Diabetes in American Indians: A Growing Problem

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Non-insulin-dependent diabetes mellitus is a major health problem in American Indian communities. Indian Health Service (IHS) collects information about outpatient visits and hospitalizations and analyzes mortality in American Indians and native Alaskans. Between October 1, 1982, and September 30, 1983 (fiscal year 1983), diabetes was the second leading clinical impression for all outpatient visits of patients 15 yr and older. Discharge diagnoses confirm both microvascular and macrovascular complications. Seventy-six percent of all IHS hospitalizations during fiscal year 1983 for lower-extremity amputation also coded diabetes. In 1982, the age-adjusted diabetes death rate per 100,000 was 19.9 for American Indians and native Alaskans, compared with 9.6 for all races in the United States. DIABETES CARE 1986; 9:609–13.

Non-insulin-dependentdiabetesmellitus(NIDDM) has become a significant health problem in American Indian communities. Extensive studies have focused on the Pima Indians of southern Arizona.[1] The World Health Organization (WHO) included both Pima Indians and a cohort of American Indians from Oklahoma in its worldwide study.[2] There are isolated reports from individual tribes, but limited data are available for most tribes on the prevalence and complications of diabetes. As a result of various treaties, American Indians and native Alaskans have received medical attention from the United States Government. Since 1955, the Indian Health Service (IHS), part of the United States Public Health Service, has been providing comprehensive care. Although some American Indians use alternate resources for health care, most use IHS for care. Thus, morbidity among American Indians can be estimated by examining the patient care data collected by IHS. We examined IHS data and compared it to other data sources to describe the extent and growth of diabetes morbidity and mortality in American Indians.

METHODS

The IHS operated 51 hospitals and many other health facilities in 28 states directly or under contract to tribes or Alaskan corporations during the time of this study. Facilities were grouped into area or program offices that follow geographical and reservation boundaries. Figure 1 shows the area and program offices where information is collected and tabulated by fiscal year. Providers listed reasons for outpatient visits at the time the patient was seen. Most areas used an ambulatory care reporting form that allowed two choices among categories of diagnoses and descriptions of care, e.g., immunization or physical examination. Alaska, Billings, and Tucson facilities used a computerized system with more flexibility. During fiscal year 1983, providers from these areas listed 1.4 reasons or clinical impressions per visit on the average. These impressions were based on the provider's best judgement at the time of the clinic visit with whatever laboratory support that might have been immediately available. The data were submitted to area and program offices and tabulated. Facilities in California, New York, Rhode Island, and Maine did not use the central data system during fiscal year 1983.

Indian patients can be admitted directly to IHS hospitals, or they can be referred to non-IHS facilities in nearby communities. IHS facilities vary in their resources for obstetrics, surgery, and intensive care. IHS contract funds are used to buy services when IHS cannot provide such services. Because these funds are limited, alternate resources such as Medicare, Medicaid, insurance, or veterans benefits are used for hospitalizations whenever possible. Patients who receive outpatient services at IHS facilities may be covered under alternate resources when hospitalized. IHS hospitalization data include only IHS inpatient services and those purchased with IHS funds, thus giving a limited picture of the hospitaliza-

TABLE 1
Diabetes outpatient clinical impressions by age*: IHS and National Ambulatory and Medical Care Survey†

Age (yr)	No. diabetes impressions	Diabetes clinical impressions (%)	IHS rank order	National Ambulatory Medical Care Survey rank order
<25	3752	2		
25–44	33,045	21	6	20
45–64	79,914	51	1	2
≥65	39,218	25	2	2
Unknown	284	1		

*October 1, 1982 to November 30, 1983.
†See ref. 3.

tions experienced by American Indians. The data system records ≤6 diagnoses on direct discharges and ≤5 diagnoses on contract discharges.

Diabetes mortality data about Indians are derived from vital records and made available to IHS from the National Center for Health Statistics (NCHS). Their analysis identifies diabetes as a primary cause of death. Further analysis is carried out by IHS. Population estimates for Indian communities are derived from census data and projected yearly by IHS. Population estimates available December 31, 1984, were used in this study.

RESULTS

Outpatient data. Diabetes was the second leading clinical impression for outpatient visits to IHS facilities in patients aged ≥15 yr from October 1, 1982, to September 30, 1983. Providers marked diabetes as a clinical impression 154,888 times during this period. This represents 6% of the outpatient clinical impressions for patients ≥15 yr old when specific reasons for the visit were listed.

Table 1 shows the number of diabetes clinical impressions by age and compares these patterns with data from the National Ambulatory Medical Care Survey (NAMCS).[3] Type I diabetes is rare in American Indians.[4] The outpatient data are consistent with epidemiologic studies that show the paucity of type I diabetes in American Indian children. Only 2% of diabetes outpatient impressions occurred in those <25 yr. However, 55% of the Indian population is <25 yr. In the 25- to 44-yr age group, diabetes ranked 6th among the leading clinical impressions in IHS, whereas it ranked 20th among visits to general and family practitioners in the United States. In the groups >45 yr, the rank order was similar in IHS and the NAMCS.

The number of outpatient visits for diabetes has been steadily increasing from 58,901 in 1971 to 156,213 in 1983. The percentage of outpatient impressions related to diabetes can be separated by area and program office. Figure 2 shows the percentage of outpatient visits for all ages in which diabetes was listed as a clinical impression. The average for all areas was 4.8%, with a low of 0.9% in Alaska and a high of 9.5% in Tucson.

Hospitalizations. Table 2 compares diabetes discharges from short-stay hospitals in the United States with IHS direct and contract discharges that again show the relative paucity of diabetes in Indians <15 yr.[5] The most striking difference between IHS and short-stay hospitals occurred in the 45- to 64-yr-old group. Figure 3 shows the percentage of total dis-

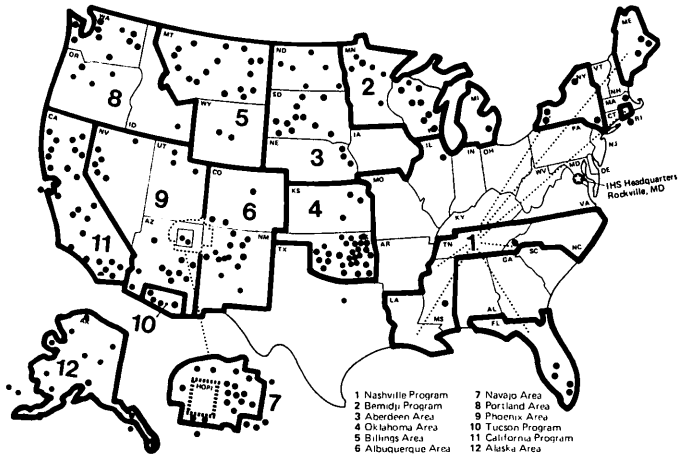

FIG. 1. Facility locations in Indian Health Service areas.

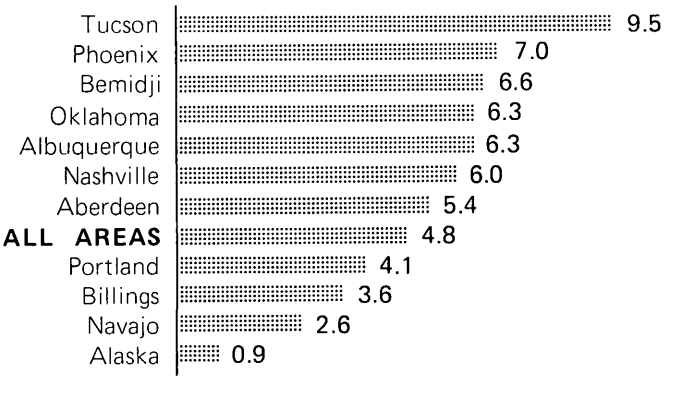

FIG. 2. Percentage of outpatient visits with diabetes as clinical impression from October 1, 1982, to September 30, 1983.

TABLE 2
Percentage of discharges listing diabetes as first diagnosis by age*

	Age (yr)			
	<15	15–44	45–64	≥65
IHS (direct and contract)†	0.37	1.09	6.10	4.14
U.S. short-stay hospitals, 1982‡	0.60	1.02	2.77	2.24
P value	<.01§	<.1	<.01	<.01

*Diabetes, ICD-9 250.0–250.9.
†October 1, 1982, to September 30, 1983.
‡Utilization of short-stay hospitals, U.S. 1982.
§χ^2-Method.

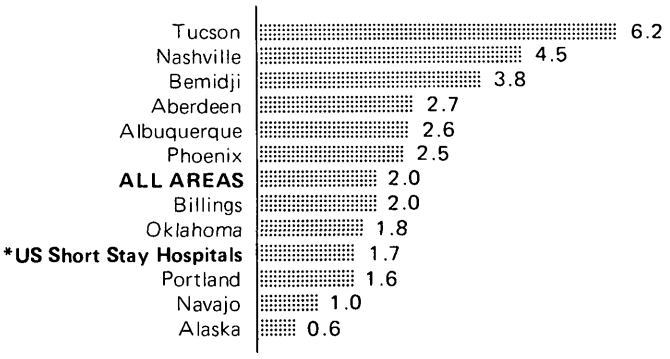

FIG. 3. Diabetes discharges, Diabetes, ICD-9 250.0; October 1, 1982, to September 30, 1983: 1st listed discharge/total hospital discharges. *Asterisk*, figures taken from report on utilization of short-stay hospitals (see ref. 5).

charges in different IHS areas in which diabetes was listed as the first diagnosis. The IHS hospitalization figures underestimate the morbidity because these data do not reflect hospitalizations in non-IHS facilities funded entirely by alternate resources such as Medicaid. In general, the hospital data show the same trends as the outpatient visits, with Alaska low and Tucson high.

Indian patients experience both microvascular and macrovascular complications that require hospitalization. Table 3 shows the percentage of lower-extremity amputations in patients with a diagnosis of diabetes. In all areas, 76% of the lower-extremity amputations performed in IHS or contract facilities between October 1982 and September 1983 occurred in patients who had a diagnosis of diabetes. Comparative data from six states showed 45% of the lower-extremity amputations were related to diabetes.[6] More than one-third of the discharges for chronic renal failure also coded diabetes between October 1982 and September 1983. Diabetes was present in 29% of hospitalizations for ischemic heart disease. Table 3 shows variations by area. Despite limitations of the data, it is clear that American Indians with diabetes are being hospitalized for complications related to diabetes.

Mortality data. Indian mortality data were collected for the 28 reservation states (Fig. 4). Age-adjusted death rates for recent years for Indians living in these states are shown in Table 4. As a group, American Indians and native Alaskans experience twice the mortality rate from diabetes compared with all races in the United States. Age-specific death rates show that native Americans age 55–64 yr experience three times the mortality rate of all races in the United States in the same age group (Table 5). Rates for each age group >24 yr are given in Table 5. Crude death rates by area and program office are shown in Fig. 5. The area death rates, like the outpatient visits, vary across the United States.

TABLE 3
Diabetes-related complications: amputations, ischemic heart disease, chronic renal failure*

IHS area	Amputations	Total amputations related to diabetes (%)	Renal failure discharges	Renal failure discharges coding diabetes (%)	Ischemic heart disease discharges	Ischemic heart disease discharges coding diabetes (%)
Phoenix	137	88	216	54	194	47
Oklahoma	63	86	124	50	689	28
Portland	7	86	13	15	159	15
Billings	12	75	83	39	273	22
Albuquerque	4	75	96	40	65	42
Bemidji	5	60	14	36	175	37
Navajo	48	60	325	18	247	27
Aberdeen	25	56	240	35	578	32
Tucson	2	50	35	54	9	44
Nashville	8	38	35	60	61	20
Alaska	14	29	21	10	120	12
All areas	325	76	1202	37	2570	29

*October 1, 1982 to September 30, 1983.
ICD codes: lower-extremity amputations, ICD-9 84.11–84.17; diabetes, ICD-9 250.0–250.9; chronic renal failure, ICD-9 585–586; ischemic heart disease, ICD-9 410–414.

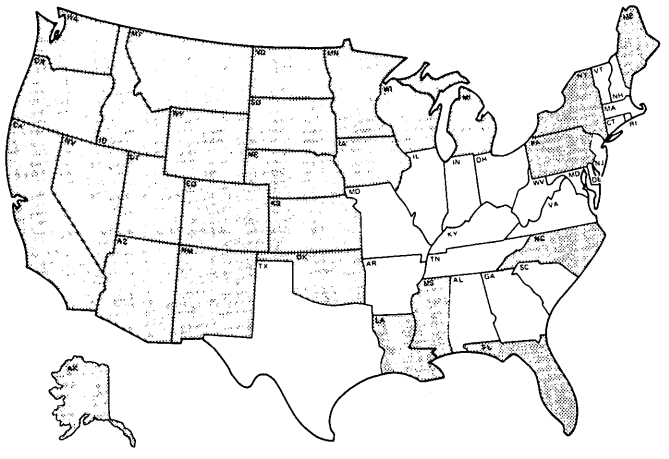

FIG. 4. Twenty-eight reservation states.

TABLE 5
Age-specific diabetes death rates (per 100,000) for American Indians and native Alaskans vs. all races in U.S.†

Age (yr)	Indians and native Alaskans* 1980–1982	All races in U.S.† 1981
25–34	2.6	1.4
35–44	5.7	3.5
45–54	26.7	9.6
55–64	83.0	25.6
65–74	132.0	61.9
75–84	189.2	127.7
>85	125.9	217.2

*Reservation states, 1980–1982.
†Monthly vital statistics report from the National Center for Health Statistics, Vol. 33, No. 3 (Suppl.), June 22, 1984.

DISCUSSION

Examination of IHS patient care data reveals that diabetes has become a significant problem in many Indian communities. Although studies have focused on specific groups, the problem appears to be widespread and growing. Theoretically, American Indians carry a "thrifty" gene that has enabled them to survive alternating periods of feast and famine. Changes in life-style experienced in Indian communities in recent years have led to increasing obesity, unmasking the genetic tendency to diabetes associated with the "thrifty" gene.[7,8] A rising prevalence of diabetes accompanied by an increasing tendency toward obesity in young people has been measured directly in Pima Indians between 1967 and 1977.[9] The number of outpatient visits to IHS facilities reflects the increasing number of patients. IHS work-load figures also indicate the relative paucity of diabetes in children. Figure 6 shows data from prevalence surveys, along with outpatient and mortality indicators. Although the survey studies used differing criteria for diabetes, data derived from actual population samples are available for the Alaska area, the Navajo area, and the Papago tribe served by the Tucson office. For other areas, data are not available or are incomplete for the tribes served. Diabetes was rare in Athabascans and Eskimos in Alaska when villages were screened.[10,11] The prevalence of diabetes in Papago Indians served by the Tucson program was similar to that of the Pimas, whereas the prevalence among Navajos was intermediate.[1] These same overall trends are present in the outpatient data and the mortality rates. Thus, area death rates and outpatient visits probably reflect the underlying prevalence of diabetes among other tribes.

As evident from the hospitalization data, amputations and other complications related to diabetes affect American Indians. In the WHO study, 9.2% of Oklahoma Indians had Q-waves present on the ECG compared with 2.4% of the Pima Indians.[12] Amputations were performed in 4.7% of the Pima Indians but in only 1.6% of the Oklahoma Indians.[12] Although some observations in the 1960s suggested that American Indians were spared complications from diabetes, IHS data and studies in specific tribes controlling for the duration of diabetes make this conclusion untenable.[13,14] The patterns of complications may vary in different groups. Formal epidemiologic investigation into these patterns may reveal important information about diabetes-related complications and their etiology. Finally, the mortality from diabetes

TABLE 4
Diabetes death rates for 28 reservation states*

Yr	Death rate of Indians and native Alaskans	No. of deaths	Death rate of all races in U.S.†
1980	22.6	204	10.1
1981	20.9	191	9.8
1982	19.9	193	9.6

*Age-adjusted per 100,000 population.
†Monthly vital statistics reports from the National Center for Health Statistics: Vol. 32, No. 4, August 11, 1983; Vol. 33, No. 3, June 22, 1984; Vol. 33, No. 9, December 20, 1984.

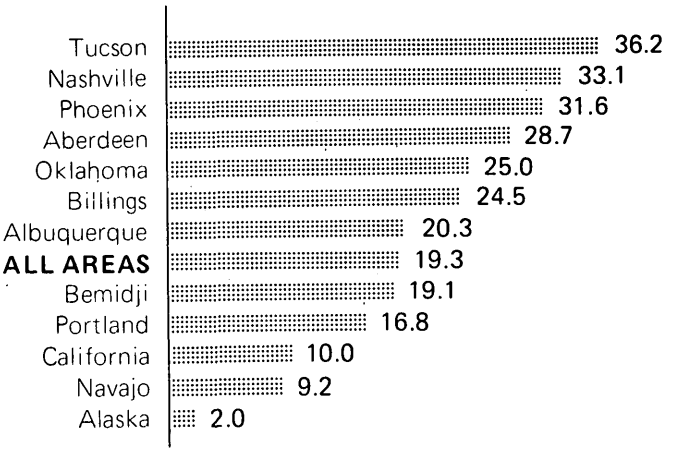

FIG. 5. Diabetes death rates 1980–82 (crude rates per 100,000).

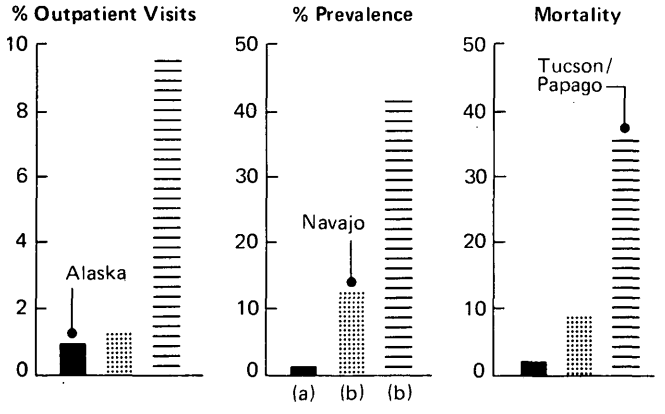

FIG. 6. Prevalence of diabetes compared with other indicators: (*a*) G. J. Mouratoff et al., 1973 (ref. 10), and G. J. Mouratoff et al., 1969 (ref. 11); (*b*) P. H. Bennett et al., 1976 (ref. 1).

in American Indian communities exceeds that for all races in the United States. The excess mortality is particularly striking in the 45- to 64-yr age range. Clearly, American Indian communities are faced with a serious growing health problem.

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