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Alaska Native Mortality, 1979–1998

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SYNOPSIS

Objectives. This study compares mortality patterns for the Alaska Native population and the U.S. white population for 1989–1998 and examines trends for the 20-year period 1979–1998.

Methods. The authors used death certificate data and Indian Health Service population estimates to calculate mortality rates for the Alaska Native population, age-adjusted to the U.S. 1940 standard million. Data on population and mortality for U.S. whites, aggregated by 10-year age groups and by gender, were obtained from the National Center for Health Statistics, and U.S. white mortality rates were age-adjusted to the U.S. 1940 standard million.

Results. Overall, 1989–1998 Alaska Native mortality rates were 60% higher than those for the U.S. white population for the same period. There were significant disparities for eight of 10 leading causes of death, particularly unintentional injury, suicide, and homicide/legal intervention. Although declines in injury rates can be documented for the period 1979–1998, large disparities still exist. Alaska Native death rates for cancer, cerebrovascular disease, chronic obstructive pulmonary disease, and diabetes increased from 1979 to 1998. Given decreases in some cause-specific mortality rates in the U.S. white population, increased rates among Alaska Natives have resulted in new disparities.

Conclusions. These data indicate that improvements in injury mortality rates are offset by marked increases in chronic disease deaths.

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The 1954 Parran report,¹ commissioned by the U.S. Department of Interior, was the first official report to describe the health status of Native Americans in Alaska. This report documented that infectious disease (45.8% of deaths from all causes) was the number one cause of death for Alaska Natives. It found, for example, that in 1946, 43% of all Alaska Native deaths were due to tuberculosis. Infant mortality was greater than 10%, and life expectancy for an Alaska Native in 1950 was 46 years.¹ In response to this report, the U.S. Public Health Service was dispatched to Alaska to provide health care services to Alaska Natives. Tuberculosis and other infectious disease control programs were instituted, and death and disease rates began to fall.

In the early 1990s, the State of Alaska Section of Epidemiology initiated a study of causes of death among Alaska Natives during the preceding decade, 1980–1989. This study found that the proportion of deaths from infections had fallen to only 1.3%, whereas injury deaths accounted for nearly one in every three deaths.² Injury prevention efforts were subsequently prioritized by both the state Department of Health and Social Services and regional Native health organizations.

It has now been more than a decade since a comprehensive investigation of mortality rates for Alaska Natives has been conducted. This article examines mortality patterns among Alaska Natives during the period 1989 to 1998, compared to U.S. white mortality rates for the same period. In addition, trends in mortality rates are examined for the 20-year period 1979–1998.

METHODS

“Alaska Native” is the term used collectively for people whose ancestors occupied, before European contact, the area that is now the state of Alaska. For the years 1989 through 1998, the average annual population of Alaska Natives numbered 91,300. Among Alaskans enumerated as “American Indian, Eskimo, or Aleut” in the 1990 Census, 51.1% were counted as Eskimo, 37.4% as American Indian, and 11.5% as Aleut.³ Although cultural, linguistic, and genetic diversity separate the three major native ethnic groups in the state, these groups are usually combined for analyses concerning Alaska Natives.

The State of Alaska Bureau of Vital Statistics maintains a database of the information recorded on death certificates of resident Alaskans. To calculate current death rates, we abstracted information from this database on Alaska Natives who died in the years 1989 to 1998. For information on trends over time, we re-

viewed deaths from 1979 to 1998. A person was counted as an Alaska Native if the race code indicated Alaska Native, Eskimo, Aleut, Indian, Canadian Eskimo or Indian, or a mixture of Alaska Native groups. Although there is often concern about under-reporting of minority groups, a recent study estimates that under-reporting of Alaska Natives on death certificates is low (5%).⁴ A check of the data file showed that race codes were missing from only 0.3% of all death records.

For current estimates, we calculated mean annual mortality rates for Alaska Natives using data on deaths during the 10-year time period 1989–1998 and Alaska Native population data for this 10-year period. We obtained estimates of the Alaska Native population from the Indian Health Service (IHS). IHS projects intercensal annual total population numbers based on births and deaths. These estimates are greater than the U.S. Census estimates for Alaska Natives and, therefore, result in more conservative estimates of rates. Age and sex distributions from the 1990 Census for the total Alaska Native population were applied to projected intercensal population totals to determine denominators for each year by age and sex. We calculated rates only for those causes that were associated with at least five deaths during the interval studied.

We compared Alaska Native mortality rates for 1989–1998 to mortality rates for the U.S. white population for the same period since the purpose of the study was to assess health disparities from a national perspective. The U.S. white population was chosen since it is frequently used as a reference population.

Data on population and mortality for U.S. whites, aggregated by 10-year age groups and by gender from the National Center for Health Statistics (NCHS), were obtained from the CDC Wonder website (<http://wonder.cdc.gov>). We age-adjusted Alaska Native and U.S. white mortality rates by the direct method to the 1940 standard million, and calculated confidence intervals around the age-adjusted Alaska Native rates.⁵ We considered Alaska Native rates significantly different from those for the white population when the 95% confidence interval did not include the U.S. white rate. We used rate ratios to show the magnitude of differences between Alaska Native and U.S. white rates. Mortality rates for Alaska whites were compared to mortality rates for U.S. whites for the leading causes of death to explore whether rates for the Alaska white population were similar to those of the Alaska Native population.

We calculated mortality rates for the 10 leading causes of death among Alaska Natives from among a list of 72 major causes of death as defined by NCHS.

For the most recent 10 years, 1989–1998, we com-

pared age-specific rates for Alaska Natives with age-specific U.S. white rates. Infant mortality rates were not disaggregated for this report. Infant mortality among Alaska Natives has been addressed in recent studies.^{6,7}

We calculated excess deaths by multiplying the age-specific death rates for U.S. whites by the Alaska Native population for each age group to determine the expected number of deaths. The difference between the expected and the observed number of Alaska Native deaths was considered excess.

We analyzed changes in mortality rates over a 20-year period for Alaska Natives by comparing average annual age-adjusted death rates for four five-year periods: 1979–1983, 1984–1988, 1989–1993, and 1994–1998. We used a chi-square test for trend to determine any significant changes in mortality rates over the 20-year period studied. Trends were considered significant at $p < 0.05$. We calculated the percent change in rates over the 20-year period by comparing rates for the last five-year period with rates for the first five-year period.

RESULTS

Overall mortality

In 1989–1998, 5,946 Alaska Natives of all ages died. Age-adjusted mortality from all causes for Alaska Natives was 779.8 per 100,000 population, compared with 476.6 per 100,000 population for U.S. whites, with a statistically significant rate ratio of 1.6. The rate for Alaska Native males was 1.6 times as high as that for U.S. white males, and the Alaska Native female death rate was 1.8 times that of U.S. white females. If Alaska Natives had died at the same rate as U.S. whites during the period studied, only 3,888 Alaska Natives would have died; thus, we calculated an excess of 2,058 deaths for Alaska Natives. Sixty-four percent of these excess deaths were to Alaska Native men. Sixty-one percent of all excess deaths occurred to Alaska Natives younger than 45 years of age.

Table 1 compares the top 10 causes of death for Alaska Natives to causes of death for U.S. whites during the period 1989 to 1998. The two racial groups shared nine of the 10 leading causes of death, although in different rank order. HIV infection replaced homicide in the top 10 for U.S. whites. Mortality rates for Alaska Natives for both sexes combined were significantly higher than those for U.S. whites for all leading causes except heart disease and diabetes mellitus. Alaska Native men demonstrated significantly higher rates than U.S. white men for all of the leading causes of death except heart disease, cerebrovascular disease, and diabetes mellitus. Alaska Native women

had significantly higher mortality rates than U.S. white women for the 10 leading causes of death except heart disease and diabetes mellitus.

Age-specific mortality patterns

In Table 2, age-specific deaths for all causes combined show excess mortality among Alaska Natives as compared to U.S. whites for all age categories. Disparities between the two populations, however, begin to decrease after age 45. For the oldest age category, ≥ 75 years, the rate ratio was only 1.1. Among those younger than age 45 years, Alaska Natives were approximately three times as likely to die as U.S. whites.

Trends over time

As shown in Table 3, the all-cause mortality rate for Alaska Natives declined a significant 20% from the five-year period 1979–1983 to the five-year period 1994–1998. Mortality decreased 22% for Alaska Native men and 17% for Alaska Native women. Mortality rates were 14% lower in 1996 as compared to 1981 for U.S. whites, 18% lower for U.S. white men, and 10% lower for U.S. white women.

Death by cause

Cancer: Cancer was the leading cause of death among all Alaska Natives for the time period 1989 to 1998. Cancer was the number one cause of death for Alaska Native women and the third cause for Alaska Native men. Cancer accounted for 18.3% of all deaths in this population. The cancer mortality rate of Alaska Natives, men and women combined, was 1.3 times that of U.S. whites. Alaska Native women experienced 1.3 times the rate of U.S. white women, and Alaska Native men had 1.2 times the mortality rate from cancer of U.S. white men. There were 205 excess cancer deaths among Alaska Natives, comprising 10% of all excess deaths. For Alaska Natives, men and women combined, all age groups 25 years and older had significantly higher cancer mortality rates, with ratios ranging from 1.2 to 1.4 times those of U.S. whites. There were no significant differences in cancer mortality rates between Alaska Natives and U.S. whites for age groups younger than 25 years.

Age-adjusted cancer mortality rates increased significantly by 12% among Alaska Natives over the time period 1979 to 1998. U.S. whites experienced a 3% decrease in cancer mortality rates from 1981 to 1996.

Unintentional injury. Alaska Native men and women combined died from unintentional injuries at 3.9 times the rate of U.S. whites in 1989–1998. Unintentional injuries accounted for 37% of excess deaths among

Table 1. Rank order of 10 leading causes of death for Alaska Native population and U.S. white population, 1989–1998

Cause of death (ICD-9 code)	Male and female combined					Male					Female				
	Alaska Native rate ^a	95% CI	U.S. white rate ^a	RR	Alaska Native excess deaths	Alaska Native rate ^a	95% CI	U.S. white rate ^a	RR	Alaska Native excess deaths	Alaska Native rate ^a	95% CI	U.S. white rate ^a	RR	Alaska Native excess deaths
Cancer (140–208)	163.7	149.7, 177.7	127.7	1.3 ^b	205	181.7	166.7, 196.7	153.5	1.2 ^b	80	145.7	132.9, 158.5	108.9	1.3 ^b	125
Unintentional injuries (E800-E949)	118.6	108.0, 129.2	30.3	3.9 ^b	756	176.7	163.8, 189.6	43.6	4.1 ^b	572	60.4	52.9, 67.9	17.3	3.5 ^b	184
Heart disease (390–398, 402, 404–429)	143.4	130.5, 156.3	136.4	1.1	–116	191.2	175.9, 206.5	184.9	1.0	–31	95.5	85.5, 105.5	96.8	1.0	–86
Suicide (E950–E959)	49.7	43.0, 56.4	11.8	4.2 ^b	348	82.4	73.9, 90.9	19.4	4.2 ^b	291	17.1	13.2, 21.0	4.6	3.7 ^b	56
Cerebrovascular disease (430–438)	36.4	29.9, 42.9	24.6	1.5 ^b	102	31.7	25.6, 37.8	26.5	1.2	32	41.2	34.7, 47.7	22.9	1.8 ^b	70
Chronic obstructive pulmonary disease (490–496)	34.4	28.2, 40.6	21.1	1.6 ^b	93	42.2	35.0, 49.4	27.0	1.6 ^b	51	26.5	21.1, 31.9	17.2	1.5 ^b	43
Pneumonia/ influenza (480–487)	23.7	18.7, 28.7	12.6	1.9 ^b	57	28.2	22.6, 33.8	16.1	1.8 ^b	32	19.1	14.7, 23.5	10.2	1.9 ^b	25
Homicide (E960–E978)	18.0	13.9, 22.1	5.5	3.3 ^b	105	24.8	20.1, 29.5	8.2	3.0 ^b	70	11.2	8.0, 14.4	2.7	4.1 ^b	35
Chronic liver disease (571)	19.6	15.0, 24.2	7.6	2.6 ^b	88	20.5	15.6, 25.4	10.9	1.9 ^b	29	18.8	14.4, 23.2	4.6	4.1 ^b	59
Diabetes mellitus (250)	12.5	8.6, 16.4	11.2	1.1	10	12.9	8.9, 16.9	12.5	1.0	5	12.1	8.5, 15.7	10.1	1.2	5
All other causes	159.8	151.2, 168.4	87.8	1.8 ^b	411	179	165.9, 192.1	109.7	1.6 ^b	178	201.5	185.5, 217.5	68.8	2.9 ^b	233
All causes	779.8	750.9, 808.7	476.6	1.6 ^b	2,058	971.3	938.5, 1,004.1	612.3	1.6 ^b	1,308	649.1	624.5, 673.7	364.1	1.8 ^b	750

^aRate per 100,000 population, age-adjusted to 1940 standard million

^b95% CI does not include U.S. white rate

CI = confidence interval

RR = rate ratio

Table 2. Age-specific mortality rates: Alaska Native population, 1989–1998, and U.S. white population, 1993

Age category	Male and female combined						Male			Female		
	Alaska Native rate ^a	95% CI	RR	U.S. white rate ^a	Alaska Native rate ^a	95% CI	RR	U.S. white rate ^a	Alaska Native rate ^a	95% CI	RR	U.S. white rate ^a
1–4 years												
Unintentional injury	63.5	48.1, 78.9	4.5 ^b	14.1	80.9	56.4, 105.4	4.8 ^b	16.7	45.6	27.0, 64.2	4.0 ^b	11.4
All other causes	38.1	26.1, 50.1	2.5 ^b	22.8	36.6	20.1, 53.1	1.5	24.2	43.6	—	2.0	21.3
Total	110.4	90.0, 130.7	3.0 ^b	36.9	131	99.9, 162.1	3.2 ^b	40.9	89.2	63.1, 115.2	2.7 ^b	32.7
5–14 years												
Unintentional injury	31.2	23.5, 38.9	3.6 ^b	8.8	38.9	26.8, 50.9	3.5 ^b	11.2	23.2	13.7, 32.7	3.7 ^b	6.3
Suicide	5	1.9, 8.0	5.6 ^b	0.9	5.8	1.2, 10.5	4.8	1.2	—	—	—	0.4
Homicide and legal intervention	3	0.6, 5.3	2.6	1.0	—	—	—	1.1	—	—	—	0.8
Cancer	2.5	0.3, 4.6	0.8	2.9	—	—	—	3.3	—	—	—	2.6
All other causes	16.3	10.8, 21.9	2.0 ^b	7.1	16.5	8.7, 24.4	2.1 ^b	7.8	15.1	7.5, 22.8	2.3 ^b	6.6
Total	57.4	47.0, 67.9	2.7 ^b	20.7	69	53.0, 85.1	2.8 ^b	24.6	45.4	32.1, 58.7	2.7 ^b	16.7
15–24 years												
Suicide	125.1	107.8, 142.4	9.0 ^b	13.3	208.9	177.6, 240.2	9.4 ^b	22.2	38	24.4, 51.7	9.5 ^b	4.0
Unintentional injury	107	91.0, 123.0	2.7 ^b	41.3	164.9	137.1, 192.8	2.7 ^b	60.0	46.9	31.8, 62.0	2.2 ^b	21.5
Homicide and legal intervention	20.5	13.5, 27.5	1.9 ^b	9.7	29.3	17.6, 41.1	1.9 ^b	15.2	11.4	4.0, 18.9	3.0 ^b	3.8
Cancer	5.6	1.9, 9.3	1.2	4.7	7.3	1.5, 13.2	1.3	5.6	—	—	—	3.9
Cerebrovascular disease	3.1	0.4, 5.8	5.7	0.5	—	—	—	0.5	—	—	—	0.4
All other causes	19.3	12.5, 26.1	1.3	14.3	20.8	10.9, 30.6	1.2	17.5	16.5	7.5, 25.5	1.5	11.0
Total	280	254.1, 305.9	3.3 ^b	83.8	434.9	389.7, 480.1	3.6 ^b	121.0	119.2	95.1, 143.3	2.7 ^b	44.6
25–44 years												
Unintentional injury	166.6	151.6, 181.6	5.2 ^b	32.1	258	231.6, 284.3	5.3 ^b	49.1	74.7	60.5, 89.0	5.0 ^b	14.9
Suicide	72.4	62.5, 82.3	4.5 ^b	16.0	120.6	102.6, 138.6	4.7 ^b	25.5	24	15.9, 32.0	3.7 ^b	6.5
Cancer	36.2	29.2, 43.2	1.4 ^b	25.2	30.1	21.1, 39.2	1.3	23.1	42.3	31.6, 53.0	1.5 ^b	27.3
Homicide and legal intervention	31.3	24.8, 37.8	3.8 ^b	7.7	43.5	32.6, 54.3	3.8 ^b	11.6	19	11.9, 26.2	5.1 ^b	3.7
Chronic liver disease	23.9	18.2, 29.6	4.9 ^b	4.8	15.4	9.0, 21.9	2.2 ^b	7.0	32.4	23.1, 41.8	13.0 ^b	2.5
Heart disease	21.4	16.1, 26.8	1.3	16.9	25.9	17.6, 34.3	1.0	25.3	16.9	10.2, 23.7	2.0 ^b	8.4
Cerebrovascular disease	8.4	5.1, 11.8	2.7 ^b	3.1	7.7	3.2, 12.3	2.3	3.3	9.2	4.2, 14.1	3.2 ^b	2.9
Pneumonia and influenza	6.3	3.4, 9.3	2.9 ^b	2.0	6.3	2.2, 10.4	2.5	2.5	6.3	2.2, 10.5	4.2 ^b	1.5
Diabetes mellitus	1.8	0.2, 3.3	0.7	2.5	—	—	—	3.0	—	—	—	2.0
All other causes	69.6	59.9, 79.3	1.6 ^b	44.2	82	67.2, 96.9	1.2 ^b	66.5	56.4	44.0, 68.8	2.6 ^b	21.7
Total	438	413.7, 462.3	2.7 ^b	154.5	591.7	551.8, 631.6	2.7 ^b	216.9	283.4	255.7, 311.1	3.1 ^b	91.4

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Table 2 (continued). Age-specific mortality rates: Alaska Native population, 1989–1998, and U.S. white population, 1993

Age category	Male and female combined					Male				Female			
	Alaska Native rate ^a	95% CI	RR	U.S. white rate ^a		Alaska Native rate ^a	95% CI	RR	U.S. white rate ^a	Alaska Native rate ^a	95% CI	RR	U.S. white rate ^a
45–54 years													
Cancer	174.9	144, 205.9	1.3 ^b	138.0		183.7	139.0, 228.3	1.3 ^b	138.0	166.1	123.4, 208.9	1.2	137.9
Heart disease	140.8	113.1, 168.5	1.4 ^b	101.4		211.9	164.0, 259.9	1.3 ^b	157.2	68.7	41.2, 96.2	1.5	47.1
Unintentional injury	140.8	113.1, 168.5	5.4 ^b	27.7		206.3	158.9, 253.6	5.0 ^b	41.0	74.5	45.8, 103.1	5.0 ^b	14.8
Chronic liver disease	34.1	20.5, 47.8	2.3 ^b	15.8		39.6	18.8, 60.3	1.7	23.8	28.6	10.9, 46.4	3.6 ^b	8.0
Cerebrovascular disease	25.6	13.8, 37.4	1.9 ^b	13.7		19.8	5.1, 34.4	1.3	15.0	31.5	12.9, 50.1	2.5 ^b	12.5
Pneumonia and influenza	24.2	12.7, 35.7	4.4 ^b	5.5		25.4	8.8, 42.0	3.8 ^b	6.7	22.9	7.0, 38.8	5.5 ^b	4.2
Homicide and legal intervention	15.6	6.4, 24.9	3.1 ^b	4.7		17	3.4, 30.5	2.4	7.1	14.3	1.8, 26.9	6.0	2.4
Suicide	14.2	5.4, 23.0	0.9	16.1		22.6	6.9, 38.3	0.9	24.6	—	—	—	7.8
Diabetes mellitus	10	2.6, 17.3	1	10.2		—	—	—	12.0	—	—	—	8.4
Chronic obstructive pulmonary disease	8.5	1.7, 15.4	1	8.2		14.1	1.7, 26.5	1.7	8.4	—	—	—	8.1
All other causes	149.3	120.8, 177.9	2.2 ^b	68.1		178	134.1, 222.0	1.9 ^b	92.8	120.3	83.9, 156.7	2.7 ^b	44.0
Total	738.2	674.7, 801.7	1.8 ^b	409.4		929.6	829.2, 1,030.1	1.8 ^b	526.6	544.1	466.8, 621.5	1.8 ^b	295.2
55–64 years													
Cancer	523.4	459.3, 587.6	1.2 ^b	412.7		534.5	442.3, 626.8	1.1	473.5	512.7	423.5, 601.8	1.4 ^b	356.7
Heart disease	308.7	259.5, 358.0	1	314.7		443.4	359.4, 527.4	1.0	463.9	177.6	125.1, 230.1	1.0	177.3
Unintentional injury	137	104.2	4.7 ^b	30.5		203	146.2, 259.9	4.7 ^b	43.4	72.7	39.1, 106.2	3.9 ^b	18.6
Chronic obstructive pulmonary disease	87.9	169.8	1.7 ^b	49.6		111.9	69.7, 154.1	2.0 ^b	55.5	64.6	32.9, 96.2	1.5	44.2
Cerebrovascular disease	73.6	61.6, 114.2	1.9 ^b	38.7		45.6	18.6, 72.5	1.0	44.1	100.9	61.4, 140.5	3.0 ^b	33.8
Chronic liver disease	69.5	49.6, 97.7	2.6 ^b	26.1		91.2	53.1, 129.3	2.4 ^b	37.7	48.4	21.0, 75.8	3.1 ^b	15.4
Pneumonia and influenza	34.8	18.2, 51.3	2.2 ^b	15.6		58	27.6, 88.4	3.0 ^b	19.5	—	—	—	12.0
Diabetes mellitus	30.7	15.1, 46.2	1	30.5		41.4	15.8, 67.1	1.2	33.7	20.2	2.5, 37.9	0.7	27.6
Suicide	26.6	12.1, 41.0	1.7	15.5		41.4	15.8, 67.1	1.6	25.2	—	—	—	6.7
Homicide and legal intervention	14.3	3.7, 24.9	4.1 ^b	3.4		24.9	5.0, 44.8	4.8	5.2	—	—	—	1.7
All other causes	284.2	237.0, 331.5	2.2 ^b	131.9		327.3	255.2, 399.5	2.0 ^b	164.6	242.2	180.9, 303.5	1.0	231.9
Total	1,590.8	1,479.0, 1,702.6	1.5 ^b	1,069.2		1,922.6	1,747.7, 2,097.5	1.4 ^b	1,366.3	1,267.5	1,127.3, 1,407.7	1.6 ^b	795.7

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Table 2 (continued). Age-specific mortality rates: Alaska Native population, 1989–1998, and U.S. white population, 1993

Age category	Male and female combined					Male				Female			
	Alaska Native rate ^a	95% CI	RR	U.S. white rate ^a		Alaska Native rate ^a	95% CI	RR	U.S. white rate ^a	Alaska Native rate ^a	95% CI	RR	U.S. white rate ^a
65–74 years													
Cancer	1,059	938.4, 1,179.6	1.2 ^b	854.2		1,286.6	1,093.2, 1,480.0	1.2 ^b	1,069.6	854.9	705.7, 1,004.2	1.3 ^b	681.0
Heart disease	837.2	729.9, 944.4	1	803.1		1,218.5	1,030.3, 1,406.7	1.1	1,125.1	495.3	381.7, 608.9	0.9	544.3
Chronic obstructive pulmonary disease	239.7	182.3, 297.1	1.4 ^b	167.3		272.5	183.5, 361.5	1.3	206.0	210.3	136.3, 284.4	1.5 ^b	136.1
Cerebrovascular disease	139.5	95.7, 183.3	1.1	126.6		174.1	102.9, 245.2	1.2	145.4	108.6	55.4, 161.8	1.0	111.5
Unintentional injury	125.2	83.7, 166.7	3.0 ^b	44.4		181.6	109.0, 254.3	3.0 ^b	59.7	74.6	30.5, 118.7	2.3	32.0
Diabetes mellitus	82.3	48.7, 115.9	1.1	73.0		75.7	28.8, 122.6	0.9	80.1	88.2	40.3, 136.2	1.3	67.2
Pneumonia and influenza	78.7	45.8, 111.6	1.4	55.2		83.3	34.1, 132.4	1.1	72.5	74.6	30.5, 118.7	1.8	41.2
Chronic liver disease	46.5	21.2, 71.8	1.4	33.2		68.1	23.6, 112.6	1.5	45.2	—	—	—	23.6
Suicide	17.9	2.2, 33.6	1	17.1		—	—	—	31.1	—	—	—	5.9
All other causes	644	549.9, 738.1	1.9 ^b	343.6		719	574.4, 863.6	1.7 ^b	424.4	576.7	454.1, 699.4	2.1 ^b	278.9
Total	3,270	3,058.0, 3,482.0	1.3 ^b	2,517.7		4,102	3,756.7, 4,447.4	1.3 ^b	3,259.1	2,524.1	2,267.6, 2,780.6	1.3 ^b	1,921.7
≥75 years													
Heart disease	2,579.9	2,334.0, 2,825.8	0.8 ^b	3,188.0		3,136.3	2,700.5, 3,516.4	0.9 ^b	3,537.5	2,147	1,848.0, 2,446.1	0.7 ^b	2,991.4
Cancer	1,787	1,582.4, 1,991.6	1.2 ^b	1,443.1		2,174.5	1,833.3, 2,515.8	1.1	1,984.5	1,485.6	1,236.8, 1,734.3	1.3 ^b	1,138.4
Cerebrovascular disease	896.6	751.6, 1,041.5	1.2 ^b	747.7		710.9	515.8, 906.0	1.0	697.2	1,041	832.7, 1,249.2	1.3 ^b	776.1
Chronic obstructive pulmonary disease	677	551.0, 802.9	1.7 ^b	379.7		878.2	661.3, 1,095.0	1.5 ^b	574.1	509.7	363.9, 655.4	1.7 ^b	298.5
Pneumonia and influenza	542.8	430.0, 655.6	1.2	442.0		641.2	455.9, 826.5	1.3	505.1	466.3	326.9, 605.6	1.1	406.7
Unintentional injury	237.9	163.2, 312.5	1.7 ^b	142.0		320.6	189.6, 451.6	1.8 ^b	176.7	173.5	88.5, 258.5	1.4	122.5
Diabetes mellitus	213.5	142.7, 284.2	1.3	172.8		195.1	92.9, 297.4	1.1	182.6	227.7	130.3, 325.1	1.4	167.3
All other causes	2,238.4	2,009.3, 2,467.4	1.4 ^b	1,638.7		2,369.7	2,013.4, 2,725.9	1.4 ^b	1,745.4	2,147	1,848.0, 2,422.9	1.4 ^b	1,550.4
Total	9,166.9	8,703.4, 9,630.3	1.1 ^b	8,154.0		10,441	9,692.8, 11,188.2	1.1 ^b	9,403.1	8,197.8	7,613.4, 8,782.2	1.1 ^b	7,451.3

NOTE: Rates not calculated for fewer than five deaths.

^aRate per 100,000 population

^b95% confidence interval does not include U.S. white rate

CI = confidence interval

RR = rate ratio

Alaska Natives. This was the second leading cause of death for the Alaska Native population as a whole. Unintentional injuries were the leading cause of death for Alaska Native men, accounting for slightly more than one in every five deaths. In contrast, only one in every 20 white men in the U.S. died from unintentional injuries. Among Alaska Native women, unintentional injuries were the third leading cause of death. One in every nine Alaska Native women died of this cause, compared with one in 37 U.S. white women.

Alaska Natives had significantly higher rates of mortality from unintentional injuries than U.S. whites for all age groups examined. Rate ratios ranged from a high of approximately 5.0 for each of the three age groups from 25 to 64 years of age to the lowest rate ratio of 1.7 for the ≥ 75 age group.

Unintentional injuries were responsible for the greatest number of excess deaths. Although the number of excess deaths remained large, there was a 43% decline in deaths of Alaska Natives from this cause during the time period 1979 to 1998, with a larger decline in men than in women. U.S. white rates declined 24% from 1981 to 1996.

Heart disease. Heart disease was the third leading cause of death among Alaska Natives, men and women combined, accounting for 16.5% of all deaths. This cause ranked second for Alaska Native men behind unintentional injuries, and second for Alaska Native women behind cancer. The Alaska Native and U.S. white populations did not differ in heart disease mortality rates for men and women combined, men, or women. However, there were differences by age groups. Mortality for Alaska Natives in the 25–44 age group was 1.3 times that of U.S. whites in the same age group, and the rate for Alaska Natives in the 45–54 age group was 1.5 times that of U.S. whites of the same age. There were no differences in mortality rates for the 55–64 and 65–74 age groups. Alaska Natives in the ≥ 75 age group had 0.8 times the heart disease mortality rates of U.S. whites.

There was no significant change in heart disease death rates for Alaska Natives in the 20-year period 1979–1998. It is important to note that heart disease death rates for U.S. whites decreased 32% during the same general time period.

Suicide. Suicide was the fourth leading cause of death among Alaska Natives, accounting for 7.5% of all deaths. Alaska Natives had a suicide rate 4.2 times that of U.S. whites. Suicide deaths accounted for 17% of all excess deaths among Alaska Natives. More than 80% of all suicides for both racial groups were among men; however, rate ratios for men and women were similar

to the rates for men and women combined. Alaska Natives in the age groups from 5 to 44 years had rate ratios 4.5 to 9.0 times those of U.S. whites. Rate ratios were not significantly higher starting at age 45.

There was no significant change in suicide death rates among Alaska Natives during the time period 1979–1998. Suicide rates for U.S. whites decreased 6% from 1981 to 1996.

Cerebrovascular disease. Cerebrovascular disease was the fifth leading cause of death among Alaska Native men and women combined. Approximately 4.5% of Alaska Natives died from this cause. Cerebrovascular disease was the seventh leading cause of death among Alaska Native men and the fourth among women. Overall, Alaska Natives had 1.5 times the mortality rate from cerebrovascular disease of U.S. whites. Cerebrovascular disease was responsible for 5% of all excess deaths among Alaska Natives. Although there was no difference in rates between Alaska Native men and U.S. white men, the rate for Alaska Native women was 1.8 times that of U.S. white women. An analysis of age-specific categories showed rate ratios ranging from 1.0 to 3.2 for all age groups starting at 25 years.

During the 20-year period 1979–1998, mortality from cerebrovascular disease increased 17% for Alaska Natives. In contrast, mortality from cerebrovascular disease among U.S. whites decreased by 31% from 1981 to 1996.

Chronic obstructive pulmonary disease. Chronic obstructive pulmonary disease (COPD) was the sixth leading cause of death among Alaska Native men and women combined. COPD ranked fifth for both Alaska Native men and women. Approximately 4% of Alaska Natives died from this cause. Alaska Natives had a 60% greater mortality rate than U.S. whites. Five percent of all excess deaths among Alaska Natives were caused by COPD. Alaska Natives had age-specific death rates 1.0 to 1.7 times those of U.S. whites for all ages categories 45 years and older. There were too few deaths from COPD among Alaska Natives younger than age 45 to calculate rates. Age-specific patterns were similar for Alaska Native men and women.

Mortality rates from COPD for Alaska Natives increased 191% over the period 1979–1998. U.S. white rates also increased, although by only 28%.

Pneumonia and influenza. Pneumonia and influenza ranked seventh among the 10 leading causes of death in Alaska Natives, accounting for 3.1% of all deaths. Alaska Natives had almost twice the pneumonia/influenza mortality of whites, as indicated by a mortality rate ratio of 1.9. Pneumonia and influenza ac-

Table 3. Age-adjusted mortality rates for leading causes of death among Alaska Natives for males and females combined: Alaska Native population, 1979–1998, and U.S. white population, 1981–1996

Cause of death (ICD-9 code)	Alaska Native ^a					U.S. white ^b				
	1979– 1983	1984– 1988	1989– 1993	1994– 1998	Percent change, 1979–1983 to 1994–1998	1981	1986	1991	1996	Percent change, 1981 to 1996
Cancer (140–208)	153.3	172.3	155.6	171.0	+12	128.6	131.0	131.3	125.2	–3
Cerebrovascular disease (430–438)	32.4	39.5	34.6	38.0	+17	35.7	28.9	24.7	24.5	–31
Chronic liver disease (571)	25.1	18.4	23.0	16.7	NS	10.5	8.6	7.8	7.3	–30
Chronic obstructive pulmonary disease (490–496)	12.8	25.8	31.2	37.2	+191	16.8	19.3	20.6	21.5	+28
Diabetes mellitus (250)	3.4	6.9	12.7	12.3	+262	8.9	8.6	10.5	12.0	+35
Heart disease (390–398, 402,404–429)	156.6	168.3	147.2	140.0	NS	191.4	171.0	143.1	129.8	–32
Homicide and legal intervention (E960–E978)	37.0	25.6	21.0	15.2	–60	6.6	5.7	6.2	4.9	–26
Pneumonia and influenza (480–487)	29.2	32.1	29.3	18.9	–35	11.6	13.0	12.8	12.2	+5
Suicide (E950–E959)	43.4	53.4	52.9	47.0	NS	12.3	12.8	12.1	11.6	–6
Unintentional injuries (E800–E949)	188.2	168.2	131.7	107.1	–43	39.3	34.6	30.3	29.9	–24
Total	944.8	890.4	804.7	757.9	–20	544.8	520.1	486.8	466.8	–14

^aRate per 100,000 population

^bChi-square test for trend significant at $p < 0.05$

NS = not significant

counted for 3% of all excess deaths. Excesses were similar for both Alaska Native men and women. Rates for age-specific groups ranged from 1.2 to 4.4 times those of U.S. whites. The greatest disparities were observed in the 25–64 age groups.

Deaths to Alaska Natives from pneumonia and influenza decreased 35% during the 20-year period 1979–1998. All of this decline occurred during the most recent five-year time period, 1994–1998. The decline appeared in all age groups. U.S. white rates increased by 5% over the 16-year period from 1981 to 1996.

Homicide and legal intervention. Homicide and legal intervention was the eighth leading cause of death among Alaska Natives. Approximately 3% of all Alaska Natives deaths were due to homicide or legal intervention. Alaska Natives died from homicide and legal intervention at a rate 3.3 times that of U.S. whites. Homicide/legal intervention accounted for 5% of excess deaths among Alaska Natives. Native men died from homicide or legal intervention 3.0 times as frequently as U.S. white men, whereas Native women were 4.1 times as likely to be murdered or die from legal intervention as U.S. white women. Disparities increased with age group, from a nonsignificant 2.6 rate ratio for the 5- to 14-year-olds to Alaska Natives having more than four times the white rate in the 55–64 age group. There were too few homicide deaths in the 1–4 age group as well as in age groups 65 and older to calculate rates.

Alaska Native deaths from homicide and legal intervention decreased a significant 60% over the 20-year period 1979–1998. U.S. white rates declined 26% from 1981 to 1996.

Chronic liver disease and cirrhosis. Chronic liver disease and cirrhosis ranked ninth out of the 10 leading causes of death among Alaska Natives, accounting for 2.4% of all deaths. Alaska Natives died from chronic liver disease 2.6 times as frequently as U.S. whites. Liver disease accounted for 4% of all excess deaths among Alaska Natives. A majority of this excess was among Alaska Native women, who died from liver disease 4.1 times as frequently as U.S. white women. The liver disease mortality rate for Alaska Native men was 1.9 times that of U.S. white men. In all age groups with sufficient numbers of deaths to calculate a rate, Alaska Native women had significantly higher rates than U.S. white women. In the 25–44 age group, Alaska Native women had a mortality rate nearly 13 times as high as that for U.S. white women. Eleven percent of all deaths of women in this age group were due to liver disease. Age-specific rate ratios ranged from 3.1 to 3.6 for the

45- to 64-year-old age groups. There were too few deaths from chronic liver disease among Alaska Native women to calculate rates for any other age groups.

There was no significant change in death rates from chronic liver disease among Alaska Natives during the 20-year period 1979–1998. Chronic liver disease deaths decreased 30% among U.S. whites during the same general time period.

Diabetes mellitus. Diabetes mellitus was the 10th leading cause of death among Alaska Natives, accounting for 1.4% of all deaths. There was no difference in death rates due to diabetes between Alaska Natives and U.S. whites. Alaska Native men and women had similar mortality rates. There were no significant differences in diabetes mortality between Alaska Natives and U.S. whites by either gender or age category.

Diabetes mortality rates among Alaska Natives were half the rate of U.S. whites during the time period 1979–1983. From 1979–1983 to 1994–1998, diabetes mortality for Alaska Natives increased by more than 250%, such that the Alaska Native diabetes mortality rate for 1994–1998 equaled the 1996 U.S. white rate. Diabetes mortality among U.S. whites increased approximately 35% during the period from 1981 to 1996.

Alaska white mortality rates

For all-cause mortality, we calculated a significant 0.9 rate ratio for Alaska white mortality as compared to U.S. white mortality (data not shown). Comparing the Alaska white population to the U.S. white population, we found significant rate ratios for unintentional injuries (1.1), suicide (1.2), homicide (0.9), cancer (0.9), and heart disease (0.8). The largest disparity between Alaska whites and U.S. whites was in the category pneumonia/influenza, in which Alaska whites had markedly lower mortality rates than U.S. whites (rate ratio 0.6). There were no other significant differences in mortality rates between the two populations.

DISCUSSION

The purpose of the study was to both identify and quantify disparities in health between Alaska Natives and a reference population. We examined mortality among Alaska Natives for a 10-year period, 1989–1998, and trends over time, from 1979 to 1998. We compared age-adjusted rates by sex and age group for all causes of death and for each of the 10 leading Alaska Native causes to U.S. white rates. We used both rate ratios and excess deaths to quantify the differences between Alaska Natives and U.S. whites. The data reveal marked disparities in death rates between Alaska

Natives and U.S. whites for eight of the 10 leading causes.

For 1989–1998, the average annual age-adjusted Alaska Native mortality rate for all causes was more than 60% higher than the comparable U.S. white rate. The two groups shared nine of the 10 leading causes of death, although in different rank order. For the 10 leading causes of death in Alaska Natives, mortality was higher among Alaska Natives than among U.S. whites, although rates for heart disease and diabetes were not significantly higher. Just over half (52.2%) of Alaska Native deaths were from one of three causes—cancer, unintentional injuries, or heart disease. Among U.S. whites, two causes, heart disease and cancer, were responsible for 57% of deaths, with heart disease deaths far exceeding cancer deaths.

Although we felt that the U.S. white population was a better standard for comparison, we also reviewed data for the Alaska white population. It is important to point out that during the study period, there were no differences in mortality rates for Alaska whites and U.S. whites for four of 10 causes of death. Cause-specific rates for Alaska Natives that differed from those for U.S. whites were no more than 20% higher or lower, except for the category pneumonia/influenza (rate ratio 0.6).

The greatest disparity in deaths between Alaska Natives and U.S. whites was found for injuries. Almost 60% of all excess deaths were due to unintentional and intentional injuries as a group.

Alaska Natives had close to four times the death rate from unintentional injuries of U.S. whites, and this cause accounted for 37% of all excess deaths. In contrast, unintentional injury deaths for Alaska whites were only slightly higher than those for U.S. whites (rate ratio 1.1). Interpretation of differences in injury mortality rates between the Alaska Native and Alaska white populations must take into consideration that almost 70% of the Alaska Native population lives in rural areas of the state, whereas only slightly more than 20% of the Alaska white population does.⁸ A report published by the State of Alaska Department of Public Health for the years 1990–1996 indicated that unintentional injury death rates were significantly higher for all Alaskans in rural regions as compared to urban regions of the state, although not of an order of magnitude to account for the differences observed.⁹

Alaska Natives had 4.1 times the suicide mortality rate and 3.3 times the homicide/legal intervention rate of U.S. whites. These two causes accounted for 17% and 5% of excess deaths. The state of Alaska reports that firearms are used in more than 70% of all homicides in Alaska, and that deaths from firearms

among Alaska Natives occur at three times U.S. rates.⁹ It is possible that the prevalence of firearms in Alaska Native homes may play a role in the high suicide and homicide rates.

Alaska Natives also had a 30% higher mortality rate from cancer than U.S. whites. Alaska Native cancer patients accounted for 10% of excess deaths. A recent study of cancer mortality among Alaska Natives found that the most marked increases since the 1960s are for lung cancer. Lung cancer is currently the leading cause of cancer death for Alaska Native men and women, accounting for a third of all cancer deaths.¹⁰ Behavioral Risk Factor Surveillance System (BRFSS) data from 1991–1993 estimate that among Alaska Natives at least 43% of men and 39% of women are current smokers.¹¹ These percentages are substantially higher than the 1993 U.S. prevalences of 25.7% for males and 20.7% for females.¹¹ BRFSS data are available for Alaska only since 1991. Data from 1991–1997 show no evidence of decline in Alaska Native smoking rates (Unpublished data, Alaska Native Health Board).

Age-specific death rates indicate that the greatest disparity between Alaska Natives and U.S. whites is in the <45 years age groups. The rate ratio is approximately three-fold and similar for men and women. Injury-related deaths were responsible for nearly 70% of all deaths, and for 81% of excess deaths in this age range.

Among Alaska Natives >45 years of age, 88% of all deaths and 70% of excess deaths were due to chronic diseases. Cancer accounted for 26% of all deaths and 23% of excess deaths. Heart disease caused 24% of all deaths, but the actual number of deaths were fewer than would have been expected if Alaska Native rates were similar to U.S. white rates. COPD and cerebrovascular disease each accounted for 6% of all deaths in this age range and 10% and 6% respectively of excess deaths. Injury remained a major cause of excess deaths (24%), although responsible for only a small percentage (8%) of all deaths.

Examination of trends over the 20-year period 1979–1998 revealed that Alaska Native death rates from all causes declined 20%, while U.S. white rates declined 14% during a slightly narrower range of time, 1981 to 1996. Overall improvement in death rates for Alaska Natives was primarily due to a 43% decrease in deaths from unintentional injuries. Homicide rates declined 60% during this period as well. Extensive injury prevention efforts by the tribal health corporations and the Indian Health Service and the introduction of local option laws for alcohol control appear to have been important factors in decreasing death rates.¹² Pneumonia and influenza also declined 35% from

1979 to 1998. All of the decline occurred during the most recent five-year time period, 1994–1998, and appeared in all age groups. Although data on specific infectious agents causing pneumonia and influenza deaths do not exist for Alaska Natives, this decline is likely the result of a combination of factors. During this period, there was an emphasis in tribal health corporations on pneumococcal and influenza vaccination in adult Alaska Natives. Among 1997 Alaska BRFSS respondents 65 years of age and older, Alaska Natives were more likely than all Alaskan respondents to indicate having had an influenza vaccination in the past year (80%) and ever having had a pneumonia vaccination (60%).¹³ According to laboratory surveillance conducted by the Arctic Investigations Program, Centers for Disease Control and Prevention (CDC), the rate of invasive pneumococcal infection has decreased in Alaska Natives 65 years and older from 186 per 100,000 in 1986–1990¹⁴ to 92 per 100,000 in 1991–1998 (Unpublished data, CDC Arctic Investigations Program), while no decrease occurred in other age groups. Others factors that may have contributed to the decrease in the mortality rate for pneumonia among Alaska Natives are the introduction of running water in many village homes, which improved sanitation, and the now universal availability of oxygen in village primary care clinics (Personal communication, Rosalyn Singleton, MD, MPH, CDC Arctic Investigations Program, February 2003).

Rates for suicide, heart disease, and chronic liver disease did not change over the 20-year study period, and disparities persist. Unfortunately, rates for death from most chronic diseases among Alaska Natives have increased: cancer 12%, cerebrovascular disease 17%, chronic obstructive lung disease 191%, and diabetes mellitus 262%. Since rates for these causes have in many cases *decreased* for U.S. whites, the disparities between Alaska Natives and U.S. whites are even greater now than 20 years ago. A state of Alaska publication reports that smoking rates, obesity, and sedentary lifestyle rates are higher among Alaska Native adults than among any other “racial” group in Alaska.⁹ Although trend data are not available, providers report increases in obesity and decreases in physical activity.

With the decline in infectious disease since the 1950s, as well as the more recent decline in injury deaths, life expectancy for the Alaska Native population has increased. The current high and/or increasing rates of chronic diseases among Alaska Natives along with decreasing trends in the U.S. population result in new disparities. Increases in rates of chronic diseases also mean an increased burden on the health care system as this very young population ages. Every

effort should be made to assure continuation of the decline in injury rates. However, new programs and initiatives are needed that will reduce chronic disease risk factors to prevent disease occurrence, provide early detection of disease, and provide optimal treatment and care as soon as disease is detected.

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