Regional Patterns and Trends in Cancer Mortality among American Indians and Alaska Natives, 1990–2001

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BACKGROUND. National estimates of cancer mortality indicate relatively low rates for American Indians (AIs) and Alaska Natives (ANs). However, these rates are derived from state vital records in which racial misclassification is known to exist.
METHODS. In this cross-sectional study of cancer mortality among AIs and ANs living in counties on or near reservations, the authors used death records and census population estimates to calculate annualized, age-adjusted mortality rates for key cancer types for the period 1996–2001 for 5 geographic regions: East (E), Northern Plains (NP), Southwest (SW), Pacific Coast (PC), and Alaska (AK). Mortality rate ratios (MRRs) and 95% confidence intervals (95% CIs) also were calculated to compare rates with those in the general United States population (USG) for the same period. To examine temporal trends, MRRs for 1996–2001 were compared with MMRs for 1990–1995.
RESULTS. The overall cancer mortality rate was lower in AIs and ANs (165.6 per 100,000 population; 95% CI, 161.7–169.5) than in the USG (200.9 per 100,000 population; 95% CI, 200.7–201.2). In the regional analysis, however, cancer mortality was higher in AK (MRR = 1.26; 95% CI, 1.17–1.36) and in the NP (MMR = 1.37; 95% CI, 1.31–1.44) than in the USG. In both regions, the excess mortality was attributed to cancer of the lung, colorectum, liver, stomach, and kidney. In the SW, the mortality rate for cancer of the liver and stomach was higher than the rate in the USG, in contrast with that region's nearly 4-fold lower mortality rate for lung cancer (MRR = 0.23; 95% CI, 0.19–0.27). Rates of cervical cancer mortality were higher among AIs and ANs (MRR = 1.35; 95% CI, 1.13–1.62), notably in the NP and SW. Rates of breast cancer mortality generally were lower (MRR = 0.60; 95% CI, 0.55–0.66), notably in the PC, SW, and E. Cancer mortality increased by 5% in AIs and ANs (MRR for 1996–2001 compared with 1990–1995: 1.05; 95% CI, 1.01–1.08), whereas it decreased by 6% in the USG (MMR = 0.94; 95% CI, 0.94–0.94).
CONCLUSIONS. Regional data should guide local cancer prevention and control activities in AIs and ANs. The disparity in temporal trends in cancer mortality between AIs and ANs and the USG gives urgency to improving cancer control in this population. ***Cancer* 2005;103:1045–53.** © *2005 American Cancer Society.*

KEYWORDS: American Indian, Alaska Native, Native American, cancer, cancer surveillance.

American Indians and Alaska Natives are a diverse group of culturally and linguistically distinct tribes living throughout the United States, with particular concentrations in Alaska and in the northern plains and western states. The age distribution of American Indians and Alaska Natives is much younger than that of the general United States population. In 2000, 34% of American Indians and Alaska Natives were age < 18 years, compared with 26% of the general

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United States population.[1] Many American Indians and Alaska Natives also are poor, with 25.7% living in poverty in 1999 compared with 12.4% of the general United States population.[2]

In recent decades, deaths due to infectious diseases and infant and pregnancy-related mortality have decreased markedly in American Indians and Alaska Natives. In addition, life expectancy at birth has risen dramatically, from 51.0 years in 1940 to 71.1 years for the period 1994–1996; and the disparity in life expectancy between American Indians and Alaska Natives and whites in the United States narrowed to 5.4 years in 1999.[3] However, as Native American health status and life span have increased, so has the burden of chronic disease. Cancer is now the second leading cause of death among American Indians and is the leading cause of death among Alaska Natives.[3,4]

Race often is coded inaccurately for American Indians and Alaska Natives on state death records. Investigators at the National Center for Health Statistics (NCHS) and the United States Census Bureau have compared self-identified race from Census forms to proxy-identified race from death certificates. Nationally, 41% of American Indians and Alaska Natives were coded as non-native when their race was assigned by someone else (E. Arias, personal communication). Most detailed cancer surveillance, including that for cancer mortality, has focused on Indian and native populations in the Southwest of the United States and in Alaska, where it is believed there is less racial misclassification. However, some investigators have examined cancer trends nationally.[5–8] Cobb and Paisano[5,6] examined trends in cancer mortality during the period 1989–1993 for American Indians and Alaska Natives who resided in counties on or near Indian reservations. Those authors found that overall cancer mortality was lower in American Indians and Alaska Natives when rates were examined nationally but that mortality varied markedly by region. Garguillo et al.[8] reported nationwide trends in mortality for 4 major cancers (lung/bronchus, colorectal, prostate, and breast) by gender and race/ethnicity for the period 1990–1998 and found that temporal trends in mortality rates among American Indians and Alaska Natives were less favorable than those in other major race/ethnic groups. However, because those researchers did not attempt to adjust for the racial misclassification of American Indians and Alaska Natives known to exist in state vital records,[9,10] the reported mortality rates likely are underestimates.

Those studies indicate several important points. First, mortality rates in American Indians and Alaska Natives differ substantially from the general rates in the United States for all races combined. Second, rates of cancer mortality and incidence among American Indians and Alaska Natives vary markedly by region. Third, recent trends in cancer mortality among American Indians and Alaska Natives differ substantially from and generally are less favorable than the trends in other major racial and ethnic groups.

The objective of this study was to provide current and accurate national and regional information on cancer mortality among American Indians and Alaska Natives, particularly those residing in areas served by the Indian Health Service (IHS). In addition, we examined trends in cancer mortality over 2 periods (1990–1995 and 1996–2001) and compared trends in American Indians and Alaska Natives with those in all races in the United States combined.

MATERIALS AND METHODS

By law, states must record each death that occurs in that state on a death certificate. For each death, a physician or coroner typically provides clinical information documenting the cause of death. The funeral home director provides demographic information, such as race and ethnicity. Death certificates are compiled at the state level yearly and are then sent to the Centers for Disease Control and Prevention's (CDC's) NCHS, where the data are edited for consistency, and personal identifiers are removed. The NCHS then makes this information available to the public in published reports and to the research community by providing the raw data (without identifiers) in electronic format. The electronic data available for analysis include cause of death, county of residence, age, gender, race, and ethnicity. We used the death records supplied by the NCHS to the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) statistical program (SEERStat), which allows researchers to analyze mortality data over the Internet.[11]

Because of concerns of racial misclassification in areas where American Indians and Alaska Natives are a small minority, we limited our analysis to American Indians and Alaska Natives who were identified on the death certificate as residing in either counties that contained federally recognized tribal lands or any adjacent county. We refer to these counties with higher concentrations of American Indians and Alaska Natives as *IHS service counties*, because most American Indians and Alaska Natives in these counties are eligible for IHS services.[12] To receive care from the IHS, an individual must be an enrolled member of a federally recognized tribe or Alaska Native village and must reside on or near a reservation. The IHS provides care to nearly 1.6 million American Indians and Alaska Natives through direct care, contractual arrangements with tribes or private providers, or self-governance

TABLE 1
Definition of Geographic Regions, Corresponding Indian Health Service Service Population, Total American Indian/Alaska Native Population Included in Regions, and Service Population Percentage for the Period 1996–2001[a]

Geographic region	IHS service population estimates	Total AI/AN population estimates	Service population % of total AI/AN	State(s)
Alaska	104,368	104,368	100.0	AK
East	397,657	1,132,242[b]	35.1	AL, CT, FL, IN, KS, LA, ME, MA, MS, NY, NC, OK, PA, RI, SC, TX
Southwest	494,271	563,561	87.7	AZ, CO, NV, NM, UT
Pacific Coast	343,368	624,067[c]	55.0	CA, ID, OR, WA
Northern Plains	251,136	367,720	68.3	IA, MI, MN, MT, NB, ND, SD, WI, WY
All U.S.	1,590,800	2,791,958	57.0	

IHS: Indian Health Service; AI/AN: American Indian/Alaska Native.

[a] All population figures were annualized from 1996–2001 intercensal estimates.

[b] Total AI/AN for East includes the nonservice states: AR, DE, GA, IL, KY, MD, MO, NH, NJ, OH, TN, VT, VA, WV.

[c] Total AI/AN for the Pacific Coast includes nonservice state: HI.

arrangements with tribes. Individuals who are referred from IHS service counties for cancer care may die in urban areas; however, the IHS will inform the assignment of race on the death certificate if the IHS is the source of payment for the health care.

We defined 5 geographic regions—Alaska, Pacific Coast, Northern Plains, Southwest, and East (Table 1)—in which to aggregate our data to allow regional comparisons and to achieve more stable rates than could be achieved with analyses at the state level, in which fewer deaths can result in wider confidence intervals around the rate estimates. This regional approach was developed by IHS Program Statistics to promote consistency in reporting of American Indian and Alaska Native health-related data. Fourteen states do not include IHS service counties and, thus, were excluded from this analysis.

The denominators for rate calculations used by SEERStat are based on United States Census Bureau bridged, single-race population estimates based on the 2000 census.[13] The race category of an individual in the census is based on self-identification.

We analyzed deaths that occurred in American Indians and Alaska Natives for the periods 1990–1995 and 1996–2001 for which the underlying cause of death was cancer, as determined by International Classification of Diseases, 9th revision (ICD-9) codes 140-208.9 and 238.6 (1990–1998) and ICD-10 codes C00.0 to C97.0 (1999–2001). Using the SEER Cause of Death Recodes 1969+,[14] we grouped cancers for common cancer sites: colon, rectosigmoid colon, and rectum; liver and intrahepatic ducts (IHBD); lung and bronchus; and kidney and renal pelvis. All age-adjusted death rates and their corresponding confidence intervals were calculated by SEERStat with use of the 2000 United States standard million as the reference population. For the purposes of comparison, we used the United States all-race cancer rates for the same period.

We also calculated mortality rate ratios (MRRs) and 95% confidence intervals (95% CIs) to compare the relative differences in age-adjusted mortality rates between American Indians and Alaska Natives and the general United States population for the period 1996–2001. For Figures 1 and 2, we used a logarithmic scale, such that an *n*-fold increase in cancer mortality rates for American Indians and Alaska Natives, compared with the United States all-race rates, projects to the right the same distance as an *n*-fold decrease projects to the left, and no difference generates a bar of zero length. To examine temporal trends, we calculated MRRs for American Indians and Alaska Natives for the periods 1996–2001 and 1990–1995. All MMR confidence intervals were calculated in SAS software (version 8.02; SAS Institute Inc, Cary, NC) by using the method described by Breslow and Day.[15]

RESULTS

On the basis of United States Census estimates, approximately 57% of all American Indians and Alaska Natives (2,791,958) reside within the geographic boundaries of the IHS service areas. From 1996 through 2001, the average annual IHS service population was 1,590,800 (Table 1). Of the five regions included in the current analysis, the Southwest had the largest IHS service population.

The seven leading cancer sites for cancer death for American Indians and Alaska Natives (both genders

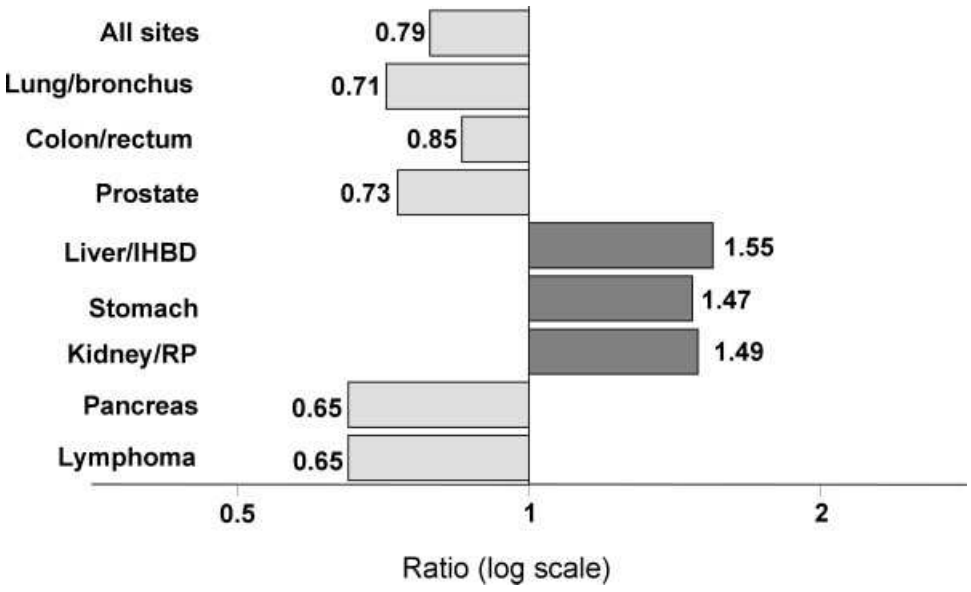

FIGURE 1. Cancer mortality rate ratios for American Indian and Alaska Native males compared with males of all races combined, by cancer site, United States, 1996–2001. RP: renal pelvis; IHBD: intra-hepatic bile duct.

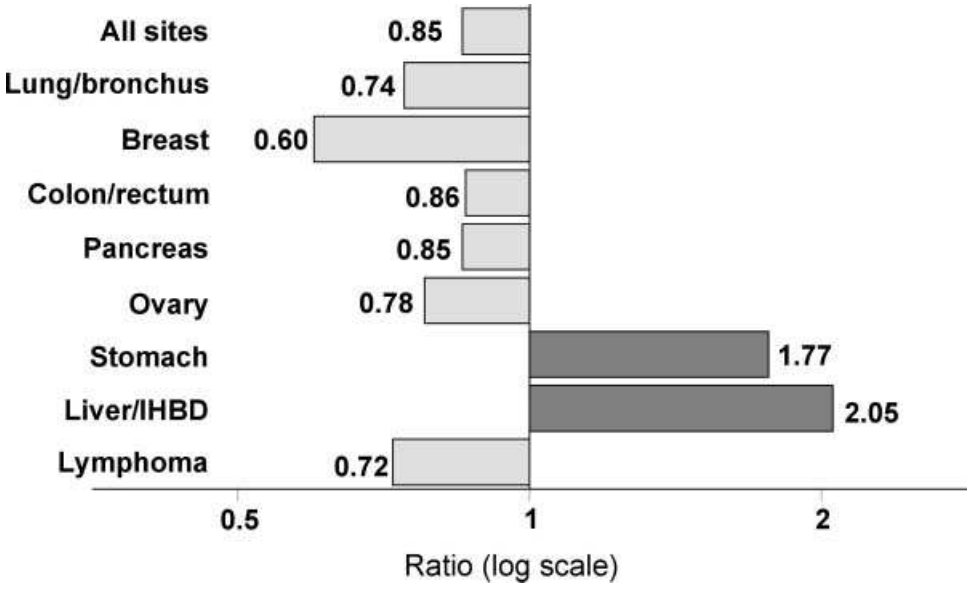

FIGURE 2. Cancer mortality rate ratios for American Indian and Alaska Native females compared with females of all races combined, by cancer site, United States, 1996–2001. IHBD: intrahepatic ducts.

combined) were lung/bronchus, colorectal, breast, liver/IHBD, pancreas, stomach, and prostate. In contrast, the seven leading cancer sites for all races combined were lung/bronchus, colorectal, breast, prostate, pancreas, non-Hodgkin lymphoma, and leukemia. For American Indian and Alaska Native men, the leading sites were lung/bronchus, colorectal, prostate, liver/IHBD, stomach, kidney/renal pelvis, and pancreas. For women, the leading sites were lung/bronchus, breast, colorectal, pancreas, ovary, stomach, and liver/IHBD. The number of cancer deaths recorded on the death certificate as "unspecified/miscellaneous" was 12% greater for American Indians and Alaska Natives than for all races combined.

The number of cancer deaths, age-adjusted cancer rates, and MRRs for American Indians and Alaska Natives compared with all races combined are shown in Table 2 for both genders combined by geographic region. The MRRs for men and women separately and for all regions combined are shown in Figures 1 and 2, respectively. The cancer mortality rate among American Indians and Alaska Natives for all sites combined (165.6 per 100,000 population) was approximately 20% lower ($P < 0.05$) than the all-race rate of 200.9 per 100,000 population (MMR = 0.82; 95% CI, 0.80–0.84). The cancer mortality rate for American Indian and Alaska Native men (200.1 per 100,000 population) was 21% lower, and the rate for American Indian and

TABLE 2
The Number of Deaths, Age-Adjusted Mortality Rates, and Mortality Rate Ratios for Seven Leading Causes of Cancer Death among American Indians and Alaska Natives by Type of Cancer and Region: United States, 1996–2001

		Age-adjusted rates[a]			
Type of cancer	No. of deaths	AI/AN	U.S. all races	Mortality rate ratio[b]	95% CI
All cancers combined					
Alaska	765	253.7		1.26[c]	1.17–1.36
East	2116	151.5		0.75[c]	0.72–0.79
Northern Plains	1785	275.7		1.37[c]	1.31–1.44
Pacific Coast	1364	137.5		0.68[c]	0.65–0.72
Southwest	1885	131.6		0.65[c]	0.62–0.69
Total	7915	165.6	200.9	0.82[c]	0.80–0.84
Lung/bronchus					
Alaska	205	70.5		1.25[c]	1.08–1.44
East	556	40.2		0.71[c]	0.65–0.78
Northern Plains	606	93.6		1.66[c]	1.52–1.80
Pacific Coast	396	39.9		0.71[c]	0.64–0.79
Southwest	174	12.9		0.23[c]	0.20–0.27
Total	1937	41.1	56.5	0.73[c]	0.69–0.76
Colorectal					
Alaska	97	35.9		1.71[c]	1.38–2.11
East	257	18.7		0.89	0.78–1.01
Northern Plains	194	32.6		1.55[c]	1.33–1.80
Pacific Coast	127	13.7		0.65[c]	0.54–0.79
Southwest	152	10.2		0.49[c]	0.41–0.58
Total	827	17.9	21.0	0.85[c]	0.79–0.92
Breast (females)					
Alaska	45	23.2		0.85	0.62–1.16
East	142	16.6		0.61[c]	0.51–0.72
Northern Plains	91	22.3		0.82	0.66–1.01
Pacific Coast	93	15.2		0.56[c]	0.45–0.69
Southwest	116	13.0		0.47[c]	0.39–0.57
Total	487	16.4	27.4	0.60[c]	0.55–0.66
Liver/IHBD					
Alaska	25	8.1		1.77[c]	1.16–2.71
East	83	5.9		1.29[c]	1.03–1.61
Northern Plains	71	10.2		2.23[c]	1.73–2.87
Pacific Coast	53	5.5		1.20	0.90–1.61
Southwest	148	10.6		2.32[c]	1.96–2.75
Total	380	8.0	4.6	1.74[c]	1.57–1.94
Pancreas					
Alaska	49	15.5		1.48[c]	1.1–1.99
East	85	6.6		0.62[c]	0.50–0.78
Northern Plains	60	8.9		0.84	0.64–1.10
Pacific Coast	60	6.0		0.57[c]	0.43–0.76
Southwest	111	8.2		0.78[c]	0.65–0.95
Total	365	7.9	10.5	0.75[c]	0.67–0.83
Stomach					
Alaska	63	17.0		3.60[c]	2.77–4.68
East	52	3.8		0.81	0.61–1.08
Northern Plains	54	8.6		1.81[c]	1.36–2.42
Pacific Coast	40	4.4		0.93[c]	0.67–1.30
Southwest	152	10.9		2.30[c]	1.94–2.72
Total	361	7.5	4.7	1.59[c]	1.43–1.78
Prostate (males)					
Alaska	22	25.5		0.79	0.50–1.25
East	98	24.0		0.75[c]	0.60–0.92
Northern Plains	79	43.1		1.34[c]	1.05–1.71
Pacific Coast	54	18.8		0.58[c]	0.44–0.78
Southwest	90	18.8		0.58[c]	0.47–0.72
Total	343	23.5	32.2	0.73[c]	0.65–0.82

AI-AN: American Indian-Alaska Native; 95% CI: 95% confidence interval; IHBD: intrahepatic ducts.

[a] Rate per 100,000 population adjusted to the 2000 United States standard.

[b] Ratio comparing the AI-AN rate for a specific region and site with the U.S. all-race rate for that site.

[c] Ratio differed significantly from the age-adjusted radio.

Alaska Native women (142.4 per 100,000 population) was 15% lower than the all-race rate ($P < 0.05$).

Mortality rates from cancer at the following sites were significantly lower in American Indians and Alaska Natives than in all races combined: lung/bronchus, colorectal, breast (in women), prostate (in men), pancreas, non-Hodgkin lymphoma (data not shown), ovary (in women), esophagus (data not shown), and brain (data not shown). Mortality rates in American Indians and Alaska Natives were significantly higher for cancers of the stomach, liver/IHBD, kidney/renal pelvis (in men), cervix (data not shown), and gallbladder (data not shown).

Regional mortality rates were highest in Alaska (253.7) and in the Northern Plains (275.7); in both regions, excess mortality was attributed to cancer of the lung, colorectum, liver, stomach, gallbladder (data not shown), and kidney/renal pelvis (data not shown). The rate of lung cancer mortality, which is the leading cause of cancer mortality among American Indians and Alaska Natives, was 93.6 per 100,000 for American Indians in the Northern Plains region (MRR = 1.66) and 70.5 per 100,000 (MRR = 1.25) for Alaska Natives. In contrast, the rate of mortality from lung cancer was fourfold lower in the Southwest than the all-race rate and nearly sevenfold lower than the rate in the Northern Plains region.

Rates of cervical cancer mortality were higher among American Indians and Alaska Natives than in all races combined (4.0 and 2.9, respectively; MRR = 1.35; 95% CI, 1.13–1.62), particularly in the Northern Plains and Southwest regions. Rates of breast cancer mortality were lower among American Indians and Alaska Natives than in all races combined (16.4 and 27.4, respectively; MRR = 0.60; $P < 0.05$), particularly in the East, Pacific Coast, and Southwest regions. Rates of prostate cancer mortality were lower among American Indian and Alaska Native men in all regions except the Northern Plains, where the rate was nearly 35% greater than the all-race rate. Rates of colorectal cancer, which is the second most common cause of cancer mortality, also varied by region. MRRs were highest in Alaska and in the Northern Plains region (1.71 and 1.55, respectively) and lowest in the Southwest and Pacific coast regions (0.49 and 0.65, respectively).

Total cancer deaths, age-adjusted mortality rates, and MMRs for 1996–2001 compared with 1990–1995 are shown in Table 3. The American Indian and Alaska Native population experienced an increase in cancer mortality (MMR = 1.05), whereas cancer mortality in all races combined declined by 6% (MMR = 0.94). Increases were noted for lung/bronchus, colorectal, and liver/IHBD cancers, reaching statistical significance only for colorectal and liver/IHBD cancers. Little change was noted in American Indian and Alaska Natives for cancers of the breast, stomach, and kidney/renal pelvis. Gallbladder cancer decreased by nearly 20% in American Indians and Alaska Natives, compared with a 13% decrease in all races combined (data not shown). Similarly, a 36% decrease was noted for cervical cancer among American Indian and Alaska Native women, whereas the decrease in all races combined was only 15%.

DISCUSSION

The data presented here show that cancer mortality among Native Americans differs greatly from that in the general United States population. For each type of cancer and for each gender, rankings varied by region. In general, Native Americans in the Southwest, East, and Pacific Coast regions had lower cancer mortality rates compared with Native Americans in the northern part of the country. However, within any geographic region, mortality rates for specific cancers were not all lower or all higher than the rates for all races combined.

The variability in lung and bronchus cancer mortality seen among Native Americans across regions (high in the Northern Plains and Alaska and low in the Southwest and East) primarily is a consequence of variability in tobacco use. Smoking prevalence among American Indian and Alaska Native adults is relatively low in the Southwest but is nearly 50% in the northern part of the country and is increasing rapidly in Alaska.[16] The variability in mortality from other cancers is more difficult to explain and may be linked to differences in diet, the prevalence of obesity and alcoholism, access to care, or later stage at diagnosis. The role of *Helicobacter pylori* in stomach cancer and the synergistic effect of alcohol abuse and viral hepatitis (both of which are prevalent in American Indian and Alaska Native communities) on liver/IHBD cancer are likely contributors.[17]

The well publicized decrease in cancer mortality in the United States starting in the mid-1990s did not extend to American Indians and Alaska Natives who, in fact experienced an increase when comparing period 1990–1995 with the period 1996–2001.[18] The increases in cancers of the lung/bronchus, colorectum, and liver/IHBD are of particular concern. It is well known that American Indians and Alaska Natives, despite their lower overall cancer mortality, have a less favorable prognosis once they receive a diagnosis of cancer.[19–21] The reasons for this disparity may include later disease stage at diagnosis, lack of availability of timely screening services, lack of appropriate medical

TABLE 3
The Number of Deaths, Age-Adjusted Mortality Rates, and Mortality Rate Ratios among American Indians and Alaska Natives and All Races Combined by Type of Cancer, United States

	No. of deaths		Age-adjusted rates[a]			
Type of cancer	1990–1995	1996–2001	1990–1995	1996–2001	Mortality[b] rate ratio	95% CI
All cancers						
AI/AN	6298	7915	158.08	165.56	1.05[c]	1.01–1.08
All races	3,143,357	3,277,410	213.05	200.94	0.94[c]	0.94–0.94
Lung and bronchus						
AI/AN	1537	1937	38.75	41.06	1.06	0.99–1.14
All races	879,740	923,029	58.80	56.45	0.96[c]	0.96–0.96
Breast (females)						
AI/AN	395	487	16.20	16.37	1.01	0.88–1.16
All races	261,075	251,179	31.70	27.36	0.86[c]	0.86–0.87
Colon and rectum						
AI/AN	603	827	15.53	17.91	1.15[c]	1.03–1.29
All races	343,368	341,885	23.49	21.01	0.89[c]	0.89–0.90
Prostate						
AI/AN	334	343	25.51	23.48	0.92	0.78–1.08
All races	204,418	192,739	38.71	32.19	0.83[c]	0.83–0.84
Stomach						
AI/AN	301	361	7.47	7.54	1.01	0.86–1.18
All races	82,991	77,028	5.67	4.73	0.83[c]	0.83–0.84
Kidney/RP						
AI/AN	251	317	6.28	6.39	1.02	0.85–1.21
All races	62,694	68,803	4.26	4.22	0.99	0.98–1.00
Liver/IHBD						
AI/AN	255	380	6.63	7.96	1.20[c]	1.02–1.42
All races combined	58,590	74,551	3.96	4.57	1.15[c]	1.14–1.17
Cervix (females)						
AI/AN	157	131	6.20	3.97	0.64[c]	0.50–0.81
All races combined	27,469	25,875	3.45	2.93	0.85[c]	0.84–0.86

AI-AN: American Indian-Alaska Native; 95% CI: 95% confidence interval; RP: renal pelvis; IHBD: intrahepatic duct.

[a] Rates per 100,000 population adjusted to 2000 U.S. standard.

[b] Ratio comparing the cancer mortality rates for 1996–2001 at each site with the rates for 1990–1995.

[c] Ratio differed significantly from the age-adjusted ratio.

care, and large travel distances to prevention and treatment services.

Cervical cancer mortality in American Indian and Alaska Native women was an exception to this trend. Comparing the period 1990–1995 with the period 1996–2001, American Indian and Alaska Native women experienced a 36% decrease in cervical cancer mortality that likely is related to concerted efforts by the IHS and the CDC to increase cervical cancer screening and follow-up among these women. These activities include an increased availability of screening funded by the CDC National Breast and Cervical Cancer Early Detection Program, aggressive colposcopy training for primary care providers in IHS and tribal health care facilities, and the development and use of software specifically designed to track screening services for women. Similarly, gallbladder cancer mortality decreased by 20% over the same period. Some IHS clinicians and epidemiologists have hypothesized that the decrease in gallbladder cancer mortality may be related to the increase in elective cholecystectomies with the advent of laparoscopic techniques. Some researchers have advocated elective cholecystectomy for the prevention of gallbladder cancer in high-risk populations, such as American Indians and Alaska Natives.[22]

The use of death certificate data to examine cause-specific mortality has several well recognized limitations. Problems with death certificate data include racial misclassification and errors in reporting residence at the time of death or the precise cause of death. Several studies have shown that racial misclassification of American Indians and Alaska Natives is a problem in some regions of the country.[9,10,23] In addition, data show that American Indians and Alaska Natives die more often than whites of "signs, symptoms, and ill-defined conditions," which is an ICD-9 coding option for deaths without a specific cause.[24]

These two problems can lead to underestimates of the true overall cancer mortality rate as well as underestimates of mortality from specific types of cancer. The proportion of counties included in the analysis differs by state. For instance, all counties in Oklahoma, Arizona, Nevada, and Alaska are included, whereas other states have only one county (e.g., Pennsylvania) or several counties that are considered IHS service counties. The inclusion of varying percentages of American Indian/Alaska Native populations by region is a consequence of the effort to decrease racial misclassification that affects primarily the stability of the estimates. An additional limitation of our study is that some rates that were included in the current analysis were based on relatively few patients. Such rates should be interpreted with caution.

All rates in this report were derived by using as denominators projections from census data from 1990 and 2000 that were adjusted according to the results of the 2000 census. Although SEERStat uses the most recently published census population estimates for American Indians and Alaska Natives, the degree to which errors may occur in the accurate counting of Native Americans is not known precisely. However, any errors would tend to result in undercounting rather than overcounting, given the difficulties of enumeration, especially on and near tribal lands. Errors in the use of population figures lower than the true numbers may lead to overestimation of the true cancer mortality rates for regions of the country where census undercounting is a problem.

Despite these limitations, the current findings show that cancer mortality patterns differ among Native Americans by region and differ compared with rates in the United States for all races combined. Native Americans in the Southwest have markedly different cancer mortality patterns than Native Americans in the Northern Plains and Alaska. This finding, along with differences in risk factors, leads to the conclusion that cancer incidence patterns also may differ. Unfortunately, the most complete data on cancer incidence among American Indians and Alaska Natives, with relatively little racial misclassification, are from limited areas, specifically, from cancer registries in the Southwest and Alaska.

To gain a better understanding of the extent of cancer among Native Americans in the United States, further collaborative efforts between the IHS, tribes, and cancer registries supported by the NCI SEER Program and the CDC National Program of Cancer Registries (NPCR) should be promoted and expanded. Such collaborations would provide the data needed to develop preventive programs and intervention strategies targeted to specific populations. We currently are conducting linkages between IHS patient registration data and NPCR-supported and SEER-supported cancer registries to decrease racial misclassification. We also are beginning a similar project with state death records. Until such data are available, cancer mortality data may provide direction to decision makers about where to apply limited resources for the most benefit.

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