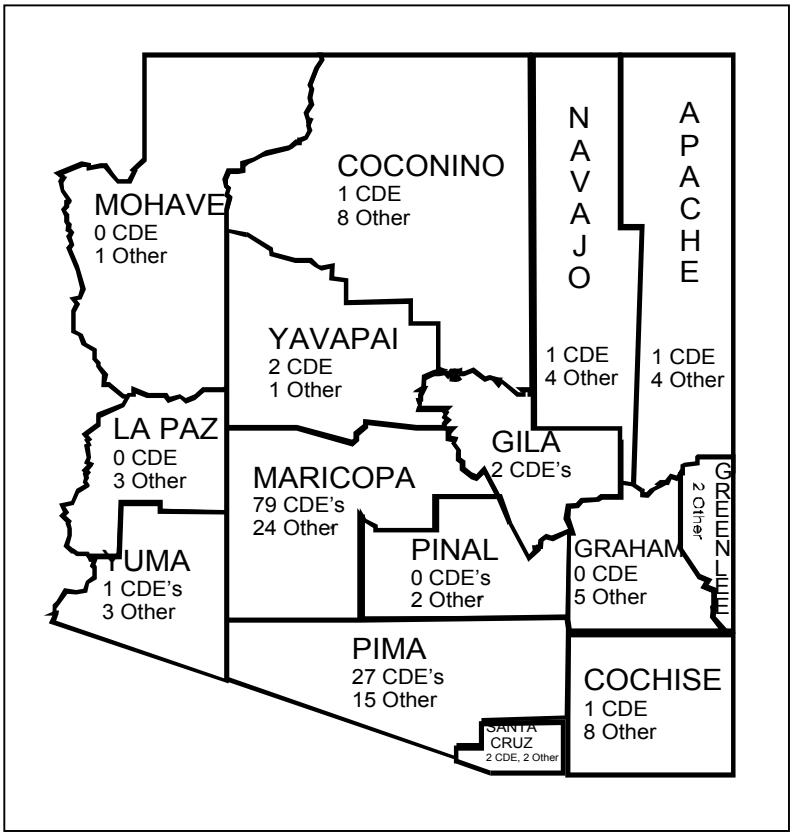

Figure 14. CDE distribution by County in Arizona, 1999.

The Education Committee of the Council has developed a resource directory, so we will not replicate their work here. [33] Nevertheless, we highlight the following aspects because they have bearing on diabetes among special population groups.

In 1998, all 21 tribes in Arizona have received funding through the Indian Health Service national grant program, *Special Diabetes Program for Indians,* to develop their own local tribal programs to prevent and delay diabetes and its complications. The following existing programs are important resources for the tribes in Arizona:

Diabetes Education Center
Gila River Health Care Corporation
Hu Hu Kam Memorial Hospital
PO Box 38
Sacaton, AZ 85247
Contact: JoAnne Lafley, MSN, CRNP, CDE
Tel: (520) 562-3321

Diabetes Prevention Program
Tucson Area School-based Health Education Program for Children
Sells Service Unit
PO Box 548
Sells, AZ 85634
Contact: Nellie Tucker, RD/LD, Coordinator
Tel: (520) 383-7333

The Diabetes Center for Excellence
Phoenix Indian Medical Center
4212 N16th Street
Phoenix, AZ 85016
Contact: Charlton Wilson, MD
Tel: (602) 263-1200 or (602) 263-1537

MORTALITY DATA

The goal as stated in *Healthy People 2000: Objectives for the Nation* is to reduce the number of diabetes-related deaths from the baseline rate of 38/100,000 in 1986 to 34/100,000 by the year 2000. [34] New objectives are being developed for the Year 2010. Rates for the *HP2000* objectives are calculated using underlying *and* contributing causes of death. These data are not readily available for inclusion in this report because the coding for contributing causes of death is performed and reported with about a 3-year delay. It would be helpful in future reports to include data from Arizona that could be compared to the national health objectives.

The mortality rate of diabetes as an *underlying* cause of death among Arizona residents is increasing (**Figure 15**). This figure includes all Arizona residents, regardless of the state in which they die. [35] Additional data about the rate among subgroups are presented in subsequent sections of this report.

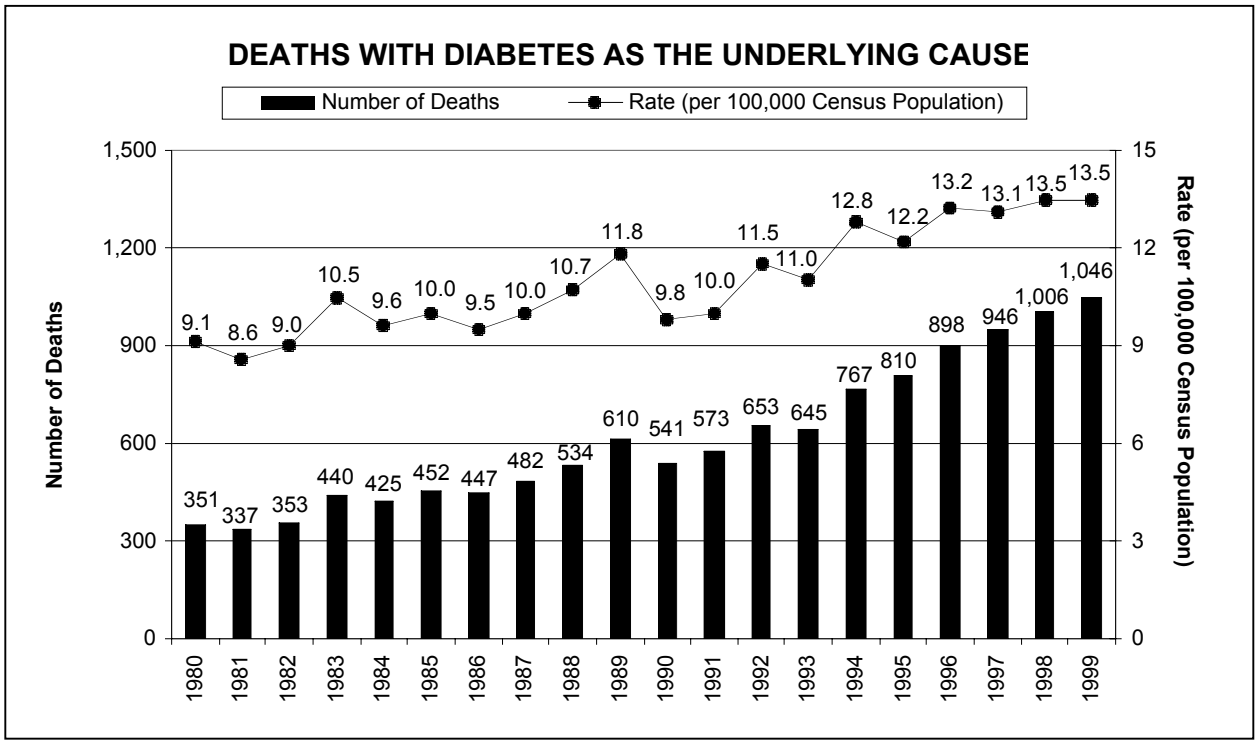

Figure 15. Deaths in Arizona with the underlying cause of death listed as ICD-9 code 250.xx (diabetes), 1980 – 1999. Rates are per 100,000 population, age-adjusted to the US 1940 standard. These data include deaths among American Indians. Source: *Arizona Health Status and Vital Statistics 1980-1999,* ADHS.

The mortality rates according to county also are available for analysis. Rates can vary widely from year to year when there are small number of events, as is often noted in the smaller counties. Nevertheless, a consistent upward trend is noted for the state as a whole, and in the larger counties, as shown in **Table 11**. As an outcome, death as a result of diabetes usually reflects the medical care and treatment received over a long period of time, generally several decades after the disease has been present. For that reason mortality rates are not regarded as timely indicators of care that diabetics receive. Rates which are slow to rise also may be slow to fall, despite improving care, given the protracted course of diabetes. Also, miscoding of death certificates may occur. For example, a person may die with renal failure, but the physician may forget to list diabetes as the underlying cause of the renal failure.

Table 11. Age-adjusted mortality rates per 100,000 population for diabetes listed as the underlying cause of death, 1991 – 1999. Source: *Arizona Health Status and Vital Statistics 1991-1999*, ADHS.

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Apache	14.0	31.1	13.5	16.3	31.8	26.5	23.9	35.2	39.0
Cochise	10.7	15.5	12.2	12.0	14.6	11.2	13.6	14.0	9.6
Coconino	11.1	14.7	8.6	13.4	9.4	13.3	8.0	14.5	8.6
Gila	19.0	17.6	13.9	20.2	12.9	15.5	22.9	29.1	18.7
Graham	10.0	13.8	18.2	23.1	24.1	28.5	8.8	43.8	16.4
Greenlee	14.5	45.6	32.0	7.0	0.0	21.6	11.9	63.0	21.9
La Paz	27.2	28.6	17.0	33.0	2.0	17.4	5.5	8.6	4.2
Maricopa	9.4	10.9	10.5	12.4	11.5	13.1	12.9	13.2	13.0
Mohave	11.2	10.4	8.3	9.6	11.1	12.7	9.8	10.6	16.0
Navajo	8.2	21.5	18.0	16.4	18.2	17.1	18.6	17.3	24.6
Pima	9.8	10.6	9.6	11.5	12.9	10.6	12.1	10.9	13.4
Pinal	19.6	20.7	22.3	22.4	17.6	23.0	23.1	23.6	22.4
Santa Cruz	9.8	8.3	9.6	18.2	15.4	6.7	14.4	23.1	36.8
Yavapai	9.2	6.7	9.5	7.5	9.9	9.3	10.3	8.2	6.0
Yuma	15.3	8.4	14.8	17.6	10.3	16.8	12.1	9.5	11.2
Arizona	**10.0**	**11.5**	**11.0**	**12.8**	**12.2**	**13.2**	**13.1**	**13.5**	**13.5**

HIGH RISK POPULATIONS

Mortality rates in Arizona differ by race and ethnic groups (**Figure 16**), [36] and the rates appear to be worsening for most groups (**Figure 17**) [37].

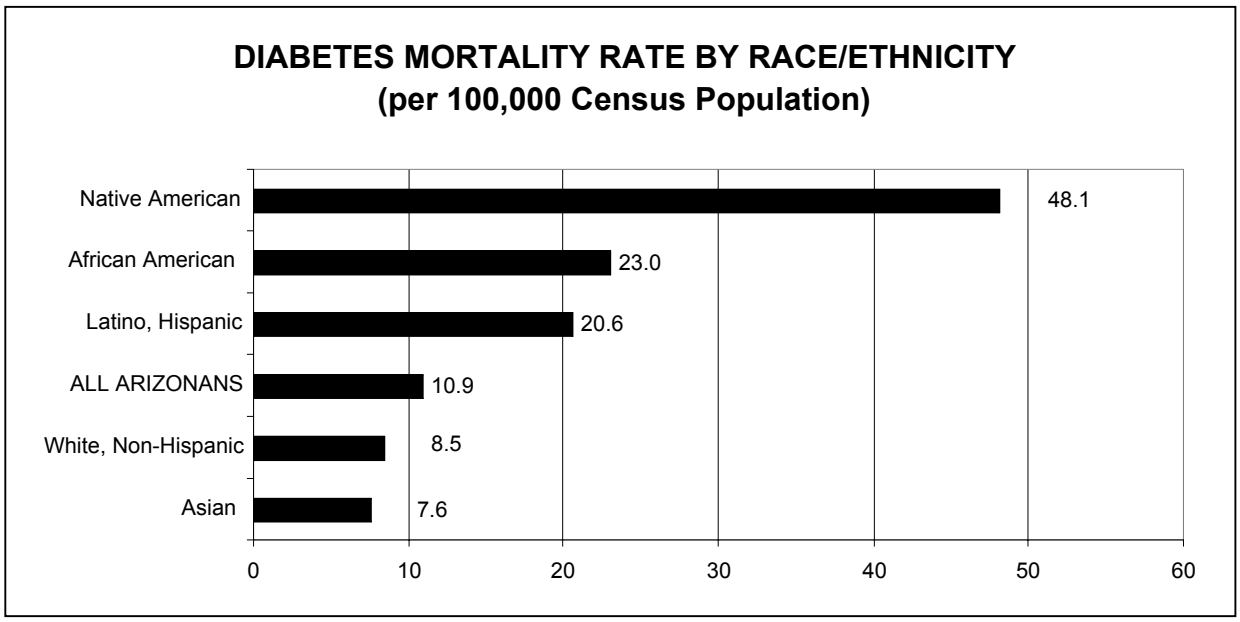

Figure 16. Average, annualized, age-adjusted mortality rates with the underlying cause of death listed as ICD-9 code 250.xx (diabetes), 1985 – 1995. The 1990 census counts multiplied by eleven were used as the denominators for the annual rate calculation. Source: *Arizona Health Status and Vital Statistics 1997*, ADHS.

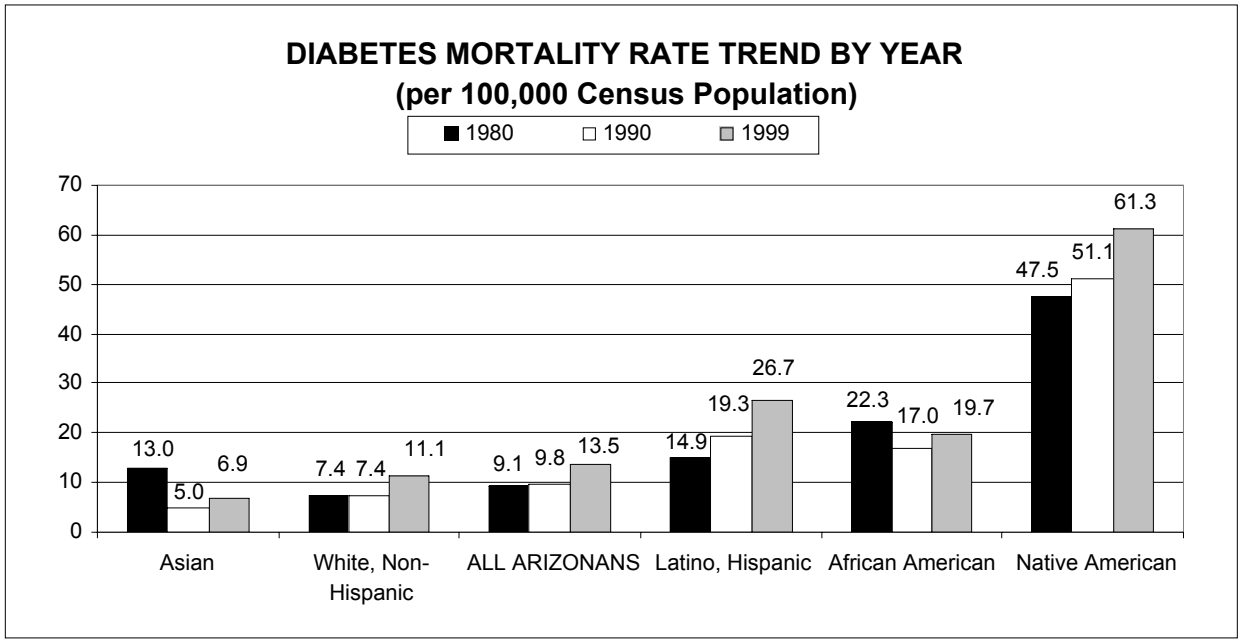

Figure 17. Age-adjusted mortality rates with the underlying cause of death listed as ICD-9 code 250.xx (diabetes), 1980, 1990, 1999. Source: *Arizona Health Status and Vital Statistics 1980, 1990, 1999*, ADHS.

Native Americans

A precise count of Native Americans with diabetes in Arizona is not available. However, a rough estimate can be obtained by counting all Indians who are registered into the Indian Health Service (IHS) Patient Registration System and who have had at least one direct or contract inpatient or outpatient visit or a direct dental visit during the last three fiscal years. Using 1996 Resource and Patient Management System (RPMS) data, the IHS counts 13,963 persons, age 15 or greater, with diabetes in Arizona. At the same time there were 159,709 persons age 15 or greater who were active users of IHS services. Dividing these two figures produces a prevalence rate of 8.7% among persons 15 years of age or older. [38] A recent report in the MMWR describes a 13.5% age-adjusted prevalence of diabetes among southwest Native Americans aged 20 years, and the uncertainties encountered in estimating the prevalence. [39]

The age-adjusted mortality rates for diabetes among Native Americans is 5.7 times higher than the rate for non-Hispanic Whites, 2.1 times as high as the rates of African Americans and 2.3 times as high as the rate of Hispanics (**Figure 16**).

Diabetes was the 4th leading cause of death among Native Americans in Arizona in 1999 [37] and also among Native Americans served by the IHS Phoenix Area in 1992-1994. Among Native Americans living in the IHS Navajo Area (part of which lies in Arizona) and the IHS Tucson Area (southern Arizona), it was the 5th leading cause of death in 1992-1994. [40]

The diversity of Arizona presents unique opportunities and challenges for effective diabetes control. Arizona has one of the largest populations of Native Americans of any state, and this population is affected disproportionately by diabetes. For example, the National Institutes of Health (National Institute of Diabetes and Digestive and Kidney Diseases) has noted that among Pima Indian adults age 30-64 the prevalence rate is about 50%, the highest rate of diabetes of any population in the world. [41] Many Native Americans live in rural areas and receive services from the Indian Health Service or a tribal health service provider.

Urban Native Americans, when contrasted with rural Native Americans, although surrounded by resources, encounter unique barriers to health care and effective diabetes management. Community health representatives and public health nurses are found on the reservations and serve to bring the patient and resources together, whereas this type of service exists to a lesser degree in the urban areas. In addition, urban Native Americans who are not living on a reservation are not entitled to the same health care benefits as those who do live on a reservation.

Diabetics, regardless of ethnic group, often fail to achieve the average US life expectancy of 75.6 years. This is especially true for Native Americans. Diabetes occurs at elevated rates among Native Americans and places a heavy burden upon the tribes.

Hispanics

Diabetes ranks 4th among the leading causes of death among Hispanics in Arizona. [37] The life expectancy of diabetics also is shortened for Hispanics. A special survey of 915 persons 18 years of age or older was conducted during 1997-1998 in Douglas, a community in which 84% of the population is of Hispanic origin. This survey revealed that 13% of adults had been told by a doctor that they had diabetes or "high blood sugar." Testing with a portable glucometer found another 36% of the sample whose capillary sugar was over 110 mg/dl. Of the known diabetics, only 19% had glucose readings that suggested their glucose levels were under good control. The expected prevalence rate of diabetes, based on national estimates, was about 10%. Instead, the survey found that, based on a prior diagnoses and a fasting plasma glucose test, the prevalence rate for this study was 18.3%. The strongest factors associated with a diagnosis of diabetes were: age, weight, and family history of diabetes (mother and father and brother or sister with diabetes).

African Americans

Data regarding diabetes among African Americans are more limited compared to other groups. This is not to say that diabetes is not a problem in this group. On the contrary, the existing data suggest higher rates of hospitalization and death compared to all Arizonans. For example, the diabetes death rate among African Americans is 2.1 times as great as that of the state as a whole (**Figure 16**). The 1999 hospitalization rate for diabetes as the primary discharge diagnosis is the highest of all racial and ethnic groups, 1.8 times that of non-Hispanic Whites (**Figure 6**). The proportion of African American males who did not reach the average years of expected life is as poor as it is for American Indian males and females.

The relatively low number of African Americans (3.6% of Arizona's population) limits our ability to say much about the prevalence of diabetes in this high risk group at this time. Thus, there is a need to ensure the inclusion of African Americans in studies addressing diabetes and related chronic diseases.

Elderly Persons

Previous tables and figures showed the elevated prevalence rate among Arizona's elderly population. In addition to the year round residents there is a large migratory group, which annually swells the state population by several hundred thousand (no one knows exactly how many), who face challenges related to continuity of health care.

Barriers to Diabetes Care and Education

A widely perceived barrier to the control of diabetes in Arizona is inadequate implementation of established standards of care, such as those recommended by the American Diabetes Association (ADA) and the Centers for Disease Control, for persons with diabetes. [42,43,44] Contributing issues include professional training, culturally competent educational programs, and reimbursement policies. In 1998, the Arizona Legislature passed a state law that requires insurers to provide supplies and glucometers. However, this is not the case for coverage of the educational needs of diabetics: the state lacks a law that requires insurers to reimburse providers for providing diabetes education. Thus, diabetics still encounter this barrier to learning about self-management of their disease.

Data regarding practice behaviors of health care providers for the most part has not been collected. However, it is clear that implementation of recommended standards of care is less than optimal. [45,46,47] For example, although the most effective means of monitoring glycemic control is self-monitoring of blood glucose, only about 50 percent of insulin users and 5 percent of non-users perform this procedure. [48] Also, while diet is considered a cornerstone of diabetes management, insulin use is often the primary indicator of the need for nutrition intervention. [49]

Implementation of practice guidelines for clinical and laboratory tests is higher in the management of type 1 patients than for those with type 2 diabetes. This suggests that type 2 diabetes is perceived as a less serious illness than type 1, as type 2 patients receive fewer preventative services. [46] Given the burden of type 2 diabetes and the number of older individuals living in Arizona, the lack of preventative services for this population is of special concern. People over the age of 65 receive nutrition counseling for diabetes at a rate that is 45 percent less than for younger individuals. [50]

It is also important to note that economically disadvantaged individuals in Arizona have a difficult time accessing health care. With the exception of certain special programs for pregnant women and children, services are not reaching the “notch group” (persons without health insurance). The state Medicaid program, called the Arizona Health Care Cost Containment System (AHCCCS), provides services to only the bottom 40% of persons meeting federal poverty criteria. There are a large number of persons who are not poor enough to qualify for AHCCCS but who do not have the financial resources to obtain care or have not taken advantage of recent legislation passed to increase the affordability of care.

Cultural Barriers

There have been a number of studies in Arizona to assess cultural barriers to health care and how to alleviate them. Barriers include language, economics, transportation, day care, work related problems, belief system regarding the health care system, discrimination, and location.

Although one program cannot accommodate everyone, some programs have made strides in customizing their program to their population. Successes within the IHS and the ADA Diabetes and Assistance Resources (DAR) pilot program in southern Arizona

clearly demonstrate the importance of tailoring education programs to the cultural and linguistic uniqueness of each community. [51,52,53]

In Arizona, programs that are specifically tailored in this way are limited at the present time. There is a lack of professionally trained bilingual/bicultural diabetes educators and other health professionals in the state. At this time, there are only six recognized diabetes education programs in Arizona meeting the national standards set by the ADA. [54] In urban areas, low-cost hospital-based diabetes classes are available on a limited basis. It is estimated that these classes reach only about 2% of the persons diagnosed with diabetes in Arizona.

BEHAVIORAL RISK FACTOR SURVEY (BRFS)

The Behavioral Risk Factor Survey (BRFS) is a federally-funded, random sample of residents in each State. The survey is administered by ADHS and asks questions regarding various health conditions and behaviors. The BRFS is particularly helpful in showing the statewide trends of modifiable risk factors for diabetes, namely overweight [55] (**Figure 18**), physical inactivity (**Figure 19**), and consumption of an unhealthy diet (**Figure 20**).

The trends of these factors may well predict the burden of diabetes (and other chronic diseases) that Arizona will face in future decades. These three figures show that Arizonans are failing to control these modifiable risk factors.

Also, the BRFS asks 12 questions specifically of persons with diabetes. These additional data from the BRFS, 1994-1999, in Arizona are presented in tables found in Appendix B.

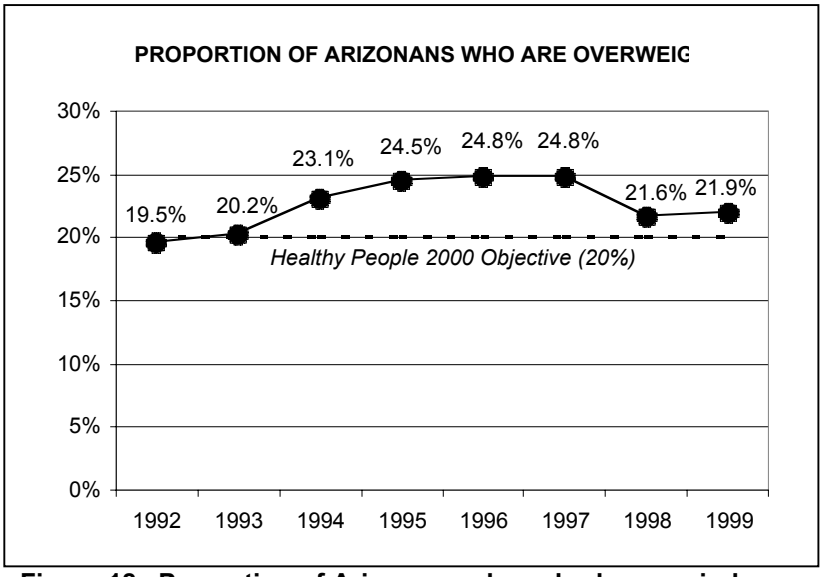

Figure 18. Proportion of Arizonans whose body mass index exceeds the lower limit of overweight, 1992-1999. Source: *Arizona BRFS*, 1992-1999.

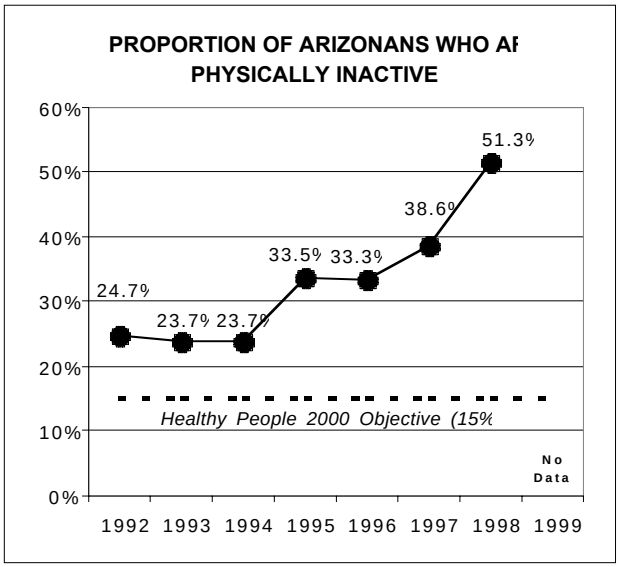

Figure 19. Proportion of Arizonans not participating in physical activity in the past month, 1992-1999. Source: *Arizona BRFS*, 1992-1999.

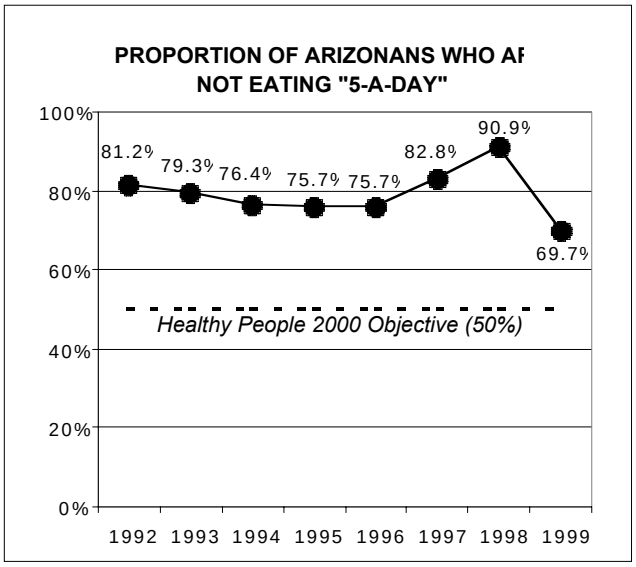

Figure 20. Proportion of Arizonans consuming less than 5 servings of fruits or vegetables per day, 1992-1999. Source: *Arizona BRFS*, 1992-1999.

THE OUTLOOK FOR THE YEAR 2020

If we assume that the diabetes prevalence rate will be the same in the Year 2020 as it is now, we can project the number of diabetics that will be present in Arizona in twenty years. **Figure 21** shows that the number of diabetes cases will increase from approximately 211,000 in 1999 to over 316,000 in the year 2020. This 50% increase occurs simply because of the growth and aging of the state's population. This information is useful in planning for the services that diabetics will need.

However, these estimates probably *underestimate* the burden that Arizona will face because the rate is increasing among all racial and ethnic groups. The risk factors for diabetes displayed on the previous page show no trends of improvement, and in fact are worsening.

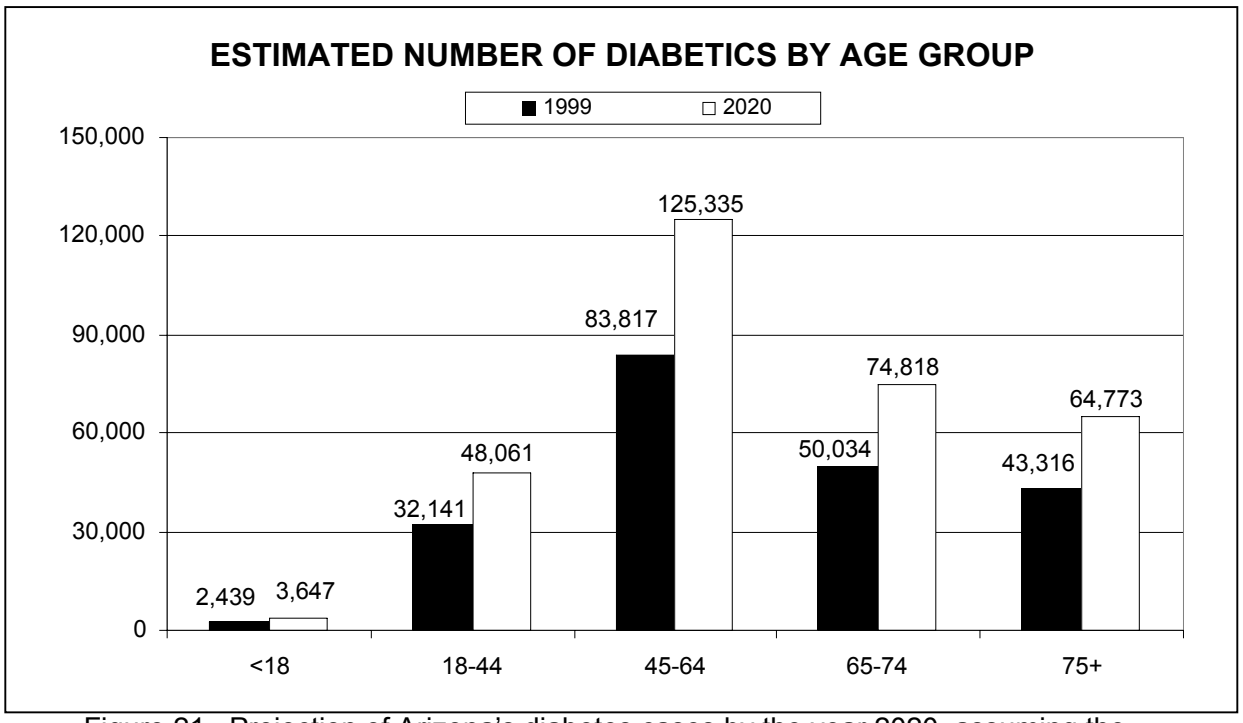

Figure 21. Projection of Arizona's diabetes cases by the year 2020, assuming the prevalence rate remains the same and does not worsen.

Also, the rate of type 2 diabetes is increasing dramatically among persons in the younger age groups. The reason for this increase is not known, but is likely related to the epidemic of obesity occurring among children. Type 2 diabetes is thought to be more aggressive when it occurs at a young age. [13] The societal implications of this issue will become a major problem in future decades. A simple system to monitor children's risk factors such as height, weight, and physical activity levels is needed.

CONCLUSIONS

An immense burden to the state's various health care delivery systems caused by diabetes in the next decade is looming. If current trends continue, diabetes will become a major chronic disease in the 21st century. Our state must plan now for the increase in resources required to treat patients who already have the disease. In addition, we must encourage activities now that will delay the onset of complications and even prevent diabetes from occurring at all. Our state's health policy makers from all sectors must be made aware of findings in this report and act upon them, so that the state's burden of diabetes is lessened.

Programs specific to each of the high risk populations are needed to reduce the increasing incidence and frequency of complications seen in these groups. The responsibility for interventions can and should be shared between governmental agencies, the private sector, and other agencies.

COMMITTEE RECOMMENDATIONS

In light of the findings in this report, we make the following recommendations:

Data-related recommendations

1. This Surveillance Committee, in consultation with the other committees of the Arizona Diabetes Control Council, should adopt a standard set of measurable indicators that can be easily tracked to see if Arizona is making progress.

    a. Yearly generation of some indicators is necessary to give feedback to the appropriate programs.

    b. The ADHS Diabetes Control Program (DCP) should provide a staff person to produce these data, including analysis of the multiple cause of death tapes for comparison with the *Healthy People 2010* objectives relative to diabetes.

    c. The Diabetes Control Program should seek out new data sources and bring them to the attention of the Surveillance Committee.

2. Based on the findings in this document, the DCP should include surveillance indicators in their strategic plan. The indicators should address the deficiencies identified in this report. The overall result of this plan should be a better service delivery system for Arizona's diverse diabetic population.

3. Organizations that hold data specific to subgroups within the state should share this information voluntarily with this Surveillance Committee through the Diabetes Control Program's epidemiologist on a regular basis so that data about all subgroups are tracked.

a. These organizations should include the ADHS, IHS, American Indian tribes, Veterans Administration, Medicare, AHCCCS, and HMOs.

b. To ensure future collaboration, multi-agency agreements and procedures for data exchange should be negotiated by the participating agencies.

c. Data concerning the risk factors for type 2 diabetes in children should be collected at the school.

4. This report should be recompiled in 3 years to determine whether Arizona is making progress in improving the health status of diabetics, and whether the standard set of indicators (see #1 above) needs to be changed.

Program-related recommendations

5. The data in this report justifies programs to address the striking disparities in health status among the high-risk populations (Native Americans, African Americans, and Hispanics).

    a. Even though American Indians have received funding for diabetes prevention under the federal "Grants for Special Diabetes Programs for Indians" it is likely that this funding will only begin to address the problem. The Diabetes Control Program should continue to provide technical assistance and financial resources where indicated to tribal health departments for program development and implementation.

    b. These disparities can be addressed through increased availability of certified diabetes educators and lay health workers.

6. The worsening behavioral risk factors among the state as a whole requires immediate attention. These factors associated strongly with diabetes include obesity, sedentary lifestyle, and unhealthful diet. Programs to modify these risk factors must be strengthened. These programs must become part of a comprehensive approach to addressing diabetes that extends beyond the immediate capacity of the ADHS Diabetes Control Program. That is to say, the effort must be designed to include agencies outside of state government. These programs should include children too.

7. Increase the number of diabetes educators who can help address the lack of education and elevated rates of diabetes in some counties. This increase should be implemented through ADHS's traditional partners: the county health departments. Non-traditional partners (e.g., HMOs, tribes, and the IHS) also can play a role in increasing the number of diabetes educators in the counties. Lay health workers also can play a role in matching patients with resources.

8. The Centers for Disease Control has been the only funding source for the Diabetes Control Program. As the Program seeks to expand its efforts to control and prevent diabetes among Arizonans, other funding sources should be explored.

    a. The state tobacco tax (health education fund) would be a logical and appropriate source for alerting diabetic smokers of their heightened risk for heart disease.

    b. The full Council should deliberate and prepare a report to ADHS, which can develop specific program and budget recommendations to the Governor's Office and Legislature for consideration.

    c. The Council should inform other leaders in health care and public health about the findings in this report so they can implement appropriate disease control policies. The dissemination should go to a broad range of governmental, private sector, and voluntary health care organizations.

APPENDIX A: REFERENCE TABLES

Table A-1
Estimated number of Arizonans with diabetes, 1999, using Arizona BRFS data, 1999.

Est. Total Population 1999	4,924,350
Percent of Arizona Adults interviewed who indicated they have been told by a physician or other health care worker that they have diabetes	4.3%
Est. Number of Arizonans with Diabetes	**211,747**

Table A-2
Estimated number of Arizonans with diabetes, 1999, using NHIS national prevalence rates.

Age Group	Estimated Number of Known Diabetics
< 18	1,794
18 – 44	23,640
45 – 64	61,649
65 – 74	36,801
75+	31,860
Total	**155,744**

Table A-3
Estimated number of Arizonans with diabetes, 1999, using NHANES-3 data, 1988 – 1994. [17]

	Age Group					Total
	20-39	**40-49**	**50-59**	**60-74**	**75+**	
NHANES-3 rate of **Dx'd** DM (%)	1.1	3.9	8.0	12.6	13.2	
Est. Pop. 1999 (thousands)	1,408	680	478	546	316	
Est. number of Arizonans age ≥20 with Diabetes Diagnosed	15,489	26,513	38,263	68,818	41,722	190,805
NHANES-3 rate of UnDx'd DM	0.6	2.5	4.6	6.2	5.7	
Est, Pop. 1999 (thousands)	1,408	680	478	546	316	
Est. number of Arizonans age ≥20 with Diabetes Undiagnosed	8,448	16,996	22,001	33,863	18,016	99,324

APPENDIX B: ARIZONA BRFS TABLES

Table B-1
Arizona BRFS Diabetes Supplement
Unweighted Data From 1994-1999

The following tables include questions from the diabetes supplement of the Arizona BRFS, 1994-1999. In six years, 369 respondents (3.3%) said that a doctor has told them that they have diabetes.

How old were you when you were told you have diabetes?

Age Group	Number	Percent
Less than 18	22	6%
18-44	116	31%
45-54	78	21%
55-64	77	21%
65 or older	61	17%
Unknown/Refused	15	4%
Total	369	100%

Are you now taking insulin?

Response	Number	Percent
Yes	130	35%
No	237	64%
Refused	2	1%
Total	369	100%

Respondents who use insulin –
Currently, about how often do you use insulin?

Response	Number	Percent
Daily or more	126	97%
1-6 times per week	2	2%
Insulin pump	1	1%
Unknown/Refused	1	1%
Total	130	100%

About how often do you check your blood for glucose or sugar?

Response	Number	Percent
Daily or more	167	45%
1-2 times per week	49	13%
3-6 times per week	39	11%
1-3 times per month	41	11%
<1 time per month	17	5%
Never	38	10%
Unknown/Refused	18	5%
Total	369	100%

Have you ever heard of glycosolated hemoglobin or hemoglobin A1c?

Response	Number	Percent
Yes	93	25%
No	248	67%
Unknown/Refused	28	8%
Total	369	100%

About how many times in the last year has a doctor, nurse, or other health professional checked you for glycosolated hemoglobin or hemoglobin A1c?

Response	Number	Percent
1-13 times	67	19%
Never*	293	79%
Unknown/Refused	9	2%
Total	369	100%

*Includes 286 respondents who either did not see a health professional for their diabetes in the last year or have never heard of hemoglobin A1c

About how many times in the last year has a health professional checked your feet for any sores or irritations?

Response	Number	Percent
1-13 times	175	47%
14-26 times	1	<1%
27-39 times	1	<1%
Never*	103	48%
Unknown/Refused	16	4%
Total	369	100%

***Includes 73 respondents who did not see a health professional for their diabetes in the last year**

When was the last time you had an eye exam in which the pupils were dilated?

Response	Number	Percent
Within last month	79	21%
1-12 months ago	162	44%
1-2 years ago	34	9%
2+ years ago	32	9%
Never	42	11%
Unknown/Refused	20	5%
Total	369	100%

I would like to ask you three questions about how well you see with your classes or contacts on if you use them:

How much of the time does your vision limit you in recognizing people or objects across the street?

Response	Number	Percent
All the time	38	10%
Most of the time	23	6%
Some of the time	25	7%
A little bit of the time	28	8%
None of the time	235	64%
Unknown/Refused	20	5%
Total	369	100%

How much of the time does your vision limit you in reading print in a newspaper, magazine, recipe, menu, or numbers on the telephone?

Response	Number	Percent
All the time	36	10%
Most of the time	25	7%
Some of the time	35	9%
A little bit of the time	44	12%
None of the time	212	57%
Unknown/Refused	17	5%
Total	369	100%

How much of the time does your vision limit you in watching television?

Response	Number	Percent
All the time	21	6%
Most of the time	21	6%
Some of the time	21	6%
A little bit of the time	22	6%
None of the time	265	72%
Unknown/Refused	19	5%
Total	369	100%

Table B-2
Arizona BRFS Tables by Diabetes Status and Age
Weighted Data From 1994-1999

The following tables use data from six years of Arizona BRFS, 1994-1999 (N = 11,341). The data below are weighted based on the Arizona population to accurately reflect the population demographics. The weighting factor considered the number of adults and telephone lines in the household, cluster size, stratum size, and age/race/sex distribution of the general population.

Weighted Percent of Population with Risk Indicator By Diabetes Status

Risk Indicator	Arizona Adults With Diabetes	Arizona Adults Without Diabetes
Annual Income Under $20,000*	19%	14%
Education Less Than High School Graduate*	24%	11%
Not Employed*	10%	5%
Does Not Have Health Insurance*	16%	15%
Health Status is Reported as Fair/Poor*	39%	10%
Sedentary Lifestyle*	49%	36%
Overweight (BMI >27.2 for females, >27.7 for males)*	46%	22%
Smoking (Reported smoking at least 100 cigarettes in their entire life and currently smoke every day or some days)*	14%	17%
High Blood Pressure**	50%	17%
High Cholesterol**	31%	29%

Source: Data analyzed by ADHS Office of Nutrition Services, September 2001
***Measure collected 1994 – 1999.**
****Measure collected 1995 and 1997 only.**

Weighted Percent of Diabetic Population with Risk Indicator By Age

Risk Indicator	Arizona Adults With Diabetes		
	Age 18-44	Age 45-64	Age 65+
Annual Income Under $20,000*	21%	16%	22%
Education Less Than High School Graduate*	33%	21%	22%
Unemployed*	7%	16%	N/A
Does Not Have Health Insurance*	33%	15%	7%
Health Status is Fair/Poor*	41%	38%	39%
Sedentary Lifestyle*	52%	48%	48%
Overweight (BMI >27.2 for females, >27.7 for males)*	51%	54%	32%
Smokes (Reported smoking at least 100 cigarettes in their entire life and currently smoke every day or some days)*	17%	18%	7%
High Blood Pressure**	40%	56%	49%
High Cholesterol**	23%	38%	27%

Source: Data analyzed by ADHS Office of Nutrition Services, September 2001
***Measure collected 1994 – 1999.**
****Measure collected 1995 and 1997 only.**
N/A represents a percent based on a value too small in include in this Table.

Weighted Percent of Non-Diabetic Population with Risk Indicator By Age

Risk Indicator	Arizona Adults Without Diabetes		
	Age 18-44	Age 45-64	Age 65+
Annual Income Under $20,000*	17%	8%	15%
Education Less Than High School Graduate*	11%	8%	13%
Unemployed*	5%	7%	N/A
Does Not Have Health Insurance*	21%	10%	N/A
Health Status is Fair/Poor*	7%	11%	19%
Sedentary Lifestyle*	34%	38%	40%
Overweight (BMI >27.2 for females, >27.7 for males)*	21%	26%	20%
Smokes (Reported smoking at least 100 cigarettes in their entire life and currently smoke every day or some days)*	18%	22%	8%
High Blood Pressure**	8%	23%	36%
High Cholesterol**	22%	35%	35%

Source: Data analyzed by ADHS Office of Nutrition Services, September 2001
***Measure collected 1994 – 1999.**
****Measure collected 1995 and 1997 only.**
N/A represents a percent based on a value too small in include in this Table.

APPENDIX C: DIAGNOSTIC CRITERIA

Table 1. Criteria for the diagnosis of diabetes mellitus

Normoglycemia	IFG or IGT	DM*
FPG < 100 mg/dl 2-h PG† < 140 mg/dl	FPG ≥ 110 and < 126 mg/dl (IFG) 2-h PG† ≥ 140 and < 200 mg/dl (IGT)	FGP ≥ 126 mg/dl 2-h PG† ≥ 200 mg/dl Symptoms of DM and random PG concentration ≥ 200 mg/dl

*A diagnosis of diabetes must be confirmed, on a subsequent day, by measurement of FPG, 2-h PG or random plasma glucose (if symptoms are present). The FPG test is greatly preferred because of case of administration, convenience, acceptability to patients, and lower cost. Fasting is defined as no caloric intake for at least 8 h.
†This test requires the use of glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water. DM, diabetes mellitus; 2-h postload glucose.
[American Diabetes Association: Clinical Practice Recommendations 1999, Diabetes Care, Volume 22, Supplement 1:S21, January 1999]

Table 2. Glycemic control for people with diabetes*

Biochemical Index	Non-diabetic	Goal	Additional Action suggested
Preprandial glucose (mg/dl) †	< 110	80 – 120	< 80 > 140
Bedtime glucose (mg/dl) †	< 120	100 – 140	< 100 > 160
HbA1C (S)	< 6	< 7	> 8

*The values shown in this table are by necessity generalized to the entire population of individuals with diabetes. Patients with co-morbid diseases, the very young and older adults, and other with unusual conditions or circumstances may warrant different treatment goals. These values are for nonpregnant adults. "Additional actions suggested" depends on individual patient circumstances. Such actions may include enhanced diabetes self-management education, co-management with a diabetes team, referral to an endocrinologist, change in pharmacological therapy, initiation of or increase in SMBG, or more frequent contact with patient. HbA_1C is referenced to non-diabetic range of 4.0-6.0% (mean 5.0%, SD 0.5%)
[American Diabetes Association: Clinical Practice Recommendations 1999, Diabetes Care, Volume 22, Supplement 1: S92, January 1999]

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