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Surveillance for Health Behaviors of American Indians and Alaska Natives—Findings From the Behavioral Risk Factor Surveillance System, 2000–2006

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An Update on Cancer in American Indians and Alaska Natives, 1999-2004

Supplement to ***Cancer***

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We acknowledge the contributions of state and territorial Behavioral Risk Factor Surveillance System coordinators in tracking health conditions and risk behaviors in the United States.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

BACKGROUND. The authors compared estimates for cancer risk factors, use of cancer screening tests, health status indicators, and access to care for American Indians and Alaska Natives (AI/ANs) and non-Hispanic whites (NHWs) in the US and for AI/ANs in 6 Indian Health Service regions.

METHODS. Behavioral Risk Factor Surveillance System data were aggregated from the years 2000 through 2006 and were used to calculate weighted prevalence estimates by gender for key variables except demographic variables.

RESULTS. Compared with NHWs, AI/ANs had lower prevalence estimates for income, educational attainment, insurance coverage, and access to personal healthcare providers. AI/ANs in Alaska and NHWs had similar estimates for diabetes (approximately 6%); however, the prevalence was nearly twice as high among AI/ANs in the other regions. The prevalence of obesity was higher for AI/ANs (29.6%) than for NHWs (20.9%). The prevalence of binge drinking was higher among AI/AN males (24.9%) than among AI/AN females (8.5%). Heavy drinking was more prevalent among NHW females (5.3%) than among AI/AN females (3.5%). AI/ANs were more likely to be current smokers (31.1%) than NHWs (22.8%). The prevalence of AI/ANs who never smoked ranged from 31.5% in Alaska to 56.9% in the Southwest. In 5 of the 6 regions, AI/AN females had lower prevalence estimates of both Papanicolaou and mammography testing than NHW females. The use of colorectal cancer screening tests was more common among NHWs (53.8%) than among AI/ANs (44%).

CONCLUSIONS. Although cancer health disparities persist among AI/ANs, the current analysis indicated that variation in the prevalence of their chronic disease risk factors may be obscured when national data are not examined by smaller geographic areas such as regions. ***Cancer*** **2008;113(5 suppl):1131–41.** *Published 2008 by the American Cancer Society.**

KEYWORDS: American Indians, Alaska Natives, behavioral risk factors, cancer prevention and control, cancer screening, surveillance.

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Cancer was the second leading cause of death among American Indians and Alaska Natives (AI/ANs) in 2004 regardless of gender.[1] Disparities in chronic disease risk factors, use of preventive services, and access to care contribute to disproportionate burdens of cancer among racial and ethnic minorities, low-income groups, and other underserved populations.[2,3] Studies have indicated that these disparities persist for the AI/AN population, including a high prevalence of alcohol abuse, tobacco use, and obesity.[4-11] Some researchers have observed that AI/ANs also report lower rates of screening for breast, cervical, and colorectal cancers compared with other racial and ethnic populations.[10-13] In addition, AI/ANs are more likely than non-Hispanic whites (NHWs) to report that they have no usual source of healthcare or health insurance coverage.[1,14,15] In part, this is because most AI/ANs live in urban areas away from medical facilities that are funded by the Indian Health Service (IHS).[14] Some AI/ANs may not be eligible to receive IHS services, because they are not members of federally recognized tribes or tribal organizations; others may be eligible, but their nearest IHS facility may not offer comprehensive services.

For this report, we compared 7 years of Behavioral Risk Factor Surveillance System (BRFSS) prevalence estimates for cancer risk factors and screening practices, health status, and access to care among AI/ANs and NHWs in the US. Prevalence estimates for AI/ANs also were provided by 6 IHS regions.

MATERIALS AND METHODS

Sampling

The BRFSS is an ongoing, state-based surveillance system that has been used to track health risk behaviors, preventive health practices, and access to healthcare since 1984 (additional information may be found at www.cdc.gov/brfss accessed on March 5, 2008). Detailed methodology regarding BRFSS administration has been published elsewhere.[16,17] In brief, the BRFSS is a cross-sectional telephone survey conducted by all state health departments, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands with funding from the Centers for Disease Control and Prevention (CDC). A multistage cluster design based on random-digit-dialing methods is used to select a representative sample of the U.S. civilian, noninstitutionalized population aged $\geq$18 years each month for interviews. The survey is conducted in English and in Spanish in states in which a substantial proportion of the population is Spanish-speaking.

The BRFSS includes a relatively small number of AI/AN respondents. To increase the precision of the estimates in this report, we aggregated data for 2000 through 2006. Cancer risk factor data were compared between the overall number of AI/ANs, regardless of ethnicity, and NHWs. Regional comparisons also were made between AI/ANs in the 6 IHS regions (Alaska, East, Northern Plains, Pacific Coast, Southern Plains, and Southwest), in the 50 states, and in the District of Columbia. The state of Alaska comprises the Alaska region. The states are distributed within the other IHS regions as follows: East (Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and the District of Columbia), Northern Plains (Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, South Dakota, Wisconsin, and Wyoming), Pacific Coast (California, Idaho, Oregon, Washington, and Hawaii), Southern Plains (Kansas, Oklahoma, and Texas), and Southwest (Arizona, Colorado, Nevada, New Mexico, and Utah). During the 7-year study period, the total number of BRFSS respondents aged $\geq$18 years was 1,863,461, and 32,426 of those respondents were self-identified as AI/AN. Their distribution was as follows: Alaska, 3301 respondents; East, 8186 respondents; Northern Plains, 7656 respondents; Pacific Coast, 4160 respondents; Southern Plains, 4632 respondents; and Southwest, 4491 respondents. The median Council of American Survey and Research Organizations (CASRO) response rate for each survey year ranged from 48.1% in 2000 (range, 28.8%-71.8%) to 58.6% in 2002 (range, 42.2%-82.6%).

Definitions of Variables

The BRFSS questionnaire has been described elsewhere.[16,17] The current analysis was limited to selected fixed and rotating core questions (asked yearly and biennially, respectively). Because CDC and state BRFSS coordinators occasionally change the wording of questions to improve clarity or to obtain additional information, some of our analyses included less than 7 years of data.

The following demographic and health indicator variables were analyzed: gender, age, marital status, educational attainment, employment status, and annual household income. Health status (ie, good or better), access to healthcare (ie, have insurance coverage and a personal healthcare provider), and diabe-

tes status (ie, ever told by a healthcare provider that you have diabetes) also were assessed.

We assessed several risk factors. The prevalence of consuming ≥5 servings of fruits and vegetables daily and of reporting no leisure-time physical activity (ie, not participating in any physical activities or exercises during the past 30 days) was estimated. Body mass index (BMI) was used to calculate overweight (BMI from 25 kg/m^2 to ≤29.9 kg/m^2) and obesity (BMI ≥30 kg/m^2) in individuals aged ≥20 years. Separate behavior patterns were assessed for alcohol consumption. Binge drinkers were defined as adults who reported that they drank in the past 30 days and had 5 or more drinks on 1 or more occasions in the past month. Heavy drinkers were males who had more than 2 drinks per day or females who had more than 1 drink per day in the past 30 days. Current smokers reported having smoked at least 100 cigarettes (5 packs) in their lifetime and smoked either every day or some days. Former smokers reported having smoked at least 100 cigarettes in their lifetime but no longer smoked.

We also assessed the use of cancer screening tests. Females aged ≥40 years who reported having a mammogram within the past 2 years were identified as having a mammogram. Females with an intact uterus who reported having a Papanicolaou (Pap) test within the previous 3 years were identified as having a Pap test. Males ages 50 to 75 years who reported having a prostate-specific antigen (PSA) test within the past year were identified as having a PSA test. Adults aged ≥50 years who had either used a fecal occult blood test (FOBT) within the past year or undergone endoscopy (sigmoidoscopy or colonoscopy) within the past 5 years were identified as having a test that screened for colorectal cancer. Because the BRFSS does not include questions about reasons for getting tested, the data cannot be interpreted as a direct measure of routine use of screening tests for these cancers.

Data Weighting and Analysis

Edited BRFSS files were aggregated by CDC staff to create a yearly sample for each state. Each state's yearly sample was weighted to the respondent's probability of selection and to the age- and gender-specific or race-, age-, and gender-specific population from the most current census data (or intercensal estimates) for the state.[17,18] Because no statistical testing was performed for the race- and region-specific comparisons in this report, the data should be considered descriptive. Prevalence estimates for AI/ANs and NHWs were age-adjusted to the 2000 projected US population. SAS version 9.1.3 (SAS Institute, Cary, NC) was used to calculate prevalence estimates, and SUDAAN version 9.0.1 (Research Triangle Institute, Research Triangle Park, NC) was used to calculate 95% confidence intervals.

RESULTS

Demographics and Health Indicators

Sociodemographic characteristics of AI/ANs and NHWs are shown in Table 1. Compared with NHWs, AI/ANs were younger, and their prevalence of unemployment and low income was higher. Regionally, the prevalence of being unemployed among AI/ANs ranged from 13% in the Southern Plains to 24.3% in Alaska, and the prevalence of earning <$15,000 annually ranged from 14.2% in the Northern Plains to 22.1% in the Pacific Coast.

The overall prevalence estimate for having healthcare coverage was 75.9% among AI/ANs compared with 88.6% among NHWs (Table 1). Across study regions, healthcare coverage ranged from 69.6% among AI/ANs in the Southwest to 80% among those living in the Pacific Coast and Alaska. Overall, NHWs were more likely to report having a personal healthcare provider compared with AI/ANs (82.8% vs 71%). In the IHS regions, the prevalence of having a personal healthcare provider ranged from 63.8% for AI/ANs in the Southwest to 73.9% for those in the Northern Plains.

Overall, fewer AI/ANs reported that their health status was good or better (72.8%) compared with NHWs (87.2%) (Table 1). Regionally, prevalence estimates among AI/ANs for this variable ranged from 78% in Alaska to 71.3% in the Pacific Coast. The estimated prevalence of self-reported diabetes was higher among AI/ANs compared with NHWs (12.4% vs 6%, respectively). This aggregate estimate obscures wide variation in diabetes prevalence across regions, which ranged from 5.7% among AI/ANs in Alaska to 13.4% among AI/ANs in the Pacific Coast.

Behavioral Risk Factors

Fruit and vegetable intake

The prevalence of select risk factor behaviors are shown in Table 2. The estimated overall prevalence of respondents that reported they consumed 5 or more servings of fruits and vegetables per day was slightly higher for AI/AN males (21.4%) than for NHW males (19.6%); the estimates for AI/AN and NHW females were similar (approximately 28.6%). Females had a higher prevalence of consuming 5 or more servings of fruits and vegetables than males, regardless of race or region.

TABLE 1
Prevalence Estimates of Selected Sociodemographic Characteristics, Access to Healthcare, and Selected Health Indicators Among American Indian/Alaska Native and Non-Hispanic White Adults: Behavioral Risk Factor Surveillance System, 2000-2006[a]

	US NHW		US AI/AN		Northern Plains[b]		Alaska[c]		Southern Plains[d]		Pacific Coast[e]		East[f]		Southwest[g]	
Characteristic	**%[h]**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**
Age group, y																
18-49	56.8	56.7-57.0	69.9	68.7-71.1	70.0	67.5-72.3	72.1	69.7-74.4	70.9	68.3-73.4	72.7	69.3-75.8	65.1	63.2-67.0	76.7	74.8-78.5
≥50	43.2	43.0-43.3	30.1	28.9-31.3	30.0	27.7-32.5	27.9	25.6-30.3	29.1	26.6-31.7	27.3	24.2-30.7	34.9	33.0-36.8	23.3	21.5-25.2
Gender																
Males	48.4	48.2-48.5	54.3	53.0-55.7	51.8	49.1-54.5	47.6	45.0-50.2	51.6	48.6-54.6	55.7	52.0-59.4	56.8	54.8-58.7	48.3	46.0-50.7
Females	51.6	51.5-51.8	45.7	44.3-47.0	48.2	45.5-50.9	52.4	49.8-55.0	48.4	45.4-51.4	44.3	40.6-48.0	43.2	41.3-45.2	51.7	49.3-54.0
Marital status																
Married	61.6	61.4-61.7	51.2	49.9-52.5	51.1	48.6-53.6	47.4	44.8-50.1	56.8	54.0-59.5	48.7	45.3-52.1	51.9	49.9-53.9	49.5	47.2-51.8
Divorced/widowed/separated	17.5	17.4-17.5	23.8	22.8-24.9	21.9	20.0-23.9	21.9	19.8-24.2	23.9	21.7-26.3	24.4	21.6-27.5	25.0	23.5-26.6	21.4	19.6-23.4
Never married/member of an unmarried couple	21.0	20.9-21.1	25.0	24.0-26.0	27.0	25.1-29.0	30.6	28.7-32.6	19.3	17.5-21.2	26.9	24.4-29.5	23.1	21.5-24.7	29.1	27.4-30.8
Education																
<High school	8.0	7.9-8.0	24.5	23.2-25.8	22.0	19.8-24.4	26.8	24.5-29.2	21.8	18.9-25.0	28.9	25.4-32.8	24.1	22.3-26.0	22.0	20.0-24.1
High school	30.2	30.1-30.3	33.8	32.5-35.2	35.2	32.6-37.9	43.6	41.3-46.0	34.3	31.5-37.1	33.3	29.8-36.9	32.3	30.5-34.2	34.9	32.6-37.2
Some college/technical school	28.1	28.0-28.3	26.4	25.2-27.6	27.2	24.9-29.7	20.4	18.6-22.5	26.3	24.0-28.8	26.3	23.3-29.6	25.6	23.9-27.4	28.6	26.5-30.9
College graduate	33.7	33.6-33.9	15.3	14.4-16.3	15.5	13.7-17.5	9.1	7.3-11.2	17.6	15.6-19.9	11.5	9.5-13.8	18.0	16.5-19.6	14.5	12.8-16.4
Income																
<$15K	6.7	6.6-6.8	16.9	15.9-18.1	14.2	12.5-16.0	17.3	15.6-19.2	14.7	12.8-16.8	22.1	19.0-25.4	14.8	13.5-16.2	15.5	13.9-17.1
$15K-<$35K	24.1	23.9-24.2	36.3	34.9-37.6	37.9	35.2-40.6	35.5	33.0-38.2	39.1	36.2-42.0	32.3	28.8-36.0	36.4	34.5-38.4	40.5	38.1-42.9
$35K-<$75K	33.2	33.0-33.3	24.2	23.1-25.4	23.7	21.6-26.0	21.0	18.6-23.5	23.9	21.5-26.4	25.1	22.2-28.3	23.6	21.9-25.3	24.5	22.4-26.7
≥$75K	23.5	23.3-23.6	9.9	9.1-10.7	10.6	8.9-12.5	10.0	8.5-11.7	11.7	9.2-14.8	9.2	7.4-11.4	10.5	9.4-11.8	6.7	5.7-7.9
Unknown	12.6	12.5-12.7	12.7	11.8-13.7	13.7	11.7-15.9	16.2	14.5-18.0	10.6	9.1-12.4	11.3	8.9-14.2	14.7	13.3-16.2	12.9	11.2-14.7
Employment																
Employed	63.7	63.6-63.9	56.8	55.7-58.0	54.1	51.6-56.5	54.1	51.4-56.7	59.5	57.1-62.0	55.9	52.9-58.9	57.8	56.0-59.5	56.9	54.8-58.9
Unemployed	7.8	7.7-7.9	17.1	16.1-18.2	18.7	16.6-21.1	24.3	22.1-26.7	13.0	11.4-14.8	15.7	13.2-18.6	18.9	17.3-20.5	15.9	14.3-17.8
Homemaker/student/retired	28.5	28.4-28.6	26.1	25.0-27.1	27.2	25.2-29.3	21.7	19.6-23.9	27.5	25.5-29.6	28.3	25.6-31.3	23.4	22.0-24.8	27.2	25.6-28.9
Healthcare coverage	88.6	88.4-88.7	75.9	74.8-77.1	77.8	75.6-79.8	80.0	77.9-81.8	72.2	69.2-74.9	80.0	76.9-82.8	74.6	72.8-76.3	69.6	67.5-71.5
Have personal provider[i]	82.8	82.7-82.9	71.0	69.6-72.4	73.9	71.3-76.4	66.6	64.2-69.0	72.9	69.4-76.1	68.4	64.7-71.8	73.7	71.8-75.5	63.8	61.4-66.2
Health status (good or better)	87.2	87.1-87.3	72.8	71.5-74.0	75.1	72.7-77.4	78.0	75.7-80.1	74.8	72.3-77.1	71.3	67.8-74.6	71.8	70.0-73.6	74.2	72.0-76.3
Ever told have diabetes[j]	6.0	5.9-6.1	12.4	11.4-13.4	13.0	11.3-14.9	5.7	4.5-7.2	12.6	11.1-14.3	13.4	10.9-16.4	11.3	10.1-12.7	12.6	11.2-14.2

NHW indicates non-Hispanic whites; AI/AN, American Indians/Alaska Natives; 95% CI, 95% confidence interval.

[a] Data from 50 US states including DC. Hawaii did not participate in 2004.

[b] AI/AN in Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, South Dakota, Wisconsin, and Wyoming.

[c] AI/AN in Alaska.

[d] AI/AN in Kansas, Oklahoma, and Texas.

[e] AI/AN in California, Idaho, Oregon, Washington, and Hawaii.

[f] AI/AN in Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and the District of Columbia.

[g] AI/AN in Arizona, Colorado, Nevada, New Mexico, and Utah.

[h] All prevalence estimates are weighted. Except for age group, estimates are age-adjusted to the 2000 US standard population. "Refused" and "don't know" responses are excluded.

[i] 2001-2006.

[j] Does not include those who had diabetes during pregnancy.

TABLE 2
Prevalence Estimates of Selected Chronic Disease Risk Behaviors Among American Indian/Alaska Native and Non-Hispanic White Adults: Behavioral Risk Factor Surveillance System, 2000-2006[a]

	US NHW		US AI/AN		Northern Plains[b]		Alaska[c]		Southern Plains[d]		Pacific Coast[e]		East[f]		Southwest[g]	
Behavior	**%[h]**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**
>5 servings/d of fruits and vegetables[i]	24.3	24.1-24.4	24.8	23.3-26.3	24.3	21.5-27.3	24.6	21.5-28.0	22.2	19.3-25.4	25.4	21.2-30.1	26.3	24.0-28.7	25.0	22.3-28.0
Males	19.6	19.4-19.9	21.4	19.4-23.6	21.1	17.3-25.5	24.5	20.4-29.1	19.6	15.4-24.6	20.9	15.5-27.5	23.5	20.3-26.9	20.2	16.9-24.0
Females	28.6	28.4-28.8	28.6	26.6-30.7	27.0	23.3-31.1	25.2	21.1-29.8	25.1	21.3-29.3	30.9	25.1-37.5	30.1	27.0-33.4	28.5	24.8-32.6
No leisure-time physical activity	21.5	21.4-21.6	31.0	29.8-32.3	28.8	26.4-31.2	31.7	29.3-34.3	31.4	28.8-34.0	29.9	26.5-33.6	32.9	31.1-34.8	26.9	24.9-29.0
Males	19.7	19.5-19.9	28.8	27.0-30.7	25.3	22.0-28.9	27.4	24.2-30.9	29.4	25.7-33.5	30.5	25.6-35.9	29.2	26.8-31.9	25.9	23.1-29.0
Females	23.1	22.9-23.2	33.4	31.7-35.0	31.6	28.5-34.8	35.6	32.2-39.2	33.2	30.2-36.4	29.3	25.1-33.8	37.6	35.2-40.2	28.4	25.7-31.2
Overweight (25 ≤BMI ≤29.9 kg/m^2)[j]	35.8	35.6-35.9	36.1	34.7-37.5	33.3	30.8-36.0	37.6	35.0-40.4	36.1	33.3-39.0	37.3	33.8-41.0	36.2	34.2-38.3	36.6	34.3-39.0
Males	45.0	44.8-45.2	39.8	37.8-41.8	36.4	32.6-40.4	43.1	39.3-47.0	38.3	34.1-42.6	41.9	36.9-47.0	40.8	37.9-43.8	41.1	37.7-44.7
Females	26.9	26.7-27.1	31.7	29.9-33.5	30.6	27.5-33.9	32.8	29.3-36.5	34.0	30.3-37.8	31.8	27.1-36.9	30.3	27.9-32.8	33.2	30.1-36.4
Obese (BMI ≥30.0 kg/m^2)[j]	20.9	20.7-21.0	29.6	28.3-30.9	31.5	29.0-34.2	29.4	27.1-31.9	32.1	29.4-34.9	33.0	29.5-36.6	24.8	23.1-26.5	29.6	27.5-31.8
Males	22.4	22.2-22.6	30.2	28.3-32.2	32.3	28.6-36.3	25.0	21.9-28.4	35.6	31.3-40.1	34.1	29.2-39.4	24.2	22.0-26.6	29.2	26.1-32.4
Females	19.3	19.1-19.4	28.8	27.2-30.5	30.6	27.7-33.8	33.6	30.2-37.2	28.2	25.2-31.3	31.6	27.2-36.4	25.4	23.2-27.8	29.7	27.0-32.6
Binge drinker[k]	16.6	16.5-16.7	17.7	16.5-19.0	19.9	17.6-22.4	18.7	16.7-20.9	17.6	15.1-20.5	17.8	14.9-21.2	16.9	15.2-18.9	16.4	14.5-18.5
Males	24.0	23.7-24.2	24.9	23.0-27.0	27.5	23.6-31.7	22.4	19.2-26.0	25.1	21.1-29.6	24.9	20.3-30.1	23.7	21.0-26.7	25.5	22.4-29.0
Females	9.3	9.2-9.5	8.5	7.6-9.6	11.0	9.0-13.3	15.2	12.9-17.8	9.5	7.2-12.6	7.9	5.7-10.9	7.4	6.0-9.1	7.5	5.8-9.6
Heavy drinker[l]	6.0	5.9-6.1	6.4	5.6-7.3	5.1	4.1-6.3	5.0	4.0-6.3	7.8	6.0-10.2	5.7	3.9-8.2	7.2	6.0-8.7	5.4	4.4-6.7
Males	6.7	6.5-6.8	8.8	7.5-10.4	6.3	4.8-8.3	4.9	3.6-6.8	10.2	7.3-13.9	8.5	5.6-12.8	9.8	7.8-12.2	7.5	5.9-9.5
Females	5.3	5.2-5.4	3.5	2.9-4.1	3.6	2.5-5.1	5.0	3.7-6.9	5.0	3.3-7.6	2.0	1.2-3.5	3.6	2.7-4.8	3.3	2.2-5.0
Current smoker[m]	22.8	22.7-22.9	31.1	29.9-32.4	40.2	37.6-42.8	40.0	37.6-42.3	33.2	30.5-36.1	22.4	19.6-25.5	36.5	34.5-38.4	21.1	19.3-23.1
Males	23.5	23.3-23.7	34.4	32.5-36.4	43.1	39.1-47.3	43.9	40.6-47.3	33.7	29.7-38.1	25.7	21.4-30.5	40.9	38.1-43.9	25.4	22.6-28.4
Females	22.1	21.9-22.3	27.2	25.9-28.7	37.7	34.5-41.0	36.7	33.5-39.9	32.7	29.2-36.3	18.4	15.3-21.9	30.3	28.2-32.6	17.1	14.8-19.6
Former smoker[m]	25.8	25.7-25.9	23.5	22.4-24.7	24.3	22.1-26.6	28.6	26.2-31.0	19.8	17.8-21.9	28.4	25.2-31.9	21.6	20.1-23.2	21.9	19.9-24.1
Males	29.8	29.6-30.0	27.0	25.3-28.8	26.7	23.3-30.2	30.1	26.8-33.6	24.2	21.0-27.7	31.5	26.9-36.5	24.6	22.3-27.0	28.0	25.1-31.1
Females	22.7	22.6-22.9	19.9	18.4-21.4	21.7	19.1-24.5	27.4	24.3-30.7	15.7	13.7-18.0	24.3	20.3-28.9	18.4	16.6-20.3	16.7	14.2-19.5
Never smoked[m]	51.4	51.2-51.5	45.3	44.0-46.7	35.5	32.9-38.3	31.5	29.1-33.9	47.0	44.0-49.9	49.1	45.4-52.8	42.0	40.0-44.0	56.9	54.5-59.4
Males	46.7	46.5-46.9	38.6	36.6-40.6	30.2	26.5-34.2	26.0	23.0-29.2	42.1	37.7-46.6	42.8	37.5-48.1	34.5	31.8-37.3	46.6	43.2-50.1
Females	55.2	55.0-55.4	52.9	51.1-54.7	40.6	37.2-44.0	36.0	32.7-39.3	51.6	48.1-55.2	57.3	52.4-62.1	51.2	48.7-53.8	66.3	63.0-69.4

NHW indicates non-Hispanic whites; AI/AN, American Indians/Alaska Natives; 95% CI, 95% confidence interval.

[a] Data from 50 US states including DC. Hawaii did not participate in 2004.

[b] AI/AN in Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, South Dakota, Wisconsin, and Wyoming.

[c] AI/AN in Alaska.

[d] AI/AN in Kansas, Oklahoma, and Texas.

[e] AI/AN in California, Idaho, Oregon, Washington, and Hawaii.

[f] AI/AN in Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and the District of Columbia.

[g] AI/AN in Arizona, Colorado, Nevada, New Mexico, and Utah.

[h] All prevalence estimates are weighted and age-adjusted to the 2000 US standard population. "Refused" and "don't know" responses are excluded.

[i] 2000-2003, 2005.

[j] In individuals aged ≥20 years.

[k] 2001-2005; ≥5 drinks on 1 occasion within the past 30 days.

[l] 2001-2006: Males, >2 drinks/day within past 30 days; females: >1 drinks/day within past 30 days.

[m] Smoking is defined as having smoked at least 100 cigarettes (5 packs) in entire life.

No leisure-time physical activity

Overall, AI/ANs had higher prevalence estimates of no leisure-time physical activity than NHWs (31% and 21.5%, respectively). Among both populations, females reported higher percentages of no physical activity than males; the gender pattern persisted for 5 regions.

Obese/overweight

The overall prevalence of being overweight was higher for NHW males (45%) than for AI/AN males (39.8%); the opposite was true for females (31.7% for AI/ANs vs 26.9% for NHWs). Overweight was more common among males than females, regardless of race or region. By region, approximately 33% or more of AI/ANs were overweight. Prevalence estimates of obesity were higher among AI/ANs overall (29.6%) and in each region compared with NHWs (20.9%). Overall, the prevalence of obesity was higher among males for both NHWs and AI/ANs.

Alcohol consumption

Overall, the prevalence of binge drinking was 17.7% among AI/ANs and 16.6% among NHWs. Regionally, the prevalence of binge drinking for AI/AN males ranged from 22.4% in Alaska to 27.5% in the Northern Plains. Estimates for AI/AN females ranged from 7.4% in the East to 15.2% in Alaska. The overall prevalence of heavy drinking was 6.4% among AI/ANs and 6% among NHWs; the prevalence among AI/AN males (8.8%) was higher than among NHW males (6.7%), but the reverse was true for females (3.5% for AI/ANs and 5.3% for NHWs). Regionally, estimates of heavy drinking among AI/AN males ranged from 4.9% in Alaska to 10.2% in the Southern Plains. Among AI/AN females, estimates ranged from 2% in the Pacific Coast to 5% in Alaska and the Southern Plains.

Tobacco use

Overall, the prevalence of current smokers was higher among AI/ANs (31.1%) than among NHWs (22.8%); for both populations, males had a higher prevalence than females. Regionally, the overall prevalence of current smoking among AI/ANs ranged from 21.1% in the Southwest to 40.2% in the Northern Plains and 40% in Alaska. Overall estimates for AI/ANs in 4 of 6 regions exceeded those for NHWs. Among former smokers, the overall estimates were higher for NHWs (25.8%) than for AI/ANs (23.5%). By region, overall estimates of former smokers among AI/ANs ranged from 19.8% in the Southern Plains to 28.6% in Alaska. Among individuals who never smoked, the overall prevalence was lower for AI/ANs (45.3%) than for NHWs (51.4%). Regional overall estimates for AI/ANs who never smoked were highest for the Southern Plains (47%), Pacific Coast (49.1%), and Southwest (56.9%). AI/AN females in the Southwest had the highest estimate of individuals who never smoked (66.3%) regardless of region, gender, or race.

Use of Cancer Screening Tests

Overall, the prevalence of mammography use was higher among NHW females (76%) compared with AI/AN females (69.4%) (Table 3). Although AI/AN females in Alaska had nearly the same prevalence as NHW females (approximately 76%), AI/AN females in all of the other regions had lower estimates. AI/AN females in Alaska had a higher prevalence of Pap testing (87.5%) than NHW females (84%); however, AI/AN females in the other 5 regions had lower estimates than NHW females. The prevalence of use of the prostate-specific antigen (PSA) test among males ages 50 to 75 years was higher among NHWs (58%) than among AI/ANs (48.4%); regionally, the estimates among AI/ANs ranged from 28.7% in Alaska to 54.9% in the Southern Plains. Overall, NHWs were more likely to have undergone FOBT or endoscopic testing than AI/ANs (53.8% vs 44%, respectively). By region, the prevalence among AI/AN males and females combined ranged from 36.6% in the Pacific Coast to approximately 49% in Alaska and the East.

DISCUSSION

The current findings revealed that disparities in healthcare access, health status indicators, cancer risk factors and use of cancer screening tests between AI/ANs and NHWs in the US persist. In addition, AI/ANs reported lower incomes and educational attainment and higher unemployment than NHWs. There was substantial variation, however, in the prevalence of these risk factors and socioeconomic indicators among AI/ANs in different IHS regions. Furthermore, although these indicators contribute to disparities in health outcomes, a majority of AI/ANs reported that they considered themselves to be in good or better health.

Having health insurance and a personal healthcare provider are important indicators of access to health services.[19] Individuals without health insurance also are more likely not to have a personal healthcare provider.[19] Compared with NHWs, all AI/ANs in our analysis reported lower levels of health insurance coverage and access to a personal healthcare provider. One reason for these disparities may be that some AI/ANs do not identify the IHS as their

TABLE 3
Prevalence Estimates of Use of Cancer Screening Tests Among American Indian/Alaska Native and Non-Hispanic White Adults: Behavioral Risk Factor Surveillance System, 2000-2006[a]

	US NHW		US AI/AN		Northern Plains[b]		Alaska[c]		Southern Plains[d]		Pacific Coast[e]		East[f]		Southwest[g]	
Screening Test	**%[h]**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**
Mammography within 2 y, females aged ≥40 y[i]	76.0	75.8-76.3	69.4	66.7-71.9	67.9	62.3-73.1	75.9	69.6-81.2	66.4	60.5-71.8	69.9	61.8-76.8	71.2	67.2-74.9	66.3	60.5-71.7
Papanicolaou (Pap) test within 3 y, females without hysterectomy[i]	84.0	83.8-84.2	78.0	75.8-80.1	80.4	76.3-84.0	87.5	84.5-90.1	74.5	69.9-78.5	77.7	71.6-82.8	78.3	74.9-81.3	79.6	75.9-82.9
Prostate-specific antigen test within 1 y, males ages 50-75 y[j]	58.0	57.6-58.5	48.4	43.0-53.7	44.9	35.5-54.7	28.7	19.4-40.2	54.9	44.3-65.0	49.0	35.2-62.9	49.7	42.9-56.6	41.5	33.7-49.7
Fecal occult blood test within 1 y or endoscopy within 5 y, aged ≥50 y[j]	53.8	53.6-54.1	44.0	40.8-47.2	43.4	37.4-49.6	49.4	42.8-56.1	44.5	39.1-50.1	36.6	28.9-45.0	49.1	44.8-53.4	37.6	32.8-42.7
Males	55.8	55.3-56.2	45.0	40.3-49.7	34.9	27.0-43.7	42.9	33.6-52.6	43.4	35.8-51.3	37.6	26.7-49.8	54.2	48.1-60.2	35.8	29.4-42.9
Females	52.4	52.1-52.7	43.6	39.5-47.8	50.9	43.0-58.7	55.1	46.0-63.8	45.3	38.2-52.6	36.2	26.1-47.8	44.5	39.3-49.8	39.7	32.8-47.0

NHW indicates non-Hispanic whites; AI/AN, American Indians/Alaska Natives; 95% CI, 95% confidence interval.

[a]Data from 50 US states including DC. Hawaii did not participate in 2004.

[b]AI/AN in Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, South Dakota, Wisconsin, and Wyoming.

[c]AI/AN in Alaska.

[d]AI/AN in Kansas, Oklahoma, and Texas.

[e]AI/AN in California, Idaho, Oregon, Washington, and Hawaii.

[f]AI/AN in Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and the District of Columbia.

[g]AI/AN in Arizona, Colorado, Nevada, New Mexico, and Utah.

[h]All prevalence estimates are weighted and age-adjusted to the 2000 US standard population. "Refused" and "don't know" responses are excluded.

[i]2000, 2002, 2004, and 2006.

[j]2001, 2002, 2004, and 2006.

insurer. In 1998, the Census Bureau, in consultation with the Bureau of Indian Affairs, reclassified individuals who reported the IHS as their only source of insurance coverage as uninsured in the Current Population Survey.[20] Zuckerman et al reported that up to 16% of all AI/ANs identified the IHS as their only source of healthcare coverage,[14] 89% of whom were able to identify a usual source of care, similar to NHWs (90%) and AI/ANs with health insurance (89%). The main difference noted in the services that these 3 groups received was in preventive care, which lagged for AI/ANs who were served by the IHS compared with insured whites and AI/ANs.

Overall, AI/ANs reported a higher prevalence of diabetes than NHWs. This is important, because diabetes is an emerging risk factor for developing cancer.[21-23] Similar to what was reported by Mohatt et al, who examined diabetes mellitus among AI/ANs in Alaska in different communities,[24] we observed that AI/ANs in Alaska reported the lowest estimates for this condition. Researchers in Alaska who have surveyed AI/ANs in the state have observed diabetes prevalence estimates similar to ours and proposed that this may be caused by dietary and other lifestyle factors among this population.[25] For example, many AI/ANs in Alaska continue to eat a diet rich in omega 3 fatty acids, which may be protective against developing many chronic diseases.[26] Increases in the prevalence of diabetes are expected to occur similar to other subpopulations in the Southwestern US as they adopt a more Western lifestyle and diet.[27] The prevalence is increasing faster in Alaska than in the continental US.[28]

Fruit and vegetable consumption among NHWs and AI/ANs was low. Further analysis of those who do not meet the daily fruit and vegetable recommendations indicated that more AI/ANs than NHWs eat only 1 or 2 servings a day (data not shown). Some of the low prevalence estimates may be attributed in part to the development of the AI/AN population in the 20th century, which was accompanied by decreases in foods that were commonplace in traditional diets (eg, fruits and vegetables) paired with increases in consumption of foods that were characteristic of more Western diets (eg, high-fat food).[29] The accessibility to fresh produce and limited refrigeration options may contribute to the low fruit and vegetable consumption.[30] In addition, the commodity food sources that are made available to low-income American Indian households on a reservation, in designated areas near a reservation, or in Oklahoma through the US Department of Agriculture (http://www.fns.usda.gov/fdd/programs/fdpir/ accessed on March 5, 2008) are high in fat and energy.[30] Although qualitative rather than quantitative assessments of AI/AN diets are more prevalent in the literature, quantitative nutritional assessments among several tribes have demonstrated that their diets are similar to those of other Americans.[29] Most quantitative measurements have been modified to include foods that are part of traditional AI/AN diets.[31-33]

Coupled with low fruit and vegetable consumption were low levels of physical activity among AI/AN adults. There is little literature on leisure-time physical activity levels of AI/AN adults. One review, however, indicated that age, gender, and social support are important correlates for physical activity.[34] The National Cancer Institute-funded Education and Research Towards Health Study, which will examine the relation of selected risk factors among AI/AN adults on the development of disease, includes a list of major physical activities that are performed by AI/ANs.[33] The leisure-time physical activity levels for AI/ANs may be underestimated, because they include a list of general activities (eg, walking or bicycling for moderate activities; running or aerobics for vigorous activities) rather than activities that are specific to the culture or tribe, such as pow-wow dancing.

The higher prevalence estimates of obesity are indicative of low levels of physical activity and consumption of high caloric foods. Although a similar pattern is observed in many adults in the US, some researchers believe that the "thrifty genotype" hypothesis originally suggested by Neel[35] may explain why AI/ANs are more prone to diabetes mellitus and other chronic conditions and diseases.[36-38] Slattery et al reported that transitioning from a traditional diet high in animal protein and subject to seasonal food shortages to a more Western diet may have harmful effects in the presence of a thrifty gene.[36] They indicated that, with the adoption of a more Western diet high in carbohydrates and refined sugars, the mechanism that fostered survival may now be responsible for obesity, diabetes, heart disease, and cancer. Other researchers have challenged the thrifty gene hypothesis and its use to explain healthcare disparities.[39-41] Irrespective of the hypothesis, the prevalence of obesity among different tribes is widespread, and appropriate interventions to curb childhood obesity are needed, because the eating habits and physical activity practices established in childhood may be carried into adulthood.[30]

We observed that patterns of alcohol abuse varied by region, population, and gender. Compared with NHW males, the prevalence of binge drinking was higher among AI/AN males overall and among those in 4 regions. A similar pattern was observed for heavy drinking, with higher prevalence estimates

among AI/AN males overall and males in 5 regions than among NHW males. Most AI/AN females had lower prevalence estimates of heavy drinking than NHW females; however, binge drinking was higher among AI/AN females in 3 regions compared with NHW females and with AI/AN females overall. These disparities may be explained in part by economic, social, and political factors.[42] Culturally appropriate educational programs for young families and younger individuals should be geared to prevent cycles of alcohol abuse. Studies have demonstrated that a positive family history of alcoholism increases the risk of alcohol abuse in children and adolescents.[43-45]

Overall, AI/AN males and females were more likely to be current smokers and were less likely to be former or never smokers compared with their NHW counterparts. However, regional variation in smoking-related variables was substantial, especially among AI/AN females. AI/AN adults and younger individuals in Alaska, which we found has one of the highest prevalence estimates of current smokers, reportedly use a homemade form of smokeless tobacco called *iqmik* extensively.[46] The use and safety of homemade tobacco should be addressed in new and existing programs to prevent the use of tobacco among adults as well as youths. A distinction should be made in interventions, however, between recreational smoking and the sacred use of tobacco.[47] Although we did not analyze data on exposure to environmental tobacco smoke and on smokeless tobacco use, both of these topics should be included in prevention education. Cigarette smoking and exposure to secondhand smoke are well established risk factors for lung cancer.[48-50]

Our regional analysis revealed that most females had achieved or were close to achieving the Healthy People 2010 objective for mammography use (ie, 70% of females aged $\geq$40 years received a mammogram within the preceding 2 years), but fewer were close to achieving the objective for use of the Pap test (ie, 90% of females aged $\geq$18 years had a Pap test within the preceding 3 years).[51] Although our mammography estimates are consistent with the findings reported for AI/AN females in other studies,[10,52,53] we observed a lower prevalence of Pap testing than many researchers.[4,10,52,53] Less data have been published on the use of colorectal and prostate cancer testing among AI/ANs. Other researchers have reported, as we did, that the rates of colorectal cancer testing among AI/ANs are lower than the rates among whites.[12,53] One study also indicated that AI/AN males were less likely than NHW males to have a PSA test.[53]

A major strength of the current report is the regional analysis. Our sample size was large enough to examine geographic differences in health behaviors among AI/ANs that are obscured in national estimates for these populations. We chose to use region as the unit of analysis rather than Contract Health Service Delivery Area (CHSDA), the unit used in the incidence reports in the supplement, to maximize the sample size. Data from 16 states and the District of Columbia would have been excluded had we used CHSDA counties. When we compared our prevalence estimates with those obtained using CHSDA counties, however, the data were similar. These data are available online (available at: http://www.cdc.gov/cancer/healthdisparities/what_cdc_is_doing/aiansupplement.htm).

Our findings are also subject to limitations. First, because participation in the BRFSS requires a landline telephone, the survey may not be representative of individuals who cannot afford telephones. A National Telecommunications and Information Administration report that was released in 1998 revealed that only 76.4% of rural-dwelling AI/AN households had telephones compared with 95% of all white households.[54] Studies have indicated that AI/AN individuals without landlines are more likely to be less educated, to have lower income, and to be unemployed.[55-57] A second limitation is the decreased availability of landlines as a sampling frame as wireless telephone usage increases. In response to this challenge, BRFSS is exploring other methods of conducting national surveillance.[58] Third, BRFSS data are self-reported and subject to recall bias. Studies have concluded, however, that the survey findings are reliable and valid.[59,60] BRFSS also does not differentiate tribal affiliation or reservation residency, nor does it inquire about the reasons for having cancer screening tests. Another limitation of our analysis is that comparisons of risk behaviors and use of cancer screening tests are descriptive, and no statistical testing is inferred.

The elimination of health disparities among subpopulations in the US population is one of the cross-cutting goals of Healthy People 2010. Although cancer risk factors among the AI/AN population vary by region, the gap between their risk for adverse health outcomes and that of the NHW population is substantial and persistent. We hope the data in this report will be used by policy makers, researchers, and community leaders to develop and refine culturally relevant programs to reduce risk factors for cancer among AI/ANs.

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