A Comparison of Selected Mortality Statistics and Life Expectancy Between the Warm Springs Indians, United States Indians, and the Nation

by

Victorie Heart, R.N., B.S.N.

A Thesis

Presented to
The Oregon Health Sciences University
School of Nursing
in partial fulfillment
of the requirements for the degree of
Master of Science

June 12, 1987

This study was supported by a traineeship from the United States Public Health Service Grant Number 2A11 NV00250-10.

APPROVED:

[redacted]

Patricia K. Patterson, R.N., M.A.

Thesis Advisor

[redacted]

Joyce A. Semradek, R.N., M.S.N.

First Reader

[redacted]

Sylvester Sahme Sr., M.B.A.

Second Reader

[redacted]

Carol A. Lindeman, R.N., Ph.D, Dean, School of Nursing

Acknowledgements

I would particularly like to thank my advisor, Patty Patterson, who has been a tremendous support. I would also like to thank Cecelia Capuzzi, chairperson for the oral examination, and committee members Joyce Semradek and Sal Sahme. Sal has been a source of continuous encouragement and motivation. Other persons on the Warm Springs Reservation who have been of extreme help with this study include Judy Charley, Bob Jackson, Kathleen Moses, Gail Lang, Elina Langnese, Lloyd Phillips, and Madeleine Queahpama.

I would like to thank Dr. Bill Morton at the Oregon Health Sciences University for discussing the study and Dr. Bill Vollmer at Kaiser Permanente for his help with the statistical procedures.

Finally, I would like to thank my family and friends for their patience and support during this endeavor.

TABLE OF CONTENTS

LIST OF TABLES

TABLES PAGE

CHAPTER I

INTRODUCTION

Early Indian treaties established that the government of the United States (U.S.) was responsible for health care delivery services on reservations nationwide. The Bureau of Indian Affairs, a division of the Department of the Interior, was responsible for Indian health until 1955. At that time, Indian health administration changed to what is now the Department of Health and Human Services, U.S. Public Health Service. Indian Health Service (IHS), a branch of the U. S. Public Health Service, currently has this responsibility. Individual tribes also administer health care services to a varying degree.

The Indian Self-Determination and Education Assistance Act of 1975 (Public Law 93-638) recognized the right of Native Americans to direct their own destiny (National Indian Health Board, 1984). Since then Indians have been instrumental in planning culturally-determined and culturally-based health care programs for themselves. With respect to local health functions, the Warm Springs Reservation in Oregon is active and directive. The idea for this research was first

proposed by the tribal health planner in an effort to determine the collective health status of the Warm Springs population, when compared with national Indian and non-Indian groups.

A five-year comprehensive health and social service plan for Warm Springs was first developed in 1979, and that plan is currently being updated. A major goal stated in the new five-year plan is that life expectancy of the Warm Springs people will be equal to or higher than the U.S. national average. However, life expectancy data are available only for the U.S. Indian population and for the U.S. total population. It is unknown whether these larger population-based life expectancies depict an accurate picture of the Warm Springs population. Thus, it is uncertain whether they can be used for evaluating goal achievement on the local reservation. If the U.S. data accurately describe the Warm Springs population, then the national data can be used confidently for measuring goal achievement. If the data are not accurate, this would provide valid rationale for the tribe to calculate its own reservation-based life expectancy rates. It is always more economical to use existing data once it has been

established that the data are available and representative of the population.

The problem will be viewed from an epidemiological framework. According to MacMahon and Pugh, epidemiology has been defined as "the systematic, scientific study of the distribution patterns and determinants of health and disease frequencies in populations, for the purpose of promoting wellness and preventing disease." (cited in Clemen, Eigsti, & McGuire, 1981).

Understanding a population's mortality pattern gives the service providers, such as health planners and public health nurses, valuable clues about the way the population lives. When mortality is described by cause, frequency, and distribution, these health care providers can identify risk factors. Dever (1984) states that risk factors are the cornerstone of epidemiology and adds that they are the key to an effective and efficient health strategy. Once populations at risk are identified, the goal is implementing preventive measures to stop or slow the phenomena which have an adverse effect (Dever, 1984, Clemen et al., 1981).

Review of the Literature

The American Indian/Alaska Native life expectancy is 71.1 years compared to the U.S. average life expectancy of 73.7 years . Life expectancy for American Indians and Alaska Natives has lagged behind the U.S. population since 1939 ("Life Expectancy", 1984).

In an effort to discover the relationship between Native and non-Native groups, studies comparing the two were reviewed. Carr and Lee (1978) used three comparison groups in their study of Navajo tribal mortality. Using life table analysis, they determined that the Navajo have a lower life expectancy at birth than all three of their comparison groups. Specifically, newborn Navajos in 1973 could expect to live 0.2 years less than all U.S. Indians, 2.1 years less than U.S. nonwhites, and 7.8 years less than the U.S. white population. As further demonstrated by Carr and Lee, Navajo male life expectancy would increase 5.17 years at birth by eliminating death from motor vehicle accidents alone. This study is unique in that it describes the mortality and life expectancy of a single Native American Indian tribe.

With Native life expectancy acknowledged to be lower than that of non-Natives, much research has focused on the leading cause of death among Natives. The historic trend of lower life expectancy and higher accidental death rates in Native populations is clearly supported by both Canadian and American research findings. Accidents have been reported as the leading cause of death at rates three to five times higher than the respective national non-Native comparison groups.

Canadian studies compared the mortality of Native populations in three separate provinces. Schmitt, Hole, and Barclay (1966) confirmed accidental death as the leading cause of mortality among British Columbia Native Indians. Accidental death ranked fourth at that time for the Canadian population as a whole. The Indians represented 2% of the total population and accounted for 10% of the accident fatalities.

In the province of Alberta, Jarvis and Boldt (1982) reported striking differences between Indian deaths compared to the Canadian national average. Thirty-two percent of deaths among the local Natives were due to accidents, compared with only 8.6%

accidental deaths in the whole Canadian population, for the period October 1976 through September 1977.

Young (1983) determined that more than one-third of deaths among the Cree-Ojibwa Indians in Ontario were due to injuries and poisonings from 1972 through 1981. The same causes contributed to only 9.7% of all Canadian deaths.

Although there are differences in Canadian and American health care delivery systems with regard to access to care, American research reports are similar. A November, 1966 to October, 1967 study of the Navajo by Brown, Gurunanjappa, Hawk, and Bitsuie (1970) revealed that accidents were fatal 2.4% of the time. Accident mortality for the Navajo population (both sexes) was almost twice as high as the U.S. rate for the same time period. Certain groups, such as Navajo men aged 35-44 years, exceeded the national comparison rate by five times.

Among the Chippewa of Minnesota, Westermeyer and Brantner (1972) found that accidents accounted for 25.8% of deaths, compared to 5.3% of deaths in the whole state during the period 1965-67.

In general, Native populations die from violent and often preventable causes as opposed to dying from chronic diseases which characterize the non-Native population. Among the Warm Springs population, accidental death was the leading cause of mortality, accounting for 32% of deaths during the years 1980-82. Heart disease and chronic liver disease are ranked second and third respectively as causes of death on the Warm Springs reservation (Indian Health Service, 1985).

Nationally, the three leading causes of death are diseases of the heart, malignant neoplasms, and cerebrovascular diseases (Oregon Center for Health Statistics, 1985). Accidents ranked fourth as a cause of death nationally in 1980, accounting for 5.1% of all deaths (Indian Health Service, 1985). As the causes of death imply, there are lifestyle differences between Native and non-Native groups.

Results from studies of accidents and mortality in Native populations have shown that accidents do not always end in death (Omran & Loughlin, 1972; Westermeyer & Brantner, 1972; Potter, 1985). For example, Potter measured unintentional injuries among

the Warm Springs population in 1985 as part of a regional task force effort to examine the high accidental death rate in the Portland Area of Indian Health Service. Results showed that injuries requiring no treatment occurred 4% of the time, injuries requiring only first aid occurred 64% of the time, and injuries requiring medical treatment or resulting in some degree of disability occurred 31.8% of the time. Fatal injuries occurred only 0.2% of the time (2 out of 930 injuries reported). With only a small percentage of accidents resulting in death, and with accidental death rates in Native populations being so high, this implies there are many accidents among these groups. Further, since accidents by definition are usually preventable, the elimination or decrease in the number of accidents could have a major effect on Native life expectancy, as suggested by Carr and Lee. Clearly, this is an area which should be examined so that health planners can make informed decisions regarding community-based accident prevention programs.

The American Nurses' Association Social Policy Statement calls for "the provision for the public health through use of preventive and environmental

measures, and increased assumption of responsibility by individuals, families, and other groups as basic self-help resources" (American Nurses' Association, 1980, p. 4). As a practice guide, the Statement specifies that the nursing professional has a responsibility for health care planning and for shaping health policy at all levels.

To stimulate such policy change, nurses can demonstrate health problems by providing epidemiological data to the community. Health services planners customarily use mortality and life expectancy data to target their intervention programs for the appropriate groups (Dever, 1984). They can then facilitate change toward prevention using the community process model, also known as the collective capacity model (Meenaghan, Washington, & Ryan, 1982). This model encourages the community to define goals based on available information.

Research Questions

In order for the Warm Springs community to measure movement toward the goal of increased life expectancy, planners must be able to compare their status with the national average. A mortality description of the reservation population is also

necessary to determine the age groups at risk. In an effort to compare mortality and life expectancy of the Warm Springs reservation with other populations, the following research questions were posed:

1a. What are the crude death rates and age-specific death rates for the Warm Springs population (1980-82 and 1983-85), the U.S. Indian/Alaska Native population (1980-82), and the U.S. population (1980)?

1b. How do the crude and age-specific death rates of Warm Springs (1980-82 and 1983-85), U.S. Indian/Alaska Native (1980-82), and U.S (1980) populations compare?

2a. Based on 1980-82 and 1983-85 data, what are the life expectancies at birth for a Warm Springs resident?

2b. How do the Warm Springs 1980-82 and 1983-85 life expectancies at birth compare with the U.S. Indian/Alaska Native 1979-81 and the U.S. 1980 life expectancies at birth?

3a. What are the 1980-82 and 1983-85 life expectancies at birth for a Warm Springs male and female?

3b. How do the Warm Springs male and female life expectancies at birth (1980-82 and 1983-85) compare with the U.S. Indian/Alaska Native (1979-81) and the U.S. (1980) male and female life expectancies at birth?

4a. Do Warm Springs mortality and life expectancy rates remain stable when two consecutive three-year periods (1980-82 and 1983-85) are compared?

CHAPTER II

METHODOLOGY

Design

The study utilized a retrospective, descriptive design. Data which describe the mortality patterns of three populations were compared and life tables were constructed for additional comparison. Warm Springs, U.S. Indian/Alaska Native, and U.S. population data were acquired through public documents and tribal records. The similarities and differences between the groups were described after the data were organized in comparable form, consistent with the research questions. Each of the three populations is described below.

Permission for the study was obtained in writing from the Warm Springs Tribal Council (see the letter in Appendix A). In addition, a personal presentation of the research proposal was made to the Tribal Council, as requested.

Warm Springs Population

The Warm Springs population consists of approximately 2,700 persons who represent the Confederated Tribes of the Warm Springs Reservation of

Oregon. The group includes people from the Warm Springs, Wasco, and Paiute tribes. The reservation is located in Central Oregon, as shown on the map in Appendix B.

In accordance with the Constitution and By-Laws of the Confederated Tribes of the Warm Springs Reservation of Oregon (1938), an individual may be eligible for tribal membership either automatically or by adoption. A child of one-fourth or more Indian blood born to a member of the Confederated Tribes who maintains residence on the Warm Springs Reservation will automatically be eligible for membership at birth. Any person of one-eighth or more Indian blood who is a descendant of a member or former member of the Confederated Tribes may be adopted by a majority vote of tribal members. Prior to adoption, the individual must have resided at least three years on the Reservation and may not be a member of any other Indian tribe. Membership can be lost only by personal written request to the Tribal Council or by death. The tribal roll is a listing of currently enrolled members which is updated monthly by the Warm Springs Vital Statistics Office.

For the comparative purposes of this study, tribal members enrolled during the years 1980-82 and 1983-85 comprised the groups. According to the Warm Springs Reservation Comprehensive Plan (1983), 75 to 80% of the enrolled tribal members lived on the Reservation at that time. Table 1 displays current data which reveal that 80.7 percent of the population reside on the reservation (Warm Springs Reservation Data Processing Department, 1986).

A high percentage of children (95.1% of those less than one year of age) and elderly (83.0 to 90.1% of those older than 55 years of age) live on the Reservation. Only 71.8 to 78.6 percent of persons between the ages of 15 and 54 live there. This group represents the "work force" ages.

U.S. Indian/Alaska Native Population

The Native American population numbered 1,240,384 in 1980 (IHS, 1984). To be eligible for inclusion in this group, an individual must be a member of a federally recognized American Indian tribe or an Alaska Native population which is in one of the 28 states where the Indian Health Service has full or partial responsibility for health care services. The 28 "Reservation States" are as follows (IHS, 1984):

Table 1

Percent of Population by Age Group Residing on Warm Springs Reservation, 1986

Age (Years)	Percent of Total Population In Age Group N	%	Percent of Age Group Living On Reservation N	%
<1	82	2.9	78	95.1
1-4	346	12.2	316	91.3
5-14	618	21.7	521	84.3
15-24	596	21.0	465	78.0
25-34	553	19.4	397	71.8
35-44	323	11.4	242	74.9
45-54	159	5.6	125	78.6
55-64	91	3.2	82	90.1
65-74	45	1.6	42	93.3
75-84	25	.9	22	88.0
85+	6	.2	5	83.0
Total	2,844	(a)100.1	2,295	80.7

Note. Data are from Warm Springs Reservation Data Processing Department, July, 1986.

(a)= Error due to rounding.

Alaska	Kansas	Nebraska	Oregon
Arizona	Louisiana	Nevada	Pennsylvania
California	Maine	New Mexico	South Dakota
Colorado	Michigan	New York	Utah
Florida	Minnesota	North Carolina	Washington
Idaho	Mississippi	North Dakota	Wisconsin
Iowa	Montana	Oklahoma	Wyoming

Population and mortality figures for the period 1980-82 were used to determine crude and age-specific mortality rates. However, life expectancy values are for the period 1979-81 since life tables had already been calculated by the IHS. Vital events data are supplied to the IHS by state vital event registrars.

U.S. Population

This population, as determined by the 1980 census, is theoretically, an enumeration of every household in the United States. It includes the U.S. Indian/Alaska Native group while the U.S. Indian group in turn includes the Warm Springs population. The U.S. census is conducted every ten years. Between deciennial census years, population data can be calculated based on the rates at which vital events occured in the

census year and the rate of population growth. In 1980, the U.S. population was 226,545,805 (National Center for Health Statistics, 1986).

Sources of Data

Data were obtained from three primary sources. Warm Springs data were collected at the Warm Springs Vital Statistics Office. U.S. Indian data were obtained from the Indian Health Service and U.S. data were obtained from the National Center for Health Statistics.

The Warm Springs mortality data, obtained from the Vital Statistics Office on the Reservation, were from a list of every death by age and sex for the years 1980-85. Tribal population data were obtained for the same years. A special "computer run" was made by the Warm Springs Data Processing Department which counted the number of tribal members at mid-year by age and sex. Tribal mortality and population data were made available only after anonymity of individual members was guaranteed. Initially, mortality data were provided by the Warm Springs Vital Statistics Office staff since the researcher was not allowed to personally review the death certificates. However,

later, the researcher was allowed to view the handwritten summary report of death certificates, which included data that were vital to the study such as sex and age at death.

Mortality data are recorded on a standard "certificate of death" form. Appendix C is an example of an Oregon death certificate which is used by the Warm Springs population. Comparable forms are used by other states. Death certificates may vary from state to state but the information that was used for comparisons (age, race, sex) was reported in all cases.

It is important to remember that the mortality data represent only 75-80% of the population, those who resided on the reservation, while the population data represent all enrolled tribal members.

Fetal deaths are listed with other deaths on the Reservation, since families are entitled to burial benefits. Care was taken to ensure that fetal deaths were not included with infant deaths, for the purposes of this study, since fetal and infant deaths are separated in the national mortality data. This was an important distinction to make, because prior to

viewing the office copy of the death record, fetal deaths had been calculated with infant deaths. This resulted in a higher age-specific death rate in the infant (<1 year) group.

U.S. Indian/Alaska Native mortality and population data were obtained from the Indian Health Service's Vital Events Office in Rockville, Maryland. Contact with this source was initiated in writing (see the letter in Appendix D) with follow-up via telephone. These data are publicly available.

United States, 1980, mortality data were obtained from the publication, "Vital Statistics of the United States", which is compiled annually by the National Center for Health Statistics (1985). Population data were taken from the 1980 census which is compiled by the same source. Contact with this source was initiated by telephone.

Definitions

Mortality Rates. Mortality refers to a death. Two types of mortality or death rates are crude and age-specific. Crude death rate is equal to the number of deaths in a population in a year divided by the mid-year population. This value is multiplied by

1,000 and the rate is then reported as deaths per 1,000 population (Fox, Hall, & Elveback, 1970). Mathematically, the equation is as follows:

crude death rate = # deaths/mid-year pop. x 1,000.

Crude rates have two disadvantages. First, they obscure the complex distribution patterns due to age and risk factors. Because of the relationship between age and cause of death, it is important to consider how many persons were in each age group and what the specific causes of death were in each age group. Second, because of the information lost through summarization, crude rates lack comparability for two communities which have different age distributions.

Age-specific death rates are determined in the same way as the crude death rates except the numerator and denominator are specific to a particular age range. This rate is calculated as follows:

age-specific death rate (for age 1-5) = # deaths in 1-5 year age range/mid-year pop. 1-5 yr. olds x 1,000.

Moreover, according to Fox et al. (1970) the only satisfactory comparison of mortality is made with age-specific rates. Crude death rates are often the only mortality data reported for a population, though age-specific data are more descriptive.

Life Expectancy. Life expectancy is an estimate of how long an individual in a given population can expect to live. Life expectancy at birth refers to the average number of years a newborn child would live if subjected to the mortality risks for that population at the time of birth. For example, a newborn would be subjected to risks such as accidents, measles, and polio.

Abridged life tables are used to determine life expectancy by summarizing age-specific mortality rates in a given interval for a given population. Life tables display the age distribution of deaths in that population. These observations are plotted and result in a survival curve, which is an estimate of the probability of death at a given age. In order to make life table calculations, the following data are utilized : the number of persons alive in the group at the beginning of an interval, the number of deaths

in the group during the interval, and the number of persons surviving to the next interval (Rimm, Hartz, Kalbfleisch, Anderson, & Hoffmann, 1980).

The life table summary of age-specific mortality rates refers to an imaginary population born into a set of age-specfic mortality rates operating during the specified calendar year and living their entire lives under that set of rates (Fox et al., 1970). This means that children born in 1980 will have life expectancies based on mortality data representative of their entire population in 1980. As the children age, they may benefit from improvements in the health care delivery system as well as other societal advances. A child may actually live longer than the life expectancy calculated for him in 1980. The life table for a specific year, then, summarizes the mortality experience of a fictitious cohort.

Calculation of Life Tables. Mathematically, the formula for calculating life expectancy is explained as follows with reference to the life table in Table 2.

Column 1- age interval (x to xi + 1), represents the interval of life between two exact ages stated in years. The 85+ age group is operationally defined as

Table 2

Life Table for Warm Springs Total Population, 1980-82

1	2	3	4	5	6	7
Age Interval	Proportion dying	Of 100,000 born Number alive	Number dying	Years lived in Interval	Total years lived	Life Expectancy (in years)
(x to xi+1)	(qi)	(li)	(di)	(Li)	(Ti)	(ei=Ti/li)
0-1	0.01695	100000	1695	99153	6448253	64.5
1-5	.00556	98305	547	392126	6349100	64.6
5-10	0	97758	0	488790	5956974	60.9
10-15	.00549	97758	537	487448	5468184	55.9
15-20	.01618	97221	1573	482173	4980736	51.2
20-25	.02551	95648	2440	472140	4498563	47.0
25-30	.03516	93208	3277	457848	4026423	43.2
30-35	.04188	89931	3766	440240	3568575	39.7
35-40	.06188	86165	5332	417495	3128335	36.3
40-45	.10638	80833	8599	382668	2710840	33.5
45-50	.04464	72234	3225	353108	2328172	32.2
50-55	.05682	69009	3921	335243	1975064	28.6
55-60	.08065	65088	5249	312318	1639821	25.2
60-65	.16854	59839	10085	273983	1327503	22.2
65-70	.07353	49754	3658	239625	1053520	21.2
70-75	.10204	46096	4704	218720	813895	17.7
75-80	.15151	41392	6271	191283	595175	14.4
80-85	0	35121	0	175605	403892	11.5
85+	1.00000	35121	35121	228287	228287	6.5

85-98 years. Since all persons must die, 98 was chosen as the upper age limit. As an example, the age interval 1-5 has been selected (see Table 2).

Column 2- proportion dying (qi), represents the proportion of persons alive at the beginning of the age interval who will die during the interval. For example, in the age interval 1-5, 0.00556 will die.

Column 3- number alive (li), represents the number of persons who survive to the exact age marking the beginning of each interval. For the age group 1-5, 98,305 persons were alive at the beginning of the interval.

Column 4- number dying (di), shows the number dying in each successive age interval out of 100,000 live births. The proportion dying multiplied by the number alive at the beginning of the interval equals the number dying (qi x li = di). For the age interval 1-5 this is .00556 x 98,305 = 547. In this group there were 547 deaths in the interval.

Column 5- years lived in interval (Li), shows the number of person-years in the indicated age interval. It is equal to the number of persons entering the interval multiplied by the time they lived in the interval and adjusts for the deaths which occur during

that time. For example, the 98,305 persons in the 1-5 age interval lived a total of 392,126 person-years. This is equal to 98,305 minus one half of 547 (li - 1/2 di) multiplied by the four years in the interval (98,305 - 273.5 x 4 = 392,126).

Column 6- total years lived (Ti), shows the total number of person-years in the population. This is the total number of person-years in the indicated age interval and all subsequent age intervals of a single life table cohort. For the 1-5 age interval, 392,126 (person-years in interval) plus all subsequent total years-lived values equals 6,349,100.

Column 7- life expectancy (ei = Ti/li), represents the average remaining lifetime and is equal to the total person-years lived by an age cohort divided by the number of persons in the cohort. For the age interval 1-5, this equals 6,349,100 divided by 98,305. An individual aged 1-5 in 1980-82 could expect to live 64.6 years.

Analysis

Once the raw data were organized by age group and sex, it was possible to address the research questions. Crude death rates were calculated for the 1980-82 and 1983-85 Warm Springs populations, for the 1980-82 U.S. Indian population, and for the 1980 U.S.

population. A crude death rate was calculated for each entire population as well as for the male and female components of each population, using the formula outlined by Fox et al. (1970).

Age-specific mortality rates were calculated for all the groups identified above. Again, the formula outlined by Fox et al. was used. Descriptive, non-parametric analysis was used to compare crude death rates and age-specific death rates of these population groups.

Abridged life tables were calculated based on the theories outlined by Rimm et al. and the National Center for Health Statistics (1975). In addition, a statistician, William M. Vollmer, Ph.D., was consulted to ensure that the resulting life tables would be derived using a standard methodology.

Although life tables existed for the U.S. Indian population for 1979-81, and for the U.S. population for 1980, life tables were recalculated for these populations using the same methodology that was used to derive the Warm Springs life tables. The goal of recalculating the national data was to ensure comparability to the smaller Warm Springs population data. Uniformly, the new life tables assume that deaths occur at the mid-point of an age interval.

For the larger U.S. population, the original methodology utilized exact month and age at death. Exact month and age at death data are available for the Warm Springs population but were not used due to the extremely small sample size. The U.S. data were not originally calculated using an upper age limit. Each age at death was included in the calculation. The U.S. Indian data were originally calculated using a method which assumed 90 years to be the upper age limit.

Six life tables were constructed using Warm Springs mortality and population data. For 1980-82, three life tables were constructed which represent the entire population, male population, and female population. For 1983-85, life tables were constructed which represent each of the same three groups.

The 1979-81 life tables for the entire U.S. Indian population, male, and female were calculated by the Indian Health Service (1984). Columns two, three, and four of those life tables were the basis of the new life tables.

Similarly, the U.S. life tables were calculated by the National Center for Health Statistics (1985) for 1980. Columns two, three, and four of those life tables served as the basis for the new life tables.

CHAPTER III

RESULTS AND DISCUSSION

Results

Crude Death Rates. A comparison of crude death rates for the three populations is found in Table 3, below. The crude death rates range from a low of 5.1/1,000 for the total U.S. Indian population to a high of 8.8/1,000 for the total U.S. population. For 1980-82 and 1983-85, the Warm Springs crude death rates fall between the U.S. Indian/Alaska Native and the U.S. crude death rates for the total, the male, and the female populations. Male crude death rates are higher than females rates in all three populations.

Table 3

Comparison of Crude Death Rates (per 1,000 population)

Population, Year(s)	Total	Male	Female
Warm Springs, 1980-82	6.6	7.4	5.7
Warm Springs, 1983-85	7.1	8.5	5.7
US Indian/AK Native, 1980-82	5.1	6.2	4.0
US, 1980	8.8	9.8	7.9

Age-Specific Death Rates. As stated previously, crude death rates are oversimplified. Therefore, age-specific death rates were examined to see the effect of age distribution within the population. The age-specific death rates for the groups are summarized in Tables 4, 5, and 6. Raw mortality and population data for the Warm Springs, U.S. Indian/Alaska Native, and U.S. populations are presented in Appendix E.

For the total population data presented in Table 4, there are two important findings. First, the Warm Springs population has the highest death rate for persons less than one year of age in both periods 1980-82 and 1983-85. In addition, the Warm Springs population shows consistently higher age-specific death rates than the comparison groups in the age intervals from 15 to 64 years.

When comparing male age-specific mortality statistics, the Warm Springs 1980-82 population has the lowest infant (less than one year old) mortality rate for the groups at 7.7/1,000. For 1983-85, the Warm Springs infant mortality rate for males was 14.2/1,000 which is consistent with the national comparison groups. However, the Warm Springs male

Table 4

Comparison of Age-Specific Mortality Rates

(per 1,000 Total Population)

Age	Warm Springs 1980-82	Warm Springs 1983-85	US Ind/AK Nat 1980-82	US 1980
<1	16.9	19.1	14.0	12.9
1-4	1.4	0	.9	.6
5-14	.6	0	.4	.3
15-24	4.2	7.0	2.1	1.2
25-34	7.6	7.3	2.9	1.4
35-44	16.0	3.5	4.2	2.3
45-54	10.0	18.4	7.3	5.8
55-64	23.5	24.0	12.9	13.5
65-74	17.1	46.9	24.2	30.0
75-84	19.6	43.5	47.5	67.0
85+	222.2	176.5	103.9	160.0

Table 5

Comparison of Male Age-Specific Mortality Rates

(per 1,000 Population)

Age	Warm Springs 1980-82	Warm Springs 1983-85	US Ind/AK Nat 1980-82	US 1980
<1	7.7	14.2	15.3	14.3
1-4	2.6	0	1.0	.7
5-14	0	0	.5	.4
15-24	3.1	10.3	3.1	1.7
25-34	9.4	11.4	4.1	2.0
35-44	28.4	2.4	5.7	3.0
45-54	10.1	27.8	9.5	7.7
55-64	32.3	39.6	16.8	18.2
65-74	33.3	108.1	30.6	41.1
75-84	55.6	0	57.7	88.2
85+	0	0	121.5	188.0

Table 6

Comparison of Female Age-Specific Mortality Rates (per 1,000 Population)

Age	Warm Springs 1980-82	Warm Springs 1983-85	US Ind/AK Nat 1980-82	US 1980
<1	28.3	24.8	12.7	11.4
1-4	0	0	.8	.5
5-14	1.2	0	.3	.2
15-24	5.4	3.4	1.0	.6
25-34	6.0	3.8	1.7	.8
35-44	5.4	4.6	2.8	1.6
45-54	9.9	9.1	5.3	4.1
55-64	16.7	13.4	9.4	9.3
65-74	11.5	22.0	18.9	21.4
75-84	0	68.2	39.5	54.4
85+	111.1	200.0	92.3	147.5

age-specific death rates for 1980-82 and 1983-85 in the age groups from 15-64 years are higher than in the national comparison groups. Warm Springs men (1980-82 and 1983-85) aged 75 years and older have age-specific death rates lower than the national rates.

Warm Springs infant females have particularly high mortality rates compared to the national groups. This may be related to the small population size as discussed later. For 1980-82, the Warm Springs female infant mortality rate was 28.3/1,000 and dropped to 24.8/1,000 for 1983-85. The U.S. female infant mortality rate was 11.4/1,000 while the U.S. Indian rate was 12.7/1,000. Warm Springs female mortality rates in the 15-64 year age groups are consistently higher than the national comparison groups but are generally lower than those of Warm Springs males of the same ages.

Life Expectancy At Birth. Table 7 presents a comparison of life expectancy at birth for the Warm Springs, the U.S. Indian, and the U.S. populations (the 12 life tables which were constructed for this study can be found in Appendix F). The U.S. population has the longest life expectancy at birth, 73.9 years, followed by the U.S. Indian population

Table 7

Comparison of Life Expectancy at Birth For Warm Springs, U.S. Indian, and U.S. Populations

	Warm Springs 1980-82	Warm Springs 1983-85	US Ind/AK 1979-81	US 1980
Total	64.5	61.8	72.6	73.8
Male	58.5	54.4	68.2	70.2
Female	69.6	69.0	77.1	77.5

with a life expectancy at birth of 72.6 years. The Warm Springs life expectancy at birth is 64.5 years for 1980-82 and 61.8 years for 1983-85. Considering the extremely small size of the Warm Springs population, the life expectancies appear relatively stable over the two consecutive three year periods.

The U.S. population has the longest life expectancies at birth for both males and females followed closely by the U.S. Indian population. Warm Springs males for 1980-82 have a life expectancy of 58.5 years which is 11.7 years less than U.S. males and 9.7 years less than U.S. Indian males. For

1983-85, the Warm Springs male life expectancy was 54.4 years making the difference between the national comparison groups even greater.

Warm Springs female life expectancies are closer to the U.S. comparison groups. Warm Springs females for 1980-82 have a life expectancy of 69.6 years which is 7.9 years less than U.S. females and 7.5 years less than U.S. Indian females. For 1983-85, the Warm Springs female life expectancy is essentially unchanged, 69.0 years. Life expectancies at birth are very similar for the Warm Springs total, male, and female groups, but are consistently lower than the national comparison groups. Male life expectancy is lower than female life expectancy for all the populations.

To ensure comparability of life expectancies between populations, a single method was used to calculate the data. Therefore, the life expectancies for the U.S. Indian and U.S. populations were recomputed which resulted in somewhat higher values than those provided by the Indian Health Service and the National Center for Health Statistics. Table 8 shows the resulting values which increased by an average of nine months for these groups.

Table 8

Difference in National Life Expectancy Values Using Two Methods of Calculation

Population, Year	Original	Recomputed	Difference
	(values in years)		
US Ind/AK Nat, 1979-81			
Total	71.1	72.6	1.5+
Male	67.1	68.2	1.1+
Female	75.1	77.1	2.0+
U.S., 1980			
Total	73.7	73.8	0.1+
Male	70.0	70.2	0.2+
Female	77.5	77.5	0

Discussion

Based on the literature review, the higher crude and age-specific death rates and the lower life expectancies at birth of the Warm Springs population seem consistent with what is currently known about Native American mortality. Several factors, in

addition to the differences in age-specific death rates, may be responsible for the substantial lag in the Warm Springs life expectancies. The differences can also be attributed to the data used and the method of calculating life expectancy.

The questions of who is included in the population distribution and in the mortality statistics are of major concern. First, the population base must be clearly defined. Currently, the population base consists of all enrolled tribal members. However, statistical data are usually collected for residents of the reservation only. The discrepancy between the populations used for numerator and denominator in the rate calculations must be removed. That is, both should refer either to the total enrolled tribal membership or only to the resident population. Second, the population is constantly fluctuating, which makes prediction of the age distribution difficult. Also, immigration occurs by adoption and by birth. When such events are recorded, immigrants become part of the age distribution census which forms the basis for the age-specific mortality statistics. Adopted persons, however, may have been living on the

reservation prior to adoption, but would not have been counted in the Warm Springs census because they did not have enrollment status.

As stated earlier, only 80.7% of the enrolled population currently resides on the reservation. Enrolled tribal members who do not reside on the reservation, the emigrants, are presently included in the population distribution. If these emigrants die off the reservation, their deaths are not included in the mortality statistics. The mortality statistics may therefore be biased toward lower than actual death rates. Logically, if 20% of a particular age group were counted in the population base, but their deaths were not counted in the mortality rates, one would expect the age-specific mortality to be lower for that group than if the deaths for the 20% were counted in the death rates. This source of inaccuracy could be eliminated by using as a base only the population residing on the reservation, as stated. However, at the time of the study, residence data were not available, nor were mortality statistics for the non-resident population.

The mid-age groups (15-64) had the highest age-specific death rates and these groups had the highest percent of individuals living off of the reservation. In view of this, the mid-age groups' death rates may have actually been higher than the results showed.

Another concern is the small size of the Warm Springs population. Even when combining six years of Warm Springs data, the cumulative population was 15,573 and experienced only 107 deaths. With such small numbers, the impact of a multi-fatality accident or neonatal twin death can have a significant effect on a particular age-specific mortality rate, since a single individual can represent 10 or 20 percent of an entire age category. Warm Springs female infant mortality is an example of how age-specific mortality rates can be affected. The high age-specific mortality rates represent three deaths in a population of approximately 100. Life expectancy estimates are subsequently affected since life tables are derived by using the age-specfic mortality rates to obtain the probability of dying in a given age interval.

Since the statistical method used to calculate life expectancies assumed deaths to occur at the mid-point of an age interval, the Warm Springs life expectancy at birth could be higher than it would be if the actual age at death (in months) was used. Quite probably, more deaths occur in the first month of life than at age six months which the statistical method assumes.

The end of the life table is another area of possible error associated with using the mid-point of an age interval. One assumption of the method used to calculate the life tables was that all deaths will occur at or before the age of 98 years. Since the interval is 85 to 98 years, the formula assumes deaths to occur at 91.5 years which is the mid-point of the interval. Since the Warm Springs population has lower age-specific mortality rates at this end of the life spectrum, there are larger numbers of older ages to be added to the "total years lived" column in the life table. Although this may be an accurate account of life expectancy, it may also lead to a cumulative error.

For these reasons, the mortality rates and life expectancy estimates for the Warm Springs population are of questionable accuracy. However, if anything, they represent a underestimate of the actual age-specific death rates and therefore an overestimate of life expectancy at birth. The differences in the rates for Warm Springs may be even more deviant from the U.S. and U.S. Indian populations than already described.

CHAPTER IV

SUMMARY, CONCLUSIONS, and RECOMMENDATIONS

Summary

In summary, this study served to test a method for calculating life expectancy for a small population. Warm Springs crude death rates fall between the U.S. Indian/Alaskan Native and U.S. crude death rates for the total, the male, and the female populations. Male rates are higher than female rates in all three populations.

The Warm Springs population shows the highest infant mortality rates and age-specific death rates in the age intervals from 15-64. In the older age groups the Warm Springs death rates are lower than both the U.S. Indian and U.S. comparison groups. Life expectancy for the Warm Springs population (1980-82) lags behind the U.S. Indian population by 8.1 years and the U.S. population by 9.3 years.

During the process, it became clear that residency of the Warm Springs population was an important issue. The recommendations outlined will assist health care planners in obtaining the most accurate data for replication of the study. Once an accurate mortality pattern for the reservation is developed, it

can serve as the basis for planning and evaluating the effectiveness of health care programs. In addition, such data could be used for further research conducted by local health care planners. This effort, based on accurate, routinely collected population and mortality statistics, will help health care planners to identify additional areas where human and financial resources should be focused toward the goal of attaining the highest possible level of health for persons of every age.

Conclusions

This study was designed to provide baseline mortality and life expectancy data for the Warm Springs population. Because the age-specific mortality rates and life expectancies at birth for the Warm Springs population maybe misleading, they are of limited use. However, even these inaccurate results give an estimate of mortality in the Warm Springs population relative to other populations. In age groups where 90 percent of the population resides on the reservation, the health care provider can have more confidence that the results are accurate, compared with results of where only 70% of the age group resides locally. With this in mind, it appears

that Warm Springs is meeting its preventive health goals in certain age groups, namely early childhood (2 to 14 years) and late adulthood (75 to 98 years).

Recommendations

Given the results of the mortality rates and life expectancies for the Warm Springs population and the limitations which were outlined, the followong recommendations are made. First, accurate data must be used to calculate all mortality rates and life expectancy values. It is imperative that the population living off the reservation be eliminated from the census and age distribution prior to making the calculations. This will result in the most accurate account of mortality specific to the Warm Springs tribal members who live on the reservation. This is important because they will be recipients of health planning based on their mortality pattern.

Second, the impact of specific causes of death could be determined using cause-deletion life tables. Cause of death is determined for each person and the data should be available to the local statistician. This would give the Tribes additional information for health planning. In accordance with the epidemiological framework, cause-deletion life

table analysis would further specify at-risk age groups within the Warm Springs population. In addition, the results of the Warm Springs cause-deletion life tables could be compared with the Navajo cause-deletion life table results obtained by Carr and Lee (1978).

Third, the Allied Health Department on the reservation could take advantage of the Indian Health Service Research Program which funds studies that benefit the Native American population. The 1987-88 research efforts are aimed specifically at epidemiological studies and those studies pertaining to data management systems. This opportunity would allow the Warm Springs Allied Health Department to incorporate the recommendations from this study into their data mamagement system.

References

American Nurses' Association. (1980). Nursing: A social policy statement. Kansas City, MO: Author.

Brown, R. C., Gurunanjappa, B. S., Hawk, R. J., & Bitsuie, D.(1970). The epidemiology of accidents among the Navajo Indians. Public Health Reports, 85(10), 881-888.

Carr, B. A., & Lee, E. S. (1978). Navajo tribal mortality: A life table analysis of the leading causes of death. Social Biology, 25(4).

Clemen, S. A., Eigsti, D. G., & McGuire, S. L. (1981). Comprehensive family and community health nursing. New York: McGraw-Hill.

Constitution and By-Laws of the Confederated Tribes of the Warm Springs Reservation of Oregon (1938).

Dever, G. E. (1984). Epidemiology in health services management. Rockville, Maryland: Aspen Systems Corporation.

Fox, J.P., Hall, C.E., & Elveback, L.R. (1970). Epidemiology. New York: Macmillan Publishing Company.

Indian Health Service. (1984). American Indian and Alaskan Native life expectancy, 1979-81 and life expectancy for selected U.S. populations by race, 1980. Rockville, MD: Author.

Indian Health Service. (1985). American Indian deaths to residents of Warm Springs Service Unit, Portland Area, 1980-82. Rockville, MD: Author.

Jarvis, G. K., & Boldt, M. (1982). Death styles among Canada's Indians. Social Science Medicine, 16(14), 1345-1352.

Life Expectancy Increases for American Indians and Alaska Natives. (1984, September-October). Public Health Reports, p. 523.

Meenaghan, T. M., Washington, R. O., & Ryan, R. M. (1982). Macropractice in the human services. New York: The Free Press.

National Center for Health Statistics. (1975). Methodology of the national and state life tables for the United States: 1969-71, Vol. 1, No. 3 (DHEW Publication No. (HRA) 75-1150). Public Health Service, Rockville, MD: U.S. Government Printing Office.

National Center for Health Statistics. (1985). Vital Statistics of the U.S., 1980, Vol. II, Mortality, Part A (DHHS Publication No. (PHS) 85-1101). Public Health Service, Washington, DC: U.S. Government Printing Office.

National Center for Health Statistics. (1986). U.S. population, 1980. Hyattsville, MD: Author.

National Indian Health Board & American Indian Technical Services. (1984). Evaluation report. The Indian Health Services' implementation of the Indian self-determination process. (Publication No. 1984-461-166:4344). Washington, D. C.: U. S. Government Printing Office.

Omran, A. R., & Loughlin, B. (1972). An epidemiologic study of accidents among the Navajo Indians. Journal of the Egyptian Medical Association, 55(1), 1-22.

Oregon Center for Health Statistics. (1985). Oregon leading causes of mortality. Portland, OR: Oregon Department of Human Resources.

Potter, W. A. (1985). A study of unintentional injuries at the Warm Springs Indian health center-A direct outpatient care facility for the calendar year 1984.

Rimm, A. A., Hartz, A. J., Kalbfleisch, J. H., Anderson, A. J., & Hoffmann, R. G. (1980). Basic biostatistics in medicine and epidemiology. New York: Appleton-Century-Crofts.

Schmitt, N., Hole, L. W., & Barclay, W. S. (1966). Accidental deaths among British Columbia Indians. Canadian Medical Association Journal, 94(5), 228-234.

Warm Springs Data Processing Department. (1986). [Percent population by age group residing on Warm Springs Reservation]. Unpublished raw data.

Warm Springs Reservation Comprehensive Plan. (1983). Corvallis, OR: CH2M Hill.

Westermeyer, J., & Brantner, J. (1972). Violent death and alcohol use among the Chippewa in Minnesota. Minnesota Medicine, 55(8), 749-752.

Young, T. K. (1983). Mortality pattern of isolated Indians in northwestern Ontario: A 10 year review. Public Health Reports, 98(5), 467-475.

Appendix A

Letter to Obtain Consent for Study

June 2, 1986

Mr. Sylvester Sahme, Director
Allied Health and Social Services, Health Planner
P.O. Box C
Warm Springs, OR 97761

Dear Sal:

Enclosed is a copy of the most recent work related to the life expectancy study. Revisions have been made as outlined in the committee meeting of May 9. Please note that the appendices have been expanded to include the specific data which are necessary to obtain from the Warm Springs Vital Statistics office. A copy of Appendix C will be provided to the Vital Statistics office as well. Anonymity of individual persons is guaranteed.

At this time, I would like to formally request your assistance in securing the approval of the Tribal Council for the project. My address and the address of my thesis advisor are also enclosed.

Thank you for your assistance.
Sincerely,

Victorie Heart

Victorie Heart, R.N., B.S.N.
Graduate student, Community Health Care Systems
School of Nursing
Oregon Health Sciences University

Home:
707 S.W. Campus Drive, #609
Portland, OR 97201

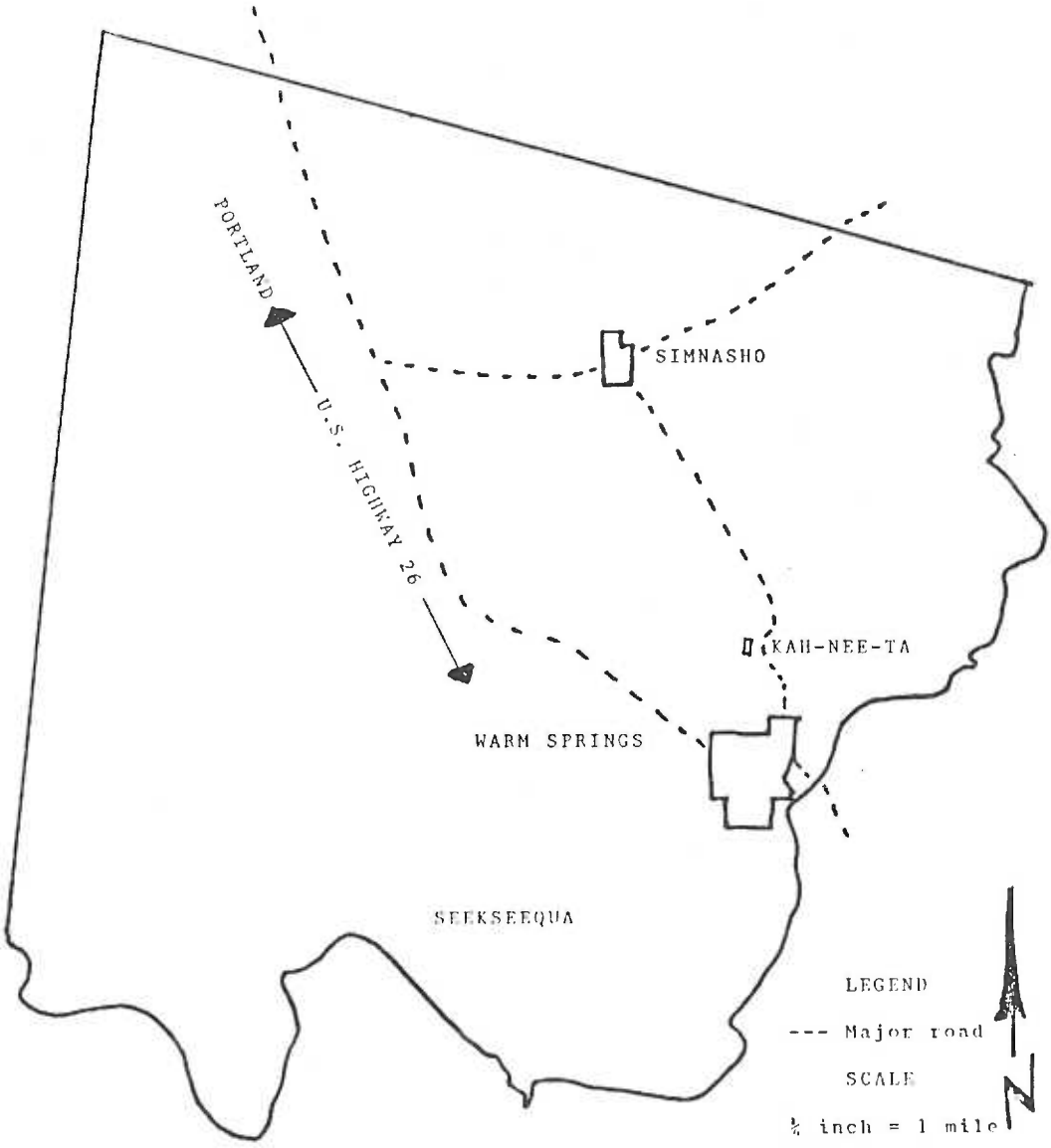
503-224-2357

Advisor:
Patricia K. Patterson, R.N., M.A.
Assistant Professor of Community Health Care Systems
School of Nursing
Oregon Health Sciences University
3191 Mackenzie Hall
3181 S.W. Sam Jackson Park Road
Portland, OR 97201

503-225-7709

Appendix B

Warm Springs Indian Reservation



WARM SPRINGS INDIAN RESERVATION

Appendix C

Oregon Death Certificate

56

STATE OF OREGON
HEALTH DIVISION DEPARTMENT OF HUMAN RESOURCES
Vital Statistics Section

CERTIFICATE OF DEATH

Local File Number | State File Number

TYPE OR PRINT IN PERMANENT BLACK INK FOR INSTRUCTIONS SEE HANDBOOK

DECEDENT

IF DEATH OCCURRED IN INSTITUTION, SEE HANDBOOK REGARDING COMPLETION OF RESIDENCE ITEMS

1 DECEASED—NAME (FIRST, MIDDLE, LAST)

2 DATE OF DEATH (MONTH, DAY, YEAR)

3 RACE (WHITE, BLACK, AMERICAN INDIAN, ETC.) (SPECIFY)

4 SEX

5A AGE—LAST BIRTHDAY (YEARS)

5B UNDER 1 YEAR — MOS. / DAYS

5C UNDER 1 DAY — HOURS / MIN.

6 DATE OF BIRTH (MONTH, DAY, YEAR)

7A COUNTY OF DEATH

7B CITY, TOWN, OR LOCATION OF DEATH

7C HOSPITAL OR OTHER INSTITUTION—NAME (IF NOT IN EITHER, GIVE STREET & NO.)

7D IF HOSP. OR INST., INDICATE DOA, OP/EMER, RM., INPATIENT (SPECIFY)

8 STATE OF BIRTH (IF NOT IN U.S.A., NAME COUNTRY)

9 CITIZEN OF WHAT COUNTRY

10 MARRIED, NEVER MARRIED, WIDOWED, DIVORCED (SPECIFY)

11 SPOUSE (IF MARRIED, WIDOWED)

12 WAS DECEDENT EVER IN U.S. ARMED FORCES? (SPECIFY YES OR NO)

13 SOCIAL SECURITY NUMBER

14A USUAL OCCUPATION (GIVE KIND OF WORK DONE DURING MOST OF WORKING LIFE, EVEN IF RETIRED)

14B KIND OF BUSINESS OR INDUSTRY

15A RESIDENCE—STATE

15B COUNTY

15C CITY, TOWN, OR LOCATION

15D STREET AND NUMBER OR R.F.D.

15E INSIDE CITY LIMITS (SPECIFY YES OR NO)

16 FATHER—NAME (FIRST, MIDDLE, LAST)

17 MOTHER—MAIDEN NAME (FIRST, MIDDLE, LAST)

18 INFORMANT—NAME AND RELATIONSHIP TO DECEASED

DISPOSITION

19A BURIAL, CREMATION, REMOVAL, MAUS, (SPECIFY)

19B CEMETERY OR CREMATORY—NAME

19C LOCATION (CITY OR TOWN, STATE)

20A FUNERAL SERVICE LICENSEE OR PERSON ACTING AS SUCH—SIGNATURE

20B NAME AND ADDRESS OF FACILITY

CERTIFIER

MEDICAL EXAMINER

CERTIFICATION — MEDICAL EXAMINER

I CERTIFY THAT I MADE INQUIRY INTO THE DEATH OF THE DECEASED PERSON DESCRIBED ABOVE, AND IN MY OPINION DEATH RESULTED ON OR ABOUT

21A DEATH OCCURRED (HOUR)

21B THE DECEDENT WAS PRONOUNCED DEAD (MONTH, DAY, YEAR, HOUR)

21C FROM: NATURAL CAUSES ☐ ACCIDENT ☐ SUICIDE ☐ HOMICIDE ☐ UNDETERMINED ☐ PENDING ☐

21D CERTIFIER — SIGNATURE

21E NAME—(TYPE OR PRINT) DEGREE OR TITLE

21F MEDICAL EXAMINER FOR: COUNTY

21G DATE SIGNED (MONTH, DAY, YEAR)

22A DATE RECEIVED BY REGISTRAR (MO., DAY, YR.)

22B REGISTRAR (SIGNATURE)

CAUSE OF DEATH

CONDITIONS IF ANY WHICH GAVE RISE TO IMMEDIATE CAUSE STATING THE UNDERLYING CAUSE LAST

23 IMMEDIATE CAUSE (ENTER ONLY ONE CAUSE PER LINE FOR (A.), (B.) AND (C.)) — INTERVAL BETWEEN ONSET AND DEATH

PART I (A)

DUE TO, OR AS A CONSEQUENCE OF: — INTERVAL BETWEEN ONSET AND DEATH

(B)

DUE TO, OR AS A CONSEQUENCE OF: — INTERVAL BETWEEN ONSET AND DEATH

(C)

PART II OTHER SIGNIFICANT CONDITIONS — CONDITIONS CONTRIBUTING TO DEATH BUT NOT RELATED TO CAUSE GIVEN IN PART I (A) — AUTOPSY (SPECIFY YES OR NO) 24

25A DATE OF INJURY (MONTH, DAY, YEAR)

25B HOUR

25C HOW INJURY OCCURRED (ENTER NATURE OF INJURY IN PART I OR PART II, ITEM 23)

25D INJ. AT WORK (SPECIFY YES OR NO)

25E PLACE OF INJURY AT HOME, FARM, STREET, FACTORY, OFFICE BLDG., ETC. (SPECIFY)

25F LOCATION (STREET OR R.F.D. NO., CITY OR TOWN, COUNTY, STATE)

RESERVED FOR REGISTRAR'S USE

ORIGINAL-VITAL STATISTICS COPY

VS-107 REV. 1-78

Appendix D

Letter to Chief, Vital Events Staff

Indian Health Service

June 28, 1986

Mr. Aaron Handler, Chief
Vital Events Staff, IHS
5600 Fishers Lane, Room 6A-30
Rockville, MD 20857

Dear Mr. Handler:

I am a graduate nursing student at the Oregon Health Sciences University in Portland. My master's thesis research involves comparing selected mortality statistics and life expectancy between the Warm Springs Indians of Oregon, U.S. Indians, and the Nation.
Enclosed is a list of data which I need in order to calculate the comparison rates for the U.S. Indian population. I would appreciate your assistance in acccessing these data.

Thank you.
Sincerely,

Victorie Heart
35 Sumpter Stage
Baker, OR 97814

Appendix E

Mortality and Population Data

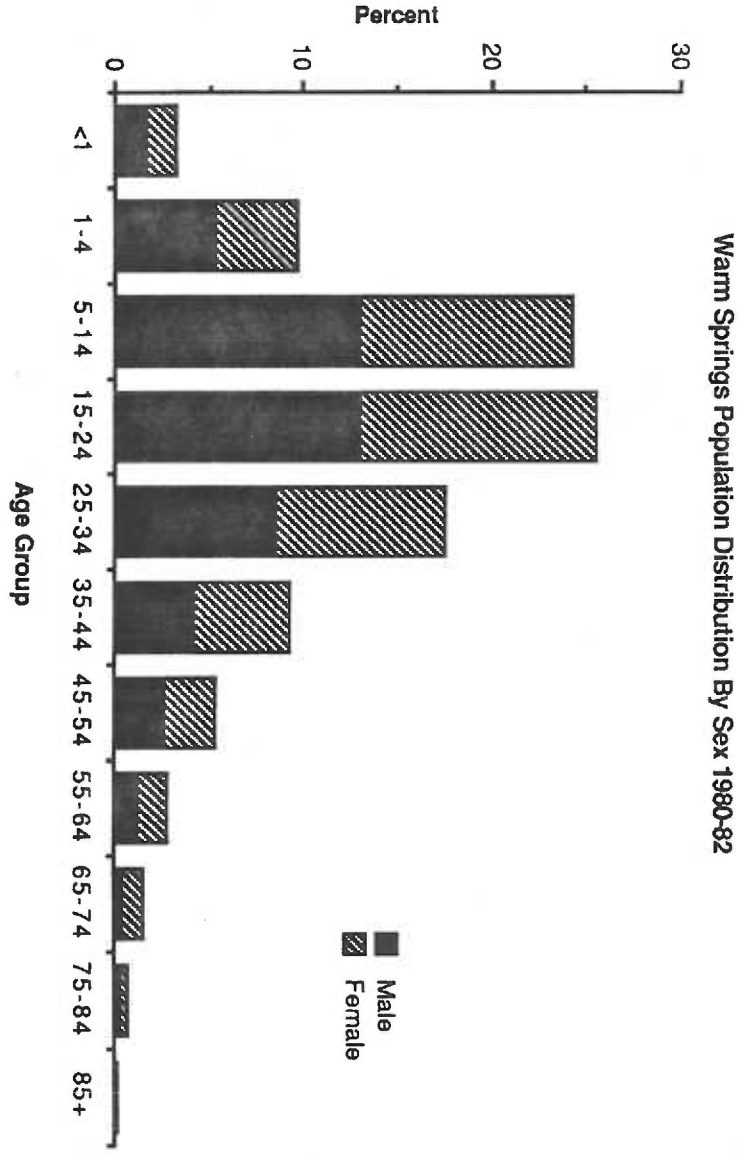
WARM SPRINGS DEATHS, 1980-85

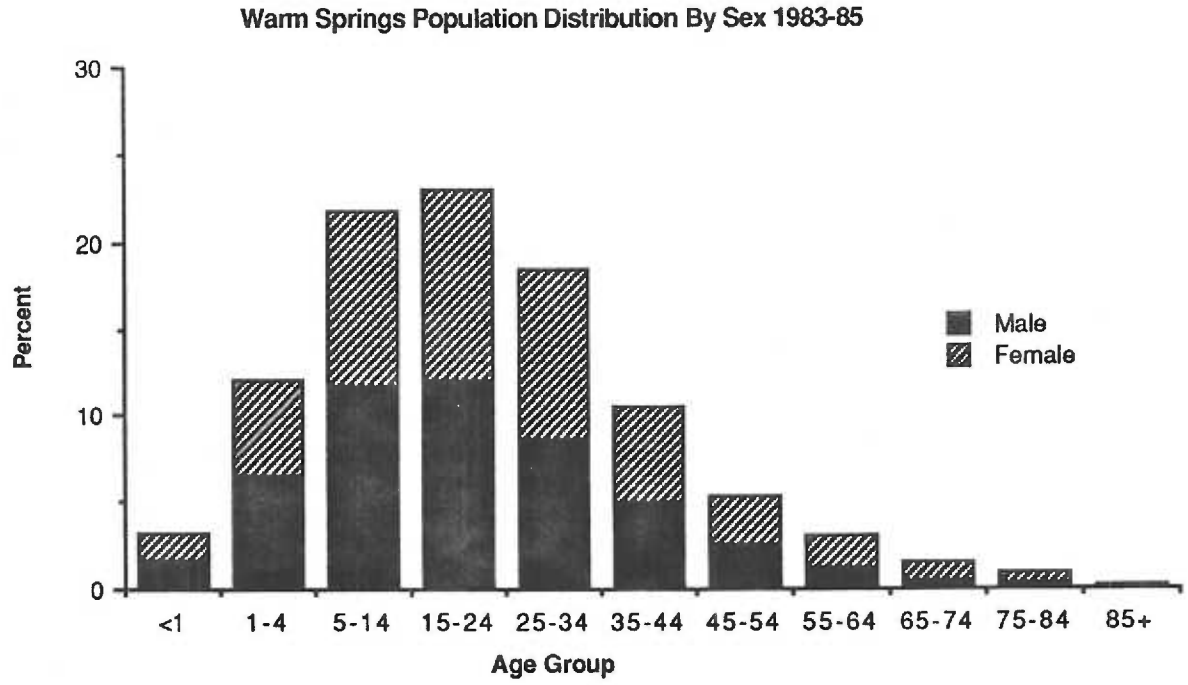
Of 100,000 born

AGE	1980	M	F	1981	M	F	1982	M	F	1983	M	F	1984	M	F	1985	M	F
<1	3	1	2	1	0	1	0	0	0	0	0	0	2	0	2	3	2	1
1-4	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
5-14	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
15-24	2	0	2	3	2	1	3	1	2	5	4	1	3	1	2	5	5	0
25-34	0	0	0	3	0	3	7	6	1	3	3	0	5	3	2	3	2	1
35-44	2	1	1	4	4	0	5	4	1	1	1	0	0	0	0	2	0	2
45-54	1	1	0	2	1	1	1	0	1	5	4	1	2	1	1	1	1	0
55-64	2	1	1	2	1	1	1	1	0	3	2	1	3	2	1	0	0	0
65-74	1	0	1	1	1	0	0	0	0	3	1	2	2	2	0	1	1	0
75-84	1	1	0	0	0	0	0	0	0	1	0	1	2	0	2	0	0	0
85+	1	1	0	0	0	0	1	0	1	1	0	1	2	0	2	0	0	0
TOTAL	13	6	7	17	9	8	19	13	6	22	15	7	21	9	12	15	11	4

WARM SPRINGS POPULATION DISTRIBUTION
BY AGE AND SEX, 1980-85

	BOTH SEXES						MALE						FEMALE					
AGE	1980	1981	1982	1983	1984	1985 *	1980	1981	1982	1983	1984	1985 *	1980	1981	1982	1983	1984	1985
<1	62	90	84	87	96	79	37	48	45	49	50	42	25	42	39	38	46	37
1-4	231	231	258	300	322	357	123	126	143	166	178	192	108	105	115	134	144	165
5-14	607	607	595	578	590	596	325	327	321	310	320	323	282	280	274	268	270	273
15-24	619	639	649	639	626	599	318	328	328	330	325	318	301	311	321	309	301	281
25-34	430	430	448	474	501	524	210	211	218	223	235	244	220	219	230	251	266	280
35-44	207	231	248	265	278	307	94	107	116	127	134	152	113	124	132	138	144	155
45-54	124	132	144	140	144	151	59	65	74	71	73	72	65	67	70	69	71	79
55-64	70	69	74	78	82	90	31	29	33	33	32	36	39	40	41	45	50	54
65-74	38	42	37	44	42	42	11	10	9	13	11	13	27	32	28	31	31	29
75-84	11	16	24	25	21	23	3	7	8	9	8	8	8	9	16	16	13	15
85+	3	3	3	4	6	7	0	0	0	0	1	1	3	3	3	4	5	6
TOTAL	2402	2490	2564	2634	2708	2775	1211	1258	1295	1331	1367	1401	1191	1232	1269	1303	1341	1374


Warm Springs Population Distribution By Sex 1980-82
Percent
0
10
20
30
Male
Female
<1
1-4
5-14
15-24
25-34
35-44
45-54
55-64
65-74
75-84
85+
Age Group

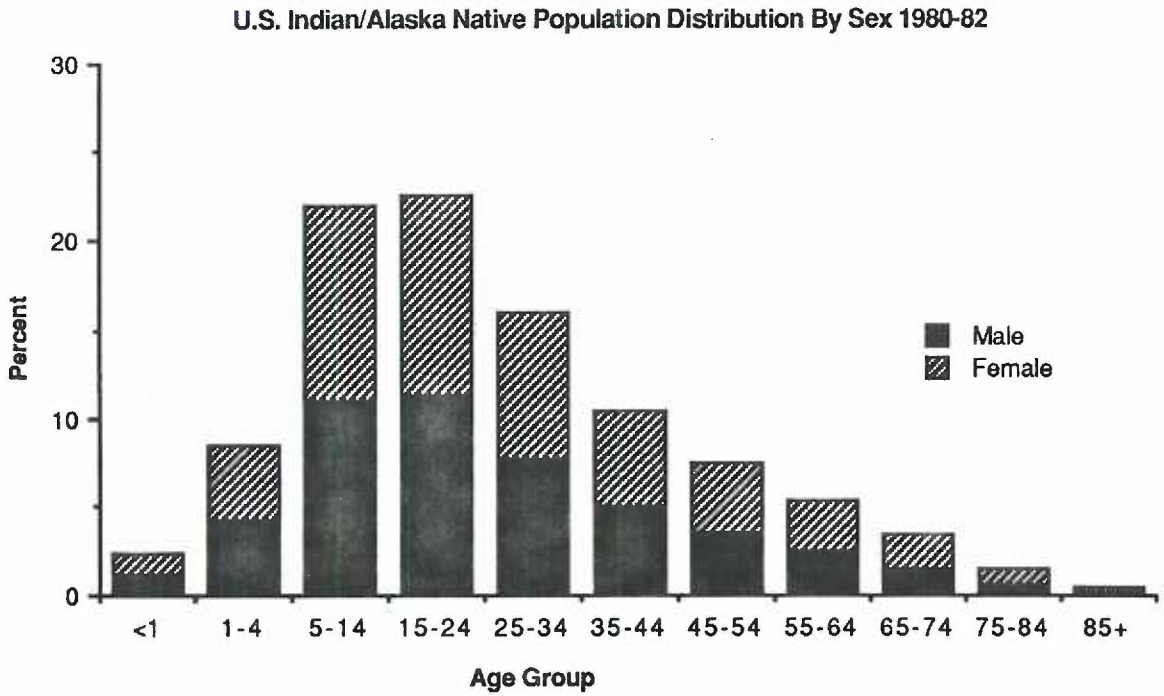

Warm Springs Population Distribution By Sex 1983-85
30
20
10
0
Percent
Male
Female
<1
1-4
5-14
15-24
25-34
35-44
45-54
55-64
65-74
75-84
85+
Age Group

U.S. INDIAN/ALASKA NATIVE DEATHS, 1980-82

AGE	1980	M	F	1981	M	F	1982	M	F
<1	465	254	211	411	224	187	399	229	170
1-4	97	48	49	104	64	40	99	53	46
5-14	115	67	48	111	76	35	72	52	20
15-24	621	483	138	592	433	159	572	426	146
25-34	603	400	203	592	419	173	573	406	167
35-44	607	394	213	569	379	190	488	325	163
45-54	698	435	263	684	418	266	721	452	269
55-64	873	549	324	861	550	311	934	545	389
65-74	1066	610	456	1013	597	416	1037	573	464
75-84	874	480	394	843	443	400	901	466	435
85+	566	280	286	512	230	282	562	253	309
Age unknown	6	4	2	6	5	1	8	6	2
TOTAL	6591	4004	2587	6298	3838	2460	6366	3786	2580

U.S. INDIAN/ALASKA NATIVE POPULATION
DISTRIBUTION BY AGE AND SEX, 1980-82

AGE	1980	M	F	1981	M	F	1982	M	F
<1	29715	15086	14629	30375	15428	14947	31067	15780	15287
1-4	105524	53454	52070	107846	54627	53219	110305	55872	54433
5-14	271763	137519	134244	277759	140553	137206	284093	143758	140335
15-24	297201	139744	139457	285328	142810	142518	291836	146067	145769
25-34	198306	96805	101501	202684	98933	103751	207305	101189	106116
35-44	129855	62803	67052	132720	64186	68534	135744	65648	70096
45-54	93414	44768	48646	95485	45765	49720	97663	46809	50854
55-64	67504	31890	35614	68990	32606	36384	70563	33350	37213
65-74	41980	18953	23027	42901	19371	23530	43877	19812	24065
75-84	17976	7849	10127	18382	8025	10357	18800	8207	10593
85+	5146	2051	3095	5261	2092	3169	5381	2139	3242
TOTAL	1240384	610922	629462	1267731	624396	643335	1296634	638631	658003


U.S. Indian/Alaska Native Population Distribution By Sex 1980-82
30
20
10
0
Percent
Male
Female
<1
1-4
5-14
15-24
25-34
35-44
45-54
55-64
65-74
75-84
85+
Age Group

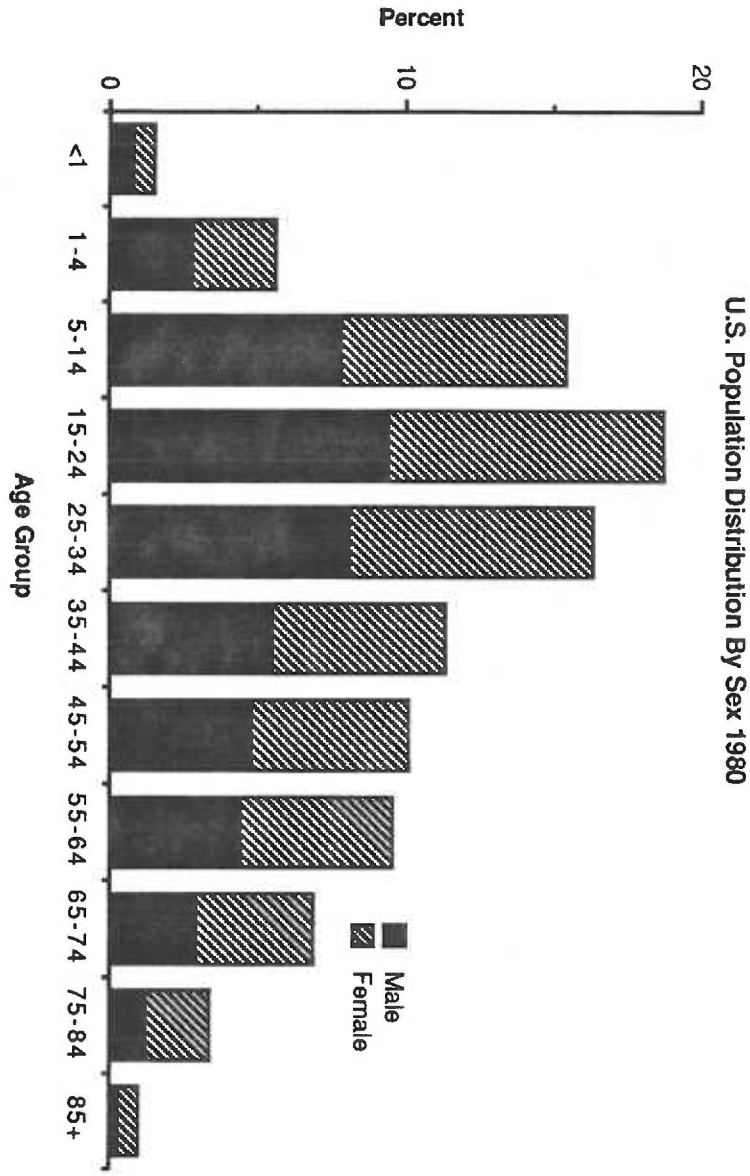
U.S. DEATHS, 1980

(Death rates per 100,000 population in specified groups)

AGE	1980	M	F
<1	1288.3	1428.5	1141.7
1-4	63.9	72.6	54.7
5-14	30.6	36.7	24.2
15-24	115.4	172.3	57.5
25-34	135.5	196.1	75.9
35-44	227.9	299.2	159.3
45-54	584.0	767.3	412.9
55-64	1346.3	1815.1	934.3
65-74	2994.9	4105.2	2144.7
75-84	6692.6	8816.7	5440.1
85+	15980.3	18801.1	14746.9
TOTAL	878.3	976.9	785.3

U. S. POPULATION
DISTRIBUTION BY AGE AND SEX, 1980

AGE	BOTH SEXES	MALE	FEMALE
<1	3533692	1806338	1727354
1-4	12814562	6555671	6258891
5-14	34942085	17855301	17086784
15-24	42486828	21418640	21068188
25-34	37081839	18381903	18699936
35-44	25634710	12569719	13064991
45-54	22799787	11008919	11790868
55-64	21702875	10151755	11551120
65-74	15580605	6756502	8824103
75-84	7728755	2866888	4861867
85+	2240067	681525	1558542
TOTAL	226545805	110053161	116492644


U.S. Population Distribution By Sex 1980
Percent
0
10
20
<1
1-4
5-14
15-24
25-34
35-44
45-54
55-64
65-74
75-84
85+
Age Group
Male
Female

Appendix F

Life Tables

LIFE TABLE - WARM SPRINGS TOTAL, 1980-82

Age Interval	Proportion dying	Of 100,000 born Number alive	Number dying	Years lived in Interval	Total years lived	Life Expectancy (in years)
(x to xi+1)	(qi)	(li)	(di)	(Li)	(Ti)	(ei=Ti/li)
0-1	0.01695	100000	1695	99153	6448253	64.5
1-5	.00556	98305	547	392126	6349100	64.6
5-10	0	97758	0	488790	5956974	60.9
10-15	.00549	97758	537	487448	5468184	55.9
15-20	.01618	97221	1573	482173	4980736	51.2
20-25	.02551	95648	2440	472140	4498563	47.0
25-30	.03516	93208	3277	457848	4026423	43.2
30-35	.04188	89931	3766	440240	3568575	39.7
35-40	.06188	86165	5332	417495	3128335	36.3
40-45	.10638	80833	8599	382668	2710840	33.5
45-50	.04464	72234	3225	353108	2328172	32.2
50-55	.05682	69009	3921	335243	1975064	28.6
55-60	.08065	65088	5249	312318	1639821	25.2
60-65	.16854	59839	10085	273983	1327503	22.2
65-70	.07353	49754	3658	239625	1053520	21.2
70-75	.10204	46096	4704	218720	813895	17.7
75-80	.15151	41392	6271	191283	595175	14.4
80-85	0	35121	0	175605	403892	11.5
85+	1.00000	35121	35121	228287	228287	6.5

LIFE TABLE - WARM SPRINGS MALE, 1980-82

Age Interval	Proportion dying	Of 100,000 born Number alive	Number dying	Years lived in Interval	Total years lived	Life Expectancy (in years)
(x to xi+1)	(qi)	(li)	(di)	(Li)	(Ti)	(ei=Ti/li)
0-1	0.00769	100000	769	99616	5847458	58.5
1-5	.01020	99231	1012	394900	5747842	57.9
5-10	0	98219	0	491095	5352942	54.5
10-15	0	98219	0	491095	4861847	49.5
15-20	0	98219	0	491095	4370752	44.5
20-25	.03119	98219	3063	483438	3879657	39.5
25-30	.07246	95156	6895	458543	3396219	35.7
30-35	.01701	88261	1501	437553	2937676	33.3
35-40	.12887	86760	11181	405848	2500123	28.8
40-45	.16260	75579	12289	347173	2094275	27.7
45-50	.04167	63290	2637	309858	1747102	27.6
50-55	.06410	60653	3888	293545	1437244	23.7
55-60	.10204	56765	5792	269345	1143699	20.1
60-65	.22727	50973	11585	225903	874354	17.2
65-70	.27778	39388	10941	169588	648451	16.5
70-75	0	28447	0	142235	478863	16.8
75-80	.33333	28447	9482	118530	336628	11.8
80-85	0	18965	0	94825	218098	11.5
85+	1.00000	18965	18965	123273	123273	6.5

LIFE TABLE - WARM SPRINGS FEMALE, 1980-82

Age Interval	Proportion dying	Of 100,000 born Number alive	Number dying	Years lived in Interval	Total years lived	Life Expectancy (in years)
(x to xi+1)	(qi)	(li)	(di)	(Li)	(Ti)	(ei=Ti/li)
0-1	0.02830	100000	2830	98585	6962873	69.6
1-5	0	97170	0	388680	6864288	70.6
5-10	0	97170	0	485850	6475608	66.6
10-15	.01168	97170	1135	483013	5989758	61.6
15-20	.03456	96035	3319	471878	5506745	57.3
20-25	.02004	92716	1858	458935	5034867	54.3
25-30	0	90858	0	454290	4575932	50.4
30-35	.06601	90858	5998	439295	4121642	45.4
35-40	0	84860	0	424300	3682347	43.4
40-45	.06289	84860	5337	410958	3258047	38.4
45-50	.04808	79523	3823	388058	2847089	35.8
50-55	.05102	75700	3862	368845	2459031	32.5
55-60	.06667	71838	4789	347218	2090186	29.1
60-65	.11111	67049	7450	316620	1742968	26.0
65-70	0	59599	0	297995	1426348	23.9
70-75	.13514	59599	8054	277860	1128353	18.9
75-80	0	51545	0	257725	850493	16.5
80-85	0	51545	0	257725	592768	11.5
85+	1.00000	51545	51545	335043	335043	6.5

LIFE TABLE - WARM SPRINGS TOTAL, 1983-85

Age Interval	Proportion dying	Of 100,000 born Number alive	Number dying	Years lived in Interval	Total years lived	Life expectancy (in years)
(xi to xi+1)	(qi)	(li)	(di)	(Li)	(Ti)	(ei=Ti/li)
0-1	0.01908	100000	1908	99046	6183494	61.8
1-5	0	98092	0	392368	6084448	62.0
5-10	0	98092	0	490460	5692080	58.0
10-15	0	98092	0	490460	5201620	53.0
15-20	.04420	98092	4336	479620	4711160	48.0
20-25	.02607	93756	2444	462670	4231540	45.1
25-30	.04819	91312	4400	445560	3768870	41.3
30-35	.02242	86912	1949	429688	3323310	38.2
35-40	.00923	84963	784	422855	2893622	34.1
40-45	.03247	84179	2733	414063	2470767	29.4
45-50	.07905	81446	6438	391135	2056704	25.3
50-55	.10989	75008	8243	354433	1665569	22.2
55-60	.06410	66765	4280	323125	1311136	19.6
60-65	.21277	62485	13295	279188	988011	15.8
65-70	.18072	49190	8890	223725	708823	14.4
70-75	.33333	40300	13433	167918	485098	12.0
75-80	.20000	26867	5373	120903	317180	11.8
80-85	.26316	21494	5656	93330	196277	9.1
85+	1.00000	15838	15838	102947	102947	6.5

LIFE TABLE - WARM SPRINGS MALE, 1983-85

Age Interval	Proportion dying	Of 100,000 born Number alive	Number dying	Years lived in Interval	Total years lived	Life expectancy (in years)
(xi to xi+1)	(qi)	(li)	(di)	(Li)	(Ti)	(ei=Ti/li)
0-1	0.01418	100000	1418	99291	5435485	54.4
1-5	0	98582	0	394328	5336194	54.1
5-10	0	98582	0	492910	4941866	50.1
10-15	0	98582	0	492910	4448956	45.1
15-20	.07495	98582	7389	474438	3956046	40.1
20-25	.02964	91193	2703	449208	3481608	38.2
25-30	.07463	88490	6604	425940	3032400	34.3
30-35	.03333	81886	2729	402608	2606460	31.8
35-40	0	79157	0	395785	2203852	27.8
40-45	.03937	79157	3116	387995	1808067	22.8
45-50	.07813	76041	5941	365353	1420072	18.7
50-55	.22727	70100	15932	310670	1054719	15.0
55-60	.08333	54168	4514	259555	744049	13.7
60-65	.36585	49654	18166	202855	484494	9.8
65-70	.55556	31488	17493	113708	281639	8.9
70-75	.50000	13995	6998	52480	167931	12.0
75-80	0	6997	0	34985	115451	16.5
80-85	0	6997	0	34985	80466	11.5
85+	1.00000	6997	6997	45481	45481	6.5

LIFE TABLE - WARM SPRINGS FEMALE, 1983-85

Age Interval	Proportion dying	Of 100,000 born Number alive	Number dying	Years lived in Interval	Total years lived	Life expectancy (in years)
(x to xi+1)	(qi)	(li)	(di)	(Li)	(Ti)	(ei=Ti/li)
0-1	0.02479	100000	2479	98761	6897380	69.0
1-5	0	97521	0	390084	6798619	69.7
5-10	0	97521	0	487605	6408535	65.7
10-15	0	97521	0	487605	5920930	60.7
15-20	.01142	97521	1114	484820	5433325	55.7
20-25	.02208	96407	2129	476713	4948505	51.3
25-30	.02336	94278	2202	465885	4471792	47.4
30-35	.01355	92076	1248	457260	4005907	43.5
35-40	.01953	90828	1774	449705	3548647	39.1
40-45	.02762	89054	2460	439120	3098942	34.8
45-50	.08000	86594	6928	415650	2659822	30.7
50-55	0	79666	0	398330	2244172	28.2
55-60	.05208	79666	4149	377585	1845842	23.2
60-65	.09434	75517	7124	359775	1468357	19.4
65-70	0	68393	0	341965	1108482	16.2
70-75	.28571	68393	19541	293113	766517	11.2
75-80	.33333	48852	16284	203550	473404	9.7
80-85	.35714	32568	11631	133763	269854	8.3
85+	1.00000	20937	20937	136091	136091	6.5

LIFE TABLE - U.S. INDIAN TOTAL, 1979-81

Age Interval	Proportion dying	Of 100,000 Number alive	Number dying	born lived in Interval	Years years lived	Total Life expectancy (in years)
(x to xi+1)	(qi)	(li)	(di)	(Li)	(Ti)	(ei=Ti/li)
0-1	0.01411	100000	1411	99295	7260292	72.6
1-5	.00416	98589	410	393536	7160997	72.6
5-10	.00210	98179	206	490380	6767461	68.9
10-15	.00210	97973	206	489350	6277081	64.1
15-20	.00851	97767	832	486755	5787731	59.2
20-25	.01422	96935	1378	481230	5300976	54.7
25-30	.01507	95557	1440	474185	4819746	50.4
30-35	.01557	94117	1465	466923	4345561	46.2
35-40	.01963	92652	1819	458713	3878638	41.9
40-45	.02630	90833	2389	448193	3419925	37.7
45-50	.03193	88444	2824	435160	2971732	33.6
50-55	.04183	85620	3581	419148	2536572	29.6
55-60	.05441	82039	4464	399035	2117424	25.8
60-65	.07832	77575	6076	372685	1718389	22.2
65-70	.10661	71499	7623	338438	1345704	18.8
70-75	.13231	63876	8451	298253	1007266	15.8
75-80	.16102	55425	8925	254813	709013	12.8
80-85	.19427	46500	8950	210125	454200	9.8
85+	1.00000	37550	37550	244075	244075	6.5

LIFE TABLE - U.S. INDIAN MALE, 1979-81

Age Interval	Proportion dying	Of 100,000 born Number alive	Number dying	Years lived in Interval	Total years lived	Life expectancy (in years)
(x to xi+1)	(qi)	(li)	(di)	(Li)	(Ti)	(ei=Ti/li)
0-1	0.01522	100000	1522	99239	6819734	68.2
1-5	.00448	98478	441	393030	6720495	68.2
5-10	.00250	98037	245	489573	6327465	64.5
10-15	.00280	97792	274	488275	5837892	59.7
15-20	.01276	97518	1244	484480	5349617	54.9
20-25	.02204	96274	2122	476065	4865137	50.5
25-30	.02229	94152	2099	465513	4389072	46.6
31-35	.02164	92053	1992	455285	3923559	42.6
35-40	.02736	90061	2464	444145	3468274	38.5
40-45	.03514	87597	3078	430290	3024129	34.5
45-50	.04198	84519	3548	413725	2593839	30.7
50-55	.05381	80971	4357	393963	2180114	26.9
55-60	.07519	76614	5760	368670	1786151	23.3
60-65	.10313	70853	7307	335998	1417481	20.0
65-70	.13571	63546	8624	296170	1081483	17.0
70-75	.17099	54922	9391	251133	785313	14.3
75-80	.21100	45531	9607	203638	534180	11.7
80-85	.25543	35924	9176	156680	330542	9.2
85+	1.00000	26748	26748	173862	173862	6.5

LIFE TABLE - U.S. INDIAN FEMALE, 1979-81

Age Interval (x to xi+1)	Proportion dying (qi)	Of 100,000 born Number alive (li)	Number dying (di)	Years lived in Interval (Li)	Total years lived (Ti)	Life expectancy (in years) (ei=Ti/li)
0-1	0.01295	100000	1295	99353	7706786	77.1
1-5	.00384	98705	379	394062	7607433	77.1
5-10	.00170	98326	167	491213	7213371	73.4
10-15	.00140	98159	137	490453	6722158	68.5
15-20	.00425	98022	417	489068	6231705	63.6
20-25	.00655	97605	639	486428	5742637	58.8
25-30	.00821	96966	796	482840	5256209	54.2
30-35	.00981	96170	943	478493	4773369	49.6
35-40	.01236	95227	1177	473193	4294876	45.1
40-45	.01813	94050	1705	465988	3821683	40.6
45-50	.02274	92345	2100	456475	3355695	36.3
50-55	.03072	90245	2772	444295	2899230	32.1
55-60	.03565	87473	3118	429570	2454925	28.1
60-65	.05638	84355	4756	409885	2025355	24.0
65-70	.08236	79599	6556	381605	1615470	20.3
70-75	.10292	73043	7518	346420	1233865	16.9
75-80	.12604	65525	8259	306978	887445	13.5
80-85	.15152	57266	8677	264638	580467	10.1
85+	1.00000	48589	48589	315829	315829	6.5

LIFE TABLE - U.S. TOTAL, 1980

Age Interval	Proportion dying	Of 100,000 born Number alive	Number dying	Years lived in Interval	Total years lived	Life expectancy (in years)
(x to xi+1)	(qi	(li)	(di)	(Li)	(Ti)	(ei=Ti/li)
0-1	0.0127	100000	1266	99367	7384279	73.8
1-5	.0025	98734	250	394436	7284912	73.8
5-10	.0015	98484	150	492045	6890476	70.0
10-15	.0015	98334	152	491290	6398431	65.1
15-20	.0049	98182	482	489705	5907141	60.2
20-25	.0066	97700	648	486880	5417436	55.4
25-30	.0066	97052	638	483665	4930556	50.8
30-35	.0070	96414	672	480390	4446891	46.1
35-40	.0091	95742	875	476523	3966501	41.4
40-45	.0139	94867	1321	471033	3489978	36.8
45-50	.0222	93546	2079	462533	3018945	32.3
50-55	.0351	91467	3209	449313	2556412	27.9
55-60	.0530	88258	4676	429350	2107099	23.9
60-65	.0794	83582	6638	401315	1677749	20.1
65-70	.1165	76944	8965	362308	1276434	16.6
70-75	.1694	67979	11517	311103	914126	13.4
15-80	.2427	56462	13702	248055	603023	10.7
80-85	.3554	42760	15197	175808	354968	8.3
85+	1.0000	27563	27563	179160	179160	6.5

LIFE TABLE - U.S. MALE, 1980

Age Interval	Proportion dying	Of 100,000 born Number alive	Number dying	Years lived in Interval	Total years lived	Life expectancy (in years)
(x to xi+1)	(qi)	(li)	(di)	(Li)	(Ti)	(e=Ti/li)
0-1	0.0140	100000	1400	99300	7019568	70.2
1-5	.0029	98600	283	393834	6920268	70.2
5-10	.0018	98317	173	491153	6526434	66.4
10-15	.0019	98144	188	490250	6035281	61.5
15-20	.0071	97956	695	488043	5545031	56.6
20-25	.0101	97261	986	483840	5056988	52.0
25-30	.0098	96275	939	479028	4573148	47.5
30-35	.0098	95336	932	474350	4094120	42.9
35-40	.0122	94404	1149	469148	3619770	38.3
40-45	.0180	93255	1681	462073	3150622	33.8
45-50	.0288	91574	2640	451270	2688549	29.4
50-55	.0462	88934	4110	434395	2237279	35.2
55-60	.0707	84824	5997	409128	1802884	21.3
60-65	.1061	78827	8365	373223	1393756	17.7
65-70	.1571	70462	11068	324640	1020533	14.5
70-75	.2259	59394	13420	263420	695893	11.7
75-80	.3149	45974	14476	193680	432473	9.4
80-85	.4354	31498	13715	123203	238793	7.6
85+	1.0000	17783	17783	115590	115590	6.5

LIFE TABLE - U.S. FEMALE, 1980

Age Interval	Proportion dying	Of 100,000 born Number alive	Number dying	Years lived in Interval	Total years lived	Life expectancy (in years)
(x to xi+1)	(qi)	(li)	(di)	(Li)	(Ti)	(ei=Ti/li)
0-1	0.0113	100000	1126	99437	7747833	77.5
1-5	.0022	98874	215	395006	7648396	77.4
5-10	.0013	98659	126	492980	7253330	73.5
10-15	.0011	98533	113	492383	6760350	68.6
15-20	.0027	98420	261	491448	6267967	63.7
20-25	.0031	98159	305	490033	5776519	58.8
25-30	.0034	97854	334	488435	5286486	54.0
30-35	.0042	97520	412	486570	4798051	49.2
35-40	.0062	97108	601	484038	4311481	44.4
40-45	.0100	96507	963	480128	3827443	39.7
45-50	.0160	95544	1524	473910	3347315	35.0
50-55	.0247	94020	2322	464295	2873405	30.6
55-60	.0369	91698	3381	450038	2409110	26.3
60-65	.0558	88317	4931	429258	1959072	22.2
65-70	.0828	83386	6902	399675	1529814	18.3
70-75	.1261	76484	9643	358313	1130139	14.8
75-80	.1937	66841	12950	301830	771826	11.5
80-85	.3088	53891	16639	227858	469996	8.7
85+	1.0000	37252	37252	242138	242138	6.5

Abstract

The aim of this study was to determine base-line mortality and life expectancy values for a single Native American population for the purpose of health planning. The Warm Springs Indians of Oregon (1980-82 and 1983-85) were compared with the U.S. Indian/Alaska Native population (1980-82) and the U.S. population (1980). Crude and age-specific death rates which describe the mortality patterns of the three populations were compared. Life tables were constucted for the total, the male, and the female groups in each population. Warm Springs crude death rates fall between the U.S. Indian and U.S. crude death rates. Male mortality rates are higher than female rates in all three populations. The Warm Springs population shows the highest infant mortality rates and age-specific death rates in the age intervals from 15-64. In the older age groups the Warm Springs death rates are lower than both of the national comparison groups. Life expectancy for the Warm Springs population (1980-82) lags behind the U.S. Indian population by 8.1 years and the U.S. population by 9.3 years.