Although data available do not permit an accurate appraisal of Navajo health conditions, mortality and morbidity rates appear to be unnecessarily high.

Health Conditions Among Navajo Indians

By J. NIXON HADLEY

THE NAVAJO Reservation, located at the only point in the United States where four States meet, occupies portions of Arizona, New Mexico, and Utah. It is a territory of about 25,000 square miles, approximately the same size as the State of West Virginia. It is an isolated territory, difficult of access. A major United States highway, No. 66, barely touches the southern border, and two subsidiary highways flank the reservation to the east and west. In between these, there are less than 100 miles of all-weather roads, according to a recent estimate (*1*).

The people whom we call Navajo call themselves *Dineh*, which means "The People." The name implies a feeling of self-sufficiency, a feeling which past history confirms. The Navajos occupy today approximately the same lands that they occupied before the arrival of Columbus. This occupancy has been continuous, except for 4 years' captivity at Fort Sumner in eastern New Mexico after their subjugation by the Army about 90 years ago. The return was at their own request, because of their desire to live their own style of life in their home country. After the return few contacts with the surrounding white people were available or desired. As a result, the majority of the Navajos, even today, do not speak English, cannot read or write in any language, and follow a culture pattern which is still basically Navajo rather than white-American.

The isolation of the Navajos began to break shortly before World War II. The tribe had increased steadily, from about 9,000 in 1868 at the return from Fort Sumner to nearly 50,000 in 1940. The reservation, although large in acreage, is an arid land that can support no more than 35,000 persons at a minimum subsistence level (*1*). Overgrazing by the sheep and goats needed to maintain 50,000 persons at even a starvation level was deteriorating the land still further. Reduction of livestock to carrying capacity of the range was essential to avoid its complete destruction. This program involved the Navajo families in new contacts with non-Navajos representing the Soil Conservation Service and the Bureau of Indian Affairs, and, since emergency relief programs were substituted for lost income from livestock, with the Civilian Conservation Corps, the Public Works Administration, and other agencies. World War II increased outside contacts. Nearly

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4,000 Navajos were in the armed forces, and wartime labor shortages brought about such active recruiting even among non-English speaking Navajos that 15,000 worked off the reservation (*1*).

At present the Navajos are well aware of the surrounding world. They look to it for trade and employment as a supplement to their inadequate land resource. With increased contacts, attitudes are changing in regard to their need for education, medical care, and other similar benefits. Nevertheless, at present the Navajo is described as "ill-fed, ill-housed, sick, and uneducated" (*2*), even though prospects for future improvement are encouraging.

Population Estimates

The members of the Navajo Tribe today probably number more than 70,000, but this figure is only a rough estimate. The last complete count was made in connection with the issuance of ration books during World War II. On the basis of this count, reports of vital events, and the United States census of 1950, the Navajo Agency estimates that in 1950 there were 69,000 Navajos who were residents of the Navajo Reservation or the adjacent allotted and public domain lands in New Mexico (*3*). The 1950 census could serve as only a partial check on the World War II count, primarily for two reasons.

First, the census recorded tribal affiliation of Indians only within the boundaries of major Indian reservations. Hence, it is known that there were 55,000 Navajos within the boundaries of the Navajo Reservation at the time of the census. Outside the reservation boundaries in New Mexico, there is a sufficiently large number of Navajos allotted on public domain lands to require that a hospital be operated at Crown Point for their benefit. Since tribal data are not available for Indians outside the reservations, the Navajos in this area cannot be tallied specifically, but the census reported about 9,000 Indians in this area who would be preponderantly Navajo.

Second, no allocation to place of residence was made in the census for migratory laborers, who were assumed to be residents of the place where they were found. As was indicated above, the Navajo has a strong sense of attachment to his home country, and, consequently, even though forced by economic need to off-reservation employment he will normally return to the reservation at frequent intervals. It is a matter of record that in 1950 there were about 8,000 Navajos working intermittently for the railroads but who were also maintaining residential ties on the reservation. It is estimated that about 2,000 additional Navajos were working in mines, timber lands, reclamation projects, and the like in areas away from the reservation. An unknown, but probably minor, proportion of these were permanent nonresidents of the reservation.

It is not possible to determine exactly how many of the 9,000 Indians reported from the public domain area are Navajos, nor is it possible to determine exactly how many of the 10,000 Navajos working on nonreservation jobs should have been, but were not, reallocated in tabulations by residence to the reservation. It would seem, however, that the estimate of 69,000 resident Navajos in 1950, including public domain allottees and persons engaged in temporary off-reservation employment, might be low rather than high.

Reporting of Vital Events

If the estimated figure for resident population is inaccurate, the main reason is to be found in the under-reporting of vital events. The test of birth registration completeness made in connection with the 1950 census throws some light on the problem of under-reporting. The test was conducted through the cooperation of the Bureau of the Census, the National Office of Vital Statistics, and the various State, Territorial, and independent city registration officials. It involved an attempt to match birth certificates with cards prepared by the census enumerators for all infants found by them who had been born during the 3-month period preceding the date of the census (*4*). For the six counties which include the Navajo Reservation, the birth registration test revealed that the names of less than one-half of the Indian infants born during the test period could be matched to filed birth certificates, according to unpublished tabulations prepared by the National Office of

Vital Statistics. This is an improvement over 1940, when less than one-fourth could be matched (*5*).

In considering the results of the birth registration tests as a measure of registration completeness among the Navajos, however, it should be remembered that they represent the degree of success in matching names between two records for an illiterate and non-record-conscious people whose culture allows for easy change of name. The same individual may be known on different records as Silversmith's Son, recorded in either English or Navajo; Tall Man, recorded in either English or Navajo; and John Jones. If the recordkeeper knows a little Navajo, the identity of the Navajo and English forms of the same name may be recognized, but only field investigation will develop the identity of the three independent variants. Consequently, although we know that out of about 600 names on the Indian infant cards prepared by the census enumerators in the 6 Navajo counties there were approximately 300 that were not matched to birth certificates, we do not know how many unmatched birth certificates also remained.

A basic assumption of the birth registration test was that the infants listed on the infant cards were a representative sample of all infants and therefore that the addition of infants not listed would not affect the proportions of registered and unregistered births. Thus, there was an implied assumption that birth certificates not matched to cards represent infants for whom no card was made. As indicated above, this is not a safe assumption for the Navajos because of their custom of using alternate names. A possible alternative assumption is that the infants listed on the infant cards were a representative sample of the ratio of medically attended births to total births, an assumption which provides a slightly different estimate of birth registration completeness among the Navajos.

According to the census enumerators' reports, 47.5 percent of the 638 Indian infants born during the 3 months of 1950 in the Navajo area counties were delivered by a physician (table 1). Registered Indian births within these counties during all of 1950 have not been tabulated by person in attendance, but nonwhite births have. Since there were only 70 non-Indian births among the 2,391 nonwhite births, the nonwhite births can be taken as representing Indians. According to the birth certificates filed for nonwhite residents during 1950 (*6*), 1,865 of the births were attended by a physician (table 2). If it is assumed, then, that these 1,865 births represented only 47.5 percent of the total number of births, the proportion reported by the census enumerators for the first 3 months, it can be estimated that there were actually about 3,900 total births during 1950, of which slightly more than 60 percent (2,391) were registered.

The 60-percent estimate of birth registration completeness corresponds moderately well with a 1944 estimate that about one-third of the births were not registered (*7*). However, the number of uncontrolled variants in all of these estimates is so large that about all that can be said with assurance is that a large but unknown proportion of Navajo births are not registered.

No data are available on the extent of underregistration of deaths among the Navajos. Since a considerable proportion of deaths occur in infancy and early childhood, it is assumed that an appreciable number are not recorded, but a percental measure of the degree of underregistration does not seem readily attainable.

Birth and Death Rates

The effect of under-reporting of vital events on Navajo birth and death rates is evident in

Table 1. Indian births during first 3 months of 1950 in Navajo area counties, as reported by census enumerators

State and county	Total number of births	Attended by a physician	
		Number	Percent
Total	638	303	47.5
Arizona:			
Apache County	186	97	52.1
Coconino County	106	38	35.8
Navajo County	149	72	48.3
New Mexico:			
McKinley County	119	64	53.8
San Juan County	50	30	60.0
Utah:			
San Juan County	28	2	7.1

Table 2. Registered nonwhite births during 1950 in the Navajo area counties

State and county	Total number of births	Attended by a physician	
		Number	Percent
Total	2, 391	1, 865	85. 0
Arizona:			
Apache County	631	491	77. 8
Coconino County	369	334	90. 5
Navajo County	502	342	68. 1
New Mexico:			
McKinley County	577	450	78. 0
San Juan County	273	229	83. 9
Utah:			
San Juan County	39	15	48. 7

every study that has been made of Navajo health conditions. Two recent studies made by the Bureau of Indian Affairs will demonstrate the point (*8*, *9*). These studies were based on Indian births and deaths by county as tabulated by the National Office of Vital Statistics. Rates were calculated on the resident Indian population as reported by the 1950 census. As indicated above, the census figures are probably an understatement to the extent of the number of persons absent as migratory laborers. If these persons were included in the base population, it would, of course, decrease the rates.

Without correction for underestimation of resident population or for under-reporting of births and deaths, the birth rate for the period 1949 through 1951 was calculated to be 32.7 per 1,000 resident population and the death rate to be 12.6 per 1,000 resident population. Both figures are lower than would be expected. The Apaches of San Carlos and Fort Apache Reservations of Arizona, one of the nearest neighbors to the Navajos, are reported to have a crude birth rate of 40.3 and a crude death rate of 19.6. The difference appears to be more likely under-reporting among the Navajos than any marked difference in actual conditions of the two groups.

Bearing in mind that rates for the Navajos are understated by an unknown but appreciable amount, a comparison of Navajo age-specific death rates with United States averages, as shown in table 3, is of interest. (The Navajo rates were calculated from National Office of Vital Statistics data as described above.) Even on an understated basis the Navajo death rate for infants and preschool children is 5 times as high as the United States average. The infant mortality rate per 1,000 live births for the Navajos is 139.4, also about 5 times the United States average. The death rates for children of school age are about 3½ times as high, and for young adults, more than 4 times as high. Navajo death rates markedly exceed the United States averages at those ages when deaths are preponderantly from communicable diseases or accidents, that is from the most readily preventable causes. In the older age groups, Navajo death rates are as low as or lower than the United States rates.

Causes of Death and Illness

The National Office of Vital Statistics has not tabulated deaths by cause for Indians in the six Navajo counties. The only cause-specific data available are those provided by the hospitals and clinics under the supervision of the Bureau of Indian Affairs. These data are still less complete than those in the tabulation above (which included all known deaths to Indian residents of the six counties), apparently covering about three-fourths of the deaths.

Without adjusting the data for under-reporting, they show that the three leading causes of death for the calendar year 1950 were tuberculosis, gastroenteric diseases, and ill-defined and unknown causes. Rates for these causes

Table 3. Age-specific death rates per 1,000 population for the Navajos, 1949–51, and the total United States population, 1950

Age group (in years)	Navajos	United States	Ratio
All ages	12. 6	9. 6	1. 31
0–4	36. 8	7. 5	4. 91
5–9	2. 1	. 6	3. 50
10–14	2. 1	. 6	3. 50
15–19	3. 9	1. 1	3. 55
20–24	6. 7	1. 5	4. 47
25–34	7. 8	1. 8	4. 33
35–44	6. 3	3. 6	1. 75
45–54	8. 9	8. 5	1. 05
55–64	13. 4	19. 1	. 70
65–74	27. 6	40. 7	. 68
75 and over	57. 1	109. 6	. 52

for the Navajos and the total United States population are given in table 4. The next three causes of death among the Navajos in 1950, according to Bureau of Indian Affairs data, were diseases peculiar to infancy, influenza and pneumonia, and accidental deaths. None of the three leading causes for the general population—diseases of the heart, malignant neoplasms, and vascular lesions affecting the central nervous system—was among the six leading causes for the Navajos.

Morbidity data for the reportable diseases are available for the calendar year 1953 from the same sources as deaths by cause, and it may be assumed that they are under-reported to at least the same degree as are deaths by cause. Even then, the case rates for many diseases are extremely high, as can be seen in table 5 (*10*).

Trachoma, a disease of negligible importance for the United States as a whole, is still one of the leading diseases among the Navajos. The rate for new cases not previously reported is nearly 600 per 100,000 population. Rates of more than 1,000 new cases per 100,000 population are reported for pneumonia and for tuberculosis. Rates for most of the common infectious diseases of childhood are high, particularly measles and mumps, for which rates are 2½ times the United States rates. However, scarlet fever and streptococcal sore throat are reported less than one-fifth as frequently as in the total United States population.

The major venereal diseases are reported about 3 to 6 times as frequently among the Navajos. No cases of the minor venereal diseases were reported, but in a population of less than 100,000 the probability of uncovering a case of a comparatively rare disease is not high.

Dysentery is over 10 times as frequent among the Navajos as in the total United States population, with a rate of about 150 per 100,000. This includes both bacillary and amebic dysentery. If data were available on the incidence of all gastroenteritis and diarrhea, hospital experience indicates that it would be one of the leading causes of illness.

Table 4. Death rates per 1,000 population for the three leading causes of death among the Navajos and comparable rates for the total United States population, 1950

Cause of death	Navajos	United States	Ratio [1]
All causes	9. 8	9. 6	1. 01
Tuberculosis, all forms	1. 9	. 2	8. 29
Gastritis, enteritis, and so forth [2]	1. 3	. 1	25. 65
Ill-defined and unknown causes	1. 2	. 1	7. 87

[1] Ratios calculated on basis of rates per 100,000 population.
[2] International List Nos. 543, 571, 572.

Table 5. Case rate per 100,000 population for 28 reportable diseases for the Navajos and for the total United States population, 1953

Disease	Navajos	United States	Ratio
Pneumonias	1, 137. 7	11. 2	101. 58
Tuberculosis, all forms	1, 042. 5	66. 2	15. 75
Measles	734. 3	282. 2	2. 60
Trachoma	581. 7	. 5	1, 163. 40
Gonococcal infections	553. 4	157. 6	3. 51
Syphilis	543. 1	96. 0	5. 66
Mumps	339. 8	126. 1	2. 69
Chickenpox	209. 8	202. 3	1. 04
Dysentery, all forms	148. 0	13. 3	11. 13
Infectious hepatitis	39. 9	21. 1	1. 89
Whooping cough	30. 9	23. 4	1. 32
Meningococcal infections	21. 9	3. 2	6. 84
Scarlet fever and streptococcal sore throat	15. 4	84. 8	. 18
Poliomyelitis, acute	10. 3	22. 7	. 45
Typhoid fever	6. 4	1. 5	4. 27
Trichinosis	3. 9	. 2	19. 50
Acute infectious encephalitis	2. 6	. 7	3. 71
Rocky Mountain spotted fever	2. 6	. 2	13. 00
Chancroid	0	2. 3	----
Diphtheria	0	1. 5	----
Brucellosis	0	1. 1	----
Malaria	0	. 9	----
Lymphogranuloma venereum	0	. 6	----
Granuloma inguinal	0	. 4	----
Tularemia	0	. 4	----
Botulism	0	0. 0	----
Anthrax	0	0. 0	----
Rabies in man	0	0. 0	----

Summary

Measurement of health conditions among the Navajos is hampered by lack of complete data either on the base population involved or on deaths and illnesses. Even with this lack of specificity, however, it is obvious that mortality and morbidity rates for most of the major dis-

eases are far in excess of the rates for the total United States population.

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(8) U. S. Bureau of Indian Affairs: Live births and infant deaths by Indian agency areas by race: United States, 1950. Processed.

(9) U. S. Bureau of Indian Affairs: Deaths by age by Indian agency areas: United States and Alaska, 1950. Processed.

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Memorandums on Economic Poisons

In April 1955 the Technical Development Laboratories of the Communicable Disease Center, Public Health Service, made available its annual revision of the material on economic poisons. In mimeographed form, the memorandums are designed primarily for the guidance of physicians who are directly concerned with diagnosis and treatment of persons extensively or intensively exposed to insecticides.

Each clinical memorandum, after briefly giving information on the identity, formulations, and uses of a poison, discusses its toxicology with special reference to human cases, the dangerous dose in man, laboratory findings, and treatment. Each operational memorandum gives formulations and procedures for the control of the various susceptible insects or rodents that are of importance to public health. The chemical memorandums deal with the preparation of biological samples and their analysis for insecticides.

The revision contains separate clinical and operational memorandums on benzene hexachloride, chlordane, DDT, demeton, dieldrin, dilan, parathion, sodium monofluoroacetate (1080), TEPP, toxaphene, and warfarin. There are also clinical memorandums on dinitrophenols, kerosene, and xylene; and operational memorandums on aldrin, allethrin, ANTU, DDD, Diazinon, Dipterex, EPN, heptachlor, lindane, malathion, methoxychlor, Pival, and pyrethrum. There are chemical memorandums on DDT and lindane.

Persons who may have use for such memorandums may request copies from the Technical Development Laboratories of the Technology Branch of the Communicable Disease Center, U. S. Public Health Service, Box 769, Savannah, Ga.