

Cancer-Related Disparities and Opportunities for Intervention in Northern Plains American Indian Communities

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ABSTRACT

Objectives. We examined behavioral trends associated with cancer risk and cancer screening use from 1997 through 2006 among American Indians/Alaska Natives (AI/ANs) in the Northern Plains region (North Dakota, South Dakota, Nebraska, and Iowa) of the United States. We also examined disparities between that population and non-Hispanic white (NHW) people in the Northern Plains and AI/ANs in other regions.

Methods. We analyzed Behavioral Risk Factor Surveillance System data from the Centers for Disease Control and Prevention for 1997–2000 and 2003–2006. We used age-adjusted Wald Chi-square tests to test the difference between these two periods for AI/ANs and the difference between AI/ANs and NHW people during 2003–2006.

Results. There was no statistically significant improvement among AI/ANs in the Northern Plains region for behaviors associated with cancer risk or cancer screening use, and there was a significant increase in the obesity rate. The prevalence of binge drinking, obesity, and smoking among AI/ANs in the Northern Plains was significantly higher than among NHW people in the same region and among AI/AN populations in other regions. Although the percentage of cancer screening use was similar for all three groups, the use of sigmoidoscopy/colonoscopy was significantly lower among the Northern Plains AI/ANs than among NHW people.

Conclusion. These results indicate a need for increased efforts to close the gaps in cancer health disparities between AI/ANs and the general population. Future efforts should focus not only on individual-level changes, but also on system-level changes to build infrastructure to promote healthy living and to increase access to cancer screening.

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American Indians/Alaska Natives (AI/ANs) who live in the Northern Plains region of the United States have disproportionate cancer disparities. In all regions of the country combined, the cancer incidence rate is lower among AI/ANs (368.4 per 100,000 population) than among non-Hispanic white (NHW) people (457.9 per 100,000 population). However, in the Northern Plains, AI/ANs have a higher cancer incidence rate (538.1 per 100,000 population) than do NHW people (464.8 per 100,000 population). Northern Plains AI/AN men and women also have the highest and second highest cancer incident rates, respectively, within the AI/AN population in the U.S.¹ Moreover, Northern Plains AI/ANs have the highest cancer mortality rate among the AI/AN population nationally (275.5 per 100,000 population), a higher rate than for all races combined in the U.S. (200.9 per 100,000 population).² Northern Plains AI/ANs, when compared with their NHW counterparts in the region and in the U.S., have an elevated risk of developing and/or dying from lung, colorectal, breast, cervical, and prostate cancers.²⁻⁷ Liver, kidney, stomach, cervical, and gallbladder cancers that are relatively rare among NHW people are more prevalent among AI/ANs.⁸⁻¹⁰ Further, AI/ANs in the Northern Plains and other regions are more likely to be diagnosed at a late stage for breast, cervical, colorectal, and prostate cancers than are NHW people.^{4,5,7,8,11}

About 80% of cancers are attributable to environmental and lifestyle factors.^{12,13} Regional variations in cancer risk within the AI/AN population and variations between AI/AN and other population groups may be due in part to differences in behavioral risk factors such as tobacco and alcohol use, lack of physical activity, and obesity.¹⁴⁻¹⁶

There is a well-established link between voluntary and involuntary commercial tobacco exposure and cancers of the lung, larynx, oral cavity and pharynx, esophagus, pancreas, bladder, cervix, and gastrointestinal systems, as well as acute myeloid leukemia.^{17,18} Chronic alcohol consumption is another important risk factor for the development of various types of cancers, including cancers of the organs and tissues of the respiratory tract and upper digestive tract, liver, colorectum, and breast.^{19,20} Excessive and prolonged use of alcohol is a strong risk factor for cancer in the upper aerodigestive tract.^{21,22} Excessive alcohol use is also a major risk factor for hepatocarcinogenesis²³ and alcohol-related liver cancer that primarily develops in people with liver cirrhosis resulting from chronic excessive alcohol consumption.¹⁹ Although the risk for alcohol-related colorectal and breast cancer is smaller than for upper aerodigestive tract cancer, alcohol is still likely an important risk factor because

of the high prevalence of alcohol use in the U.S.^{19,21,24,25} Moreover, synergistic effects of alcohol and smoking have been noted for cancers of the esophagus, head, and neck.²⁶⁻²⁹

Obese individuals are at higher risk of developing post-menopausal breast cancer; cancers of the endometrium, colon, and kidney; and malignant adenomas of the esophagus.²⁰ Recent studies also suggest that obesity may be linked to other types of cancer, including pancreatic, hepatic, and gallbladder. Possible mechanisms that relate obesity to cancer risk include insulin resistance and chronic hyperinsulinemia (tissue inflammation mediated by adipose tissue), although the underlying mechanisms for the increased cancer risk as a result of obesity are not clearly understood.^{20,30}

Epidemiologic research provides evidence for the effects of physical activity in reducing cancer risk.³¹⁻³³ For example, on average, moderate-intensity or greater physical activity can reduce the risk of developing breast cancer by 20%–30%³⁴⁻³⁷ and colon cancer by 30%–40%.^{31,38} Strong evidence exists to support the theory that a diet high in fruit, vegetables, and fiber-rich foods and low in processed foods and red meats may reduce the risk of developing gastrointestinal cancers (e.g., cancers of the stomach, colon, and rectum).³⁹⁻⁴³

In 2005, the Northern Plains Comprehensive Cancer Control Program (NPCCCP) was established by the Great Plains Tribal Chairmen's Health Board (GPTCHB, formerly the Aberdeen Area Tribal Chairmen's Health Board) to address cancer disparities among AI communities in the four-state Northern Plains region (North Dakota, South Dakota, Iowa, and Nebraska), which is served by the GPTCHB. In 2007, the Northern Plains Tribal Cancer Data Initiative was developed to improve access to cancer data. As part of the initiative, an analysis of the Centers for Disease Control and Prevention's (CDC's) Behavioral Risk Factor Surveillance System (BRFSS) data was proposed to evaluate the patterns and trends of behaviors associated with cancer risk and screening behaviors among AI/ANs residing in the four-state Northern Plains region.

Our study addressed two questions: (1) Did behaviors associated with cancer risk and screening use among AI/ANs residing in the Northern Plains improve from 1997 through 2006? and (2) What is the extent of the disparities in behaviors associated with cancer risk and cancer screening use among AI/ANs in the Northern Plains, NHW people in the Northern Plains, and AI/ANs in other regions? In this article, we report findings from our analysis of national and regional BRFSS data to answer these questions. In addition, we

discuss strategies to reduce cancer disparities in the AI/AN population.

METHODS

Data source

We analyzed BRFSS data for 1997–2000 and 2003–2006. The BRFSS survey is a state-based, cross-sectional, random-digit-dialed telephone survey of the U.S. non-institutionalized, civilian population aged 18 years and older regarding risk behaviors and preventive health practices that affect health status. Telephone survey data collected from each state are sent to CDC, which uses post-stratification weights to correct for bias by non-telephone coverage, to adjust for differences in probability of selection, to reduce bias due to non-response, and to reflect each respondent's probability of selection compared with the age- and gender-specific population of a given state. Further detailed information on the BRFSS is available from the CDC website.⁴⁴ For this study, BRFSS data from the 50 states were downloaded from the CDC website. We defined the Northern Plains region as including Iowa, Nebraska, South Dakota, and North Dakota. A total of 17 tribes and one service area in these four states are served through the NPCCCP operated by the GPTCHB.

Variables used

Sociodemographic variables. Non-Hispanic respondents who indicated AI or AN as their primary or only race/ethnicity were categorized as AI/AN. Similarly, non-Hispanic respondents who indicated Caucasian as their primary or only race were categorized as NHW. We also examined gender and age (18–44 years, 45–64 years, and ≥ 65 years). We classified employment status into employed, not employed, student, and retired. The “employed” category included employed for wages and self-employed, and the “not employed” category included those out of work for more than one year, those out of work for less than one year, homemakers, and those unable to work.

Education was classified as less than a high school education, and high school diploma and higher education. Household income in the year before the survey was grouped into $< \$25,000$ and $\geq \$25,000$. Residence was classified into urban and rural based on the Urban Influence Codes. Urban areas include large (metropolitan area with at least one million residents), small (metropolitan area with fewer than one million residents), micropolitan area adjacent to a large metropolitan area, noncore adjacent to a small metropolitan area, and micropolitan area adjacent to a small metropolitan area. All others were coded as rural.

Access to health care was evaluated using two variables. Respondents aged 18–64 years were asked if they had health insurance coverage at the time of the interview. Respondents were also asked whether they had a personal doctor. The question about a personal doctor differed across years. In 1997 and 1998, the question was, “Is there one particular clinic, health center, doctor's office, or other place that you usually go to if you are sick or need advice about your health?” In other years (2000, 2003, 2004, 2005, and 2006), the question was, “Do you have one person you think of as your personal doctor or health-care provider?” The question about a personal doctor was not included in the 1999 BRFSS survey.

Behaviors associated with cancer risk and screening use.

Behaviors associated with cancer risk were selected based on the *Healthy People 2010* health indicators available in the BRFSS. In 2006, CDC changed the definition of binge drinker from “having five or more drinks on one occasion” for both men and women to “men having five or more drinks on one occasion and women having four or more drinks on one occasion.” To compare two time periods, we used the pre-2006 definition (having five or more drinks on one occasion) for both men and women. Heavy drinking was defined as men having more than two drinks per day and women having more than one drink per day. Obesity was defined as body mass index ≥ 30 kilograms/meter squared. Current smoking status was defined as smoking more than 100 cigarettes during one's lifetime and currently smoking on some days or every day. An optimal level of vegetable and fruit intake was defined as daily consumption of at least five servings. Physical activity engagement was defined as engaging in physical activity outside of work.

The screening tests examined in this study were clinical breast exam in the past two years among women aged ≥ 40 years, mammogram in the past two years among women aged ≥ 40 years, Papanicolaou (Pap) smear in the past three years among women aged ≥ 18 years (those who had had a hysterectomy and those who were pregnant were excluded in the analysis of Pap smear), prostate-specific antigen test in the past year among men aged ≥ 50 years, digital rectal exam in the past five years among men aged ≥ 50 years, fecal occult blood test in the past year among individuals aged ≥ 50 years, and sigmoidoscopy or colonoscopy in the past five years among those aged ≥ 50 years.

Statistical analysis

After multiple-year data were combined, we used SUDAAN[®] version 9.0.1⁴⁵ to estimate coefficients and standard errors to accommodate the major features of

this survey sample design. Respondents who refused to answer, had a missing answer, or did not know the answer to a question were excluded from our analysis for that specific question.

To examine whether risk behaviors and screening use had improved among Northern Plains AI/ANs from 1997 through 2006, we analyzed aggregated four-year BRFSS data for 1997–2000 and for 2003–2006 to obtain sufficient sample sizes for these two time periods. We used the age-adjusted Wald Chi-square test to test the difference between these two periods for AI/ANs and NHW people in the four-state Northern Plains region. To examine the current status of cancer disparities among Northern Plains AI/ANs, we used the 2003–2006 BRFSS data to compare the prevalence of behaviors associated with cancer risk and cancer screening use between AI/ANs and NHW people in the Northern Plains region and between AI/ANs in the Northern Plains region and AI/ANs in the other regions combined (all states except North Dakota, South Dakota, Nebraska, and Iowa). We used the age-adjusted Wald Chi-square test to test the difference. All tests were two-sided tests.

RESULTS

Unweighted percentages in Table 1 show the demographic characteristics of AI/ANs and NHW people in the Northern Plains who responded to the 1997–2000 and 2003–2006 BRFSS. Northern Plains AI/ANs had lower educational and income levels and less access to health care than NHW people in the same region and AI/ANs in other regions combined in 2003–2006 (Table 2). These differences were statistically significant after adjusting for age.

Did behaviors associated with cancer risk and screening use among AI/ANs and NHWs residing in the Northern Plains improve from 1997 through 2006?

Table 3 shows results of age-adjusted Wald Chi-square tests to compare the prevalence of behaviors associated with cancer risk and cancer screening use between the two time periods for AI/ANs and NHW people residing in the Northern Plains. Among AI/ANs, there were no statistically significant differences in behaviors associated with cancer risk between the two time periods, except for obesity, which worsened. The percentage of obese adults increased from 32.1% in 1997–2000 to 40.5% in 2003–2006 ($p=0.02$). Among NHW people, significant improvements were seen for leisure-time physical activity and smoking, as well as mammogram, sigmoidoscopy, and colonoscopy use;

obesity significantly worsened; and no significant difference was seen in other areas.

What is the extent of the disparities in behaviors associated with cancer risk and cancer screening use between AI/ANs in the Northern Plains and NHW people in the Northern Plains and AI/ANs in other regions?

Table 4 shows the age-adjusted Chi-square test results for the comparison of current behaviors associated with cancer risk and screening use between AI/ANs and NHW people in the Northern Plains and between AI/ANs in the Northern Plains and AI/ANs in other U.S. regions. The 2003–2006 BRFSS data show that, compared with NHW people in the Northern Plains region, a significantly higher percentage of AI/ANs in the same region were obese, had no leisure-time physical activity, and were current smokers. Compared with AI/ANs in other U.S. regions, a significantly higher percentage of AI/ANs in the Northern Plains were obese, were current smokers, and consumed fewer than five servings of fruit and vegetables per day. The percentage of people who had had a clinical breast exam, mammogram, and sigmoidoscopy or colonoscopy was significantly lower among AI/ANs than among NHW people in the Northern Plains. The percentage of cancer screening test use was similar between AI/ANs in the Northern Plains and AI/ANs in other regions, except that a significantly higher percentage of AI/ANs in the Northern Plains had had a Pap smear test within the past three years than AI/ANs in other regions ($p=0.02$)

DISCUSSION

Study implications

Previous research has documented health disparities among AI/ANs in an 11-state Northern Plains region,⁴⁶ but to our knowledge, this is the first study to examine the trend in behaviors associated with cancer risk and screening use among AI/ANs residing in a four-state Northern Plains region. We found a striking lack of improvement in behaviors associated with cancer risk and cancer screening among AI/ANs in the Northern Plains region from 1997 through 2006. This trend may contribute to current cancer disparities between AI/ANs and NHW people in the region—disparities that may continue unless effective measures are taken. As discussed previously, the Northern Plains AI/ANs suffer from a significantly higher incidence of cancers than NHW people. In addition, the mortality rate from four screenable cancers examined in this study, with the exception

of breast cancer, was significantly higher among AI/ANs than their NHW counterparts.²

This study shows that compared with NHW people in the Northern Plains, AI/ANs in the same region have a significantly higher prevalence of behaviors associated with cancer risk, including drinking, obesity, smoking, and inadequate intake of fruit and vegetables. These data may explain the presence of cancer disparities indicated by higher overall cancer incidence rates and higher incidence rates for selected cancers in this population.¹

The study also shows a significantly lower rate of clinical breast exam, mammogram use, and sigmoidoscopy/colonoscopy use among AI/ANs in the Northern Plains region compared with their NHW counterparts. Previous studies have found that Northern Plains AI/ANs in an 11-state region had a higher proportion of late-stage diagnosis of breast, colorectal, cervical, and prostate cancer than their NHW counterparts.^{4,5,7,8} However, the difference in the proportion of late-stage diagnosis of breast cancer among women aged ≥ 65 years in those same populations was much smaller,

Table 1. Characteristics of Northern Plains^a BRFSS NHW and AI/AN respondents in two time periods: 1997–2000 and 2003–2006^b

Characteristics	1997–2000		2003–2006	
	NHW people (n=43,765) N (percent)	AI/AN people (n=867) N (percent)	NHW people (n=83,182) N (percent)	AI/AN people (n=2,334) N (percent)
Gender				
Male	17,779 (40.6)	339 (39.1)	33,305 (40.0)	890 (38.1)
Female	25,986 (59.4)	528 (60.9)	49,877 (60.0)	1,444 (61.9)
Age (in years)				
18–44	19,841 (45.3)	530 (61.1)	27,943 (33.6)	1,203 (51.5)
45–64	12,876 (29.4)	242 (27.9)	31,451 (37.8)	793 (34.0)
≥ 65	10,878 (24.9)	91 (10.5)	23,277 (28.0)	328 (14.1)
Missing	170 (0.4)	4 (0.5)	511 (0.6)	10 (0.4)
Education				
\leq High school	19,802 (45.3)	473 (54.6)	34,509 (41.5)	1,207 (51.7)
Some college	13,189 (30.1)	266 (30.7)	23,986 (28.8)	729 (31.2)
College degree	10,694 (24.4)	126 (14.5)	24,561 (29.5)	394 (16.9)
Missing	80 (0.2)	2 (0.2)	126 (0.2)	4 (0.2)
Household income				
<\$25,000	13,545 (31.0)	468 (54.0)	20,826 (25.0)	1,230 (52.7)
\geq \$25,000	24,599 (56.2)	304 (35.1)	52,226 (62.8)	873 (37.4)
Missing	5,621 (12.8)	95 (11.0)	10,130 (12.2)	231 (9.9)
Employment ^c				
Employed	28,194 (64.4)	499 (57.6)	52,592 (63.2)	1,302 (55.8)
Not employed	4,047 (9.3)	220 (25.4)	9,231 (11.1)	639 (27.4)
Student	1,286 (2.9)	50 (5.8)	1,549 (1.9)	122 (5.2)
Retired	10,177 (23.3)	96 (11.1)	19,710 (23.7)	269 (11.5)
Missing	61 (0.1)	2 (0.2)	100 (0.1)	2 (0.1)
Area ^d				
Urban	19,852 (45.4)	214 (24.7)	33,851 (40.7)	332 (14.2)
Rural	7,050 (16.1)	154 (17.8)	25,435 (30.6)	1,168 (50.0)
Missing	16,863 (38.5)	499 (57.6)	23,896 (28.7)	834 (35.7)

^aIncludes Nebraska, North Dakota, South Dakota, and Iowa

^bThe percentages in the table are not weighted percentages.

^cEmployed included employed for wages and self-employed; not employed included those out of work for more than one year, those out of work for less than one year, homemakers, and those unable to work.

^dBased on the Urban Influence Codes, <http://www.ers.usda.gov/Data/UrbanInfluenceCodes>: urban included large (metropolitan area with at least one million residents), small (metropolitan area with fewer than one million residents), micropolitan area adjacent to a large metropolitan area, noncore adjacent to a small metropolitan area, and micropolitan area adjacent to a small metropolitan area. All others were coded as rural.

BRFSS = Behavioral Risk Factor Surveillance System

NHW = non-Hispanic white

AI/AN = American Indian/Alaska Native

Table 2. Sociodemographic characteristics and access to care: Northern Plains^a AI/AN people compared with Northern Plains NHW people and AI/AN people in other regions: BRFSS 2003–2006

Characteristics	AI/AN people in Northern Plains		NHW people in Northern Plains		AI/AN vs. NHW people in Northern Plains		AI/AN people in Northern Plains and in other U.S. regions combined		AI/AN people in Northern Plains vs. other U.S. regions combined	
	Percent of total (95% CI)	Percent of total (95% CI)	Percent of total (95% CI)	Percent of total (95% CI)	P-value ^b	P-value ^b	Percent of total (95% CI)	Percent of total (95% CI)	P-value ^b	P-value ^b
>High school education	41.7 (38.0, 45.6)	59.3 (57.9, 60.8)	59.3 (57.9, 60.8)	47.7 (45.7, 49.6)	<0.01	<0.01	47.7 (45.7, 49.6)	47.7 (45.7, 49.6)	<0.01	0.01
Annual household income ≥\$25,000	44.4 (40.3, 48.5)	76.5 (75.3, 77.7)	76.5 (75.3, 77.7)	59.9 (57.8, 62.0)	<0.01	<0.01	59.9 (57.8, 62.0)	59.9 (57.8, 62.0)	<0.01	<0.01
No health insurance (<18 years of age)	31.8 (28.3, 35.5)	10.1 (9.5, 10.8)	10.1 (9.5, 10.8)	23.2 (21.5, 25.1)	<0.01	<0.01	23.2 (21.5, 25.1)	23.2 (21.5, 25.1)	<0.01	<0.01
No health insurance (18–64 years of age)	33.9 (30.2, 37.9)	12.3 (11.5, 13.1)	12.3 (11.5, 13.1)	25.8 (23.8, 27.8)	<0.01	<0.01	25.8 (23.8, 27.8)	25.8 (23.8, 27.8)	<0.01	<0.01
No personal doctor ^c	33.0 (29.6, 36.5)	15.0 (14.0, 16.0)	15.0 (14.0, 16.0)	26.4 (24.4, 28.4)	<0.01	<0.01	26.4 (24.4, 28.4)	26.4 (24.4, 28.4)	<0.01	<0.01

^aIncludes Nebraska, North Dakota, South Dakota, and Iowa

^bWald Chi-square test after adjusting for age

^cThere were no data for 1999. The question asked in 1997 and 1998 was different from other years. In 1997 and 1998, the question was, "Is there one particular clinic, health center, doctor's office, or other place that you usually go to if you are sick or need advice about your health?" In other years, the question was, "Do you have one person you think of as your personal doctor or health-care provider?"

AI/AN = American Indian/Alaska Native

NHW = non-Hispanic white

BRFSS = Behavioral Risk Factor Surveillance System

CI = confidence interval

Table 3. Chi-square test results comparing two time periods from the BRFSS (1997–2000 and 2003–2006) on access to care, education and income levels, cancer risk behaviors, and cancer screening use among Northern Plains^a AI/AN and Northern Plains NHW people

Questions	Northern Plains AI/AN people			Northern Plains NHW people		
	1997–2000 (n = 867) Percent of total (95% CI) ^b	2003–2006 (n = 2,334) Percent of total (95% CI) ^b	P-value ^c	1997–2000 (n = 43,765) Percent of total (95% CI) ^b	2003–2006 (n = 83,182) Percent of total (95% CI) ^b	P-value ^c
Lifestyle factors						
Binge drinking ^d	26.3 (22.1, 31.1)	23.7 (20.9, 26.6)	0.39	18.4 (17.6, 19.2)	19.1 (18.5, 19.7)	0.09
Heavy drinking	5.3 (3.0, 9.3)	6.4 (4.3, 9.3)	0.66	5.0 (3.9, 6.4)	5.1 (4.8, 5.5)	0.77
Obese (≥20 years of age)	32.1 (28.5, 36.0)	40.5 (37.4, 43.7)	0.02	20.1 (19.3, 20.9)	25.1 (24.5, 25.7)	<0.01
No leisure-time physical activity	28.8 (21.3, 37.7)	27.4 (24.2, 30.8)	0.87	27.2 (26.1, 28.4)	21.6 (20.8, 22.3)	<0.01
Current smoker	51.9 (45.4, 58.4)	49.1 (45.8, 52.4)	0.37	22.3 (21.7, 22.8)	20.2 (19.4, 21.0)	<0.01
<5 servings of fruit and vegetables per day	82.6 (77.7, 86.6)	81.1 (76.5, 84.9)	0.64	80.7 (79.4, 81.9)	80.9 (80.3, 81.6)	0.61
Cancer screening use						
Clinical breast exam within two years (female ≥40 years of age)	73.9 (68.8, 78.5)	74.5 (69.5, 78.9)	0.85	78.1 (76.6, 79.6)	79.3 (78.3, 80.3)	0.24
Mammogram within two years (female ≥40 years of age)	67.6 (61.1, 73.5)	69.7 (64.3, 74.7)	0.67	71.6 (69.6, 73.5)	76.0 (74.8, 77.0)	<0.01
Pap smear test within three years ^e (female ≥18 years of age)	85.0 (79.0, 89.6)	86.8 (83.2, 89.8)	0.58	84.2 (82.8, 85.5)	83.8 (82.7, 84.9)	0.83
Prostate-specific antigen test within one year (male ≥50 years of age)	NA	47.7 (36.6, 59.1)	NA	NA	55.1 (53.7, 56.6)	NA
Fecal occult blood test within one year (≥50 years of age)	18.9 (9.9, 33.2)	15.3 (10.2, 22.3)	0.57	20.7 (18.9, 22.5)	18.7 (17.7, 19.8)	0.12
Sigmoidoscopy or colonoscopy within five years (≥50 years of age)	32.0 (25.0, 39.9)	31.5 (24.8, 39.1)	0.92	28.2 (26.5, 30.0)	44.4 (42.8, 46.0)	<0.01
Digital rectal exam within five years (≥50 years of age)	NA	65.0 (53.7, 74.9)	NA	NA	74.5 (73.1, 76.0)	NA

^aIncludes Nebraska, North Dakota, South Dakota, and Iowa

^bThe percentages in the cells are weighted percentages.

^cWald Chi-square test after adjusting for age

^dIn 2006, the Centers for Disease Control and Prevention changed the definition of binge drinker to "males having five or more drinks on one occasion, females having four or more drinks on one occasion" from the previous definition of "having five or more drinks on one occasion" for both males and females.

^eExcluded females aged 18 years and older who had had a hysterectomy and those who were pregnant

BRFSS = Behavioral Risk Factor Surveillance System

AI/AN = American Indian/Alaska Native

NHW = non-Hispanic white

CI = confidence interval

Pap = Papanicolaou

NA = not applicable

Table 4. Cancer risk behaviors and cancer screening use: Northern Plains^a AI/AN people compared with Northern Plains NHW people and AI/AN people in other regions: BRFSS 2003–2006

	Northern Plains AI/AN people	Northern Plains NHW people	AI/AN people (other U.S. regions combined)	Compared with Northern Plains NHW people	Compared with AI/AN people in other U.S. regions combined
	Percent of total (95% CI)	Percent of total (95% CI)	Percent of total (95% CI)	P-value ^b	P-value ^b
Lifestyle factors					
Binge drinking ^c	23.7 (20.9, 26.6)	19.1 (18.5, 19.7)	17.4 (15.9, 19.0)	0.40	0.05
Heavy drinking	6.4 (4.3, 9.3)	5.1 (4.8, 5.5)	6.6 (5.5, 7.9)	0.96	0.40
Obese (≥20 years of age)	40.5 (37.4, 43.7)	25.1 (24.5, 25.7)	31.7 (29.8, 33.7)	<0.01	<0.01
No leisure-time physical activity	27.4 (24.2, 30.8)	21.6 (20.8, 22.3)	27.8 (26.4, 29.2)	<0.01	0.27
Current smoker	49.1 (45.8, 52.4)	20.2 (19.5, 21.0)	35.9 (34.0, 37.8)	<0.01	<0.01
<5 servings of fruit and vegetables per day	81.1 (76.5, 84.9)	80.9 (80.3, 81.6)	73.1 (70.8, 75.4)	0.29	<0.01
Cancer screening use					
Clinical breast exam within two years (female ≥40 years of age)	74.5 (69.5, 78.9)	79.3 (78.3, 80.3)	72.9 (69.6, 76.0)	<0.01	0.64
Mammogram within two years (female ≥40 years of age)	69.7 (64.3, 74.7)	76.0 (74.8, 77.0)	66.8 (63.6, 69.8)	0.01	0.25
Pap smear test within three years ^d (female ≥18 years of age)	86.8 (83.2, 89.8)	83.8 (82.7, 84.9)	80.3 (77.7, 82.7)	0.91	0.02
Prostate-specific antigen test within one year (male ≥50 years of age)	47.7 (36.6, 59.1)	55.1 (53.7, 56.6)	45.3 (39.3, 51.4)	0.31	0.71
Fecal occult blood test within one year (≥50 years of age)	15.3 (10.2, 22.3)	18.7 (17.7, 19.8)	14.8 (12.7, 17.2)	0.39	0.92
Sigmoidoscopy or colonoscopy within five years (≥50 years of age)	31.5 (24.8, 39.1)	44.4 (42.8, 46.0)	37.1 (33.8, 40.4)	<0.01	0.16
Digital rectal exam within five years (≥50 years of age)	65.0 (53.7, 74.9)	74.5 (73.1, 76.0)	65.7 (59.4, 71.4)	0.08	0.86

^aIncludes Nebraska, North Dakota, South Dakota, and Iowa

^bWald Chi-square test after adjusting for age

^cIn 2006, the Centers for Disease Control and Prevention changed the definition of binge drinking to “males having five or more drinks on one occasion, females having four or more drinks on one occasion” from the previous definition of “having five or more drinks on one occasion” for both men and women.

^dExcluded females aged 18 years and older who had had a hysterectomy and those who were pregnant

AI/AN = American Indian/Alaska Native

NHW = non-Hispanic white

BRFSS = Behavioral Risk Factor Surveillance System

CI = confidence interval

Pap = Papanicolaou

suggesting a potential role for Medicare in providing access to mammograms.⁵

Lastly, this study found that Northern Plains AI/ANs have a significantly higher prevalence of some behaviors associated with cancer risk than AI/ANs in all other U.S. regions combined, which supports the findings of previous research.¹

While there is room for improvement in all behaviors associated with cancer risk and screening use among AI/ANs in the Northern Plains region, three areas stand out as priorities for intervention: the very low rate of colorectal cancer screening use, the increasing rate of obesity, and the persistent high rate of smoking.

Colorectal cancer screening

Previous research has shown that AI/ANs in the Northern Plains have a higher risk of developing and dying from colorectal cancer than NHW people in the same region, and are more likely to be diagnosed at a later stage of colorectal cancer than NHW people in every region.^{2,5} These findings demonstrate the need for increasing efforts to reduce the risk of developing colorectal cancer and detect the disease early. Several such efforts are being made.

To change the perception that colorectal cancer is not a preventable and treatable disease, the NPCCCP has been implementing cancer educational workshops in AI/AN communities. Pre- and posttest results show that these workshop sessions are effective in increasing knowledge among participants. In addition, a short video on colorectal cancer screening runs on the “Good Health TV” program that airs in the Indian Health Service (IHS)/tribal clinics’ waiting rooms.

Furthermore, stakeholders from Northern Plains tribes, IHS, state departments of health, and other cancer-related organizations have formed a workgroup to network and collaborate on increasing colorectal cancer knowledge and improving access to screening. The community-driven interventions, which included more than 15 screening clinics and nine educational workshops, mostly targeted men and reached hundreds of community members. Six of the workshops showed increases in knowledge from pretest to posttest, and 228 individuals received recommended cancer screening.

Obesity

We found that the prevalence of obesity among AI/AN adults in the Northern Plains region increased from 32.1% in 1997–2000 to 40.5% in 2003–2006. In another study of childhood obesity in the same four-state Northern Plains region, researchers found that the prevalence of overweight and obesity among

children aged 5–17 years increased significantly from 1995–1996 to 2002–2003.⁴⁷

Historical factors have contributed to the AI/AN obesity epidemic. In the 1960s and 1970s, the federal government addressed longstanding malnutrition⁴⁸ among AI children by creating the Food Distribution Program on Indian Reservations. The foods distributed through this program were surplus agricultural commodities. In the early days of the program, many of these commodity foods were high in fat and calories and low in fiber. Continued use of commodity foods and other federal food programs (e.g., the school breakfast program) have caused voluntary and involuntary changes to the diets of AI/ANs in the last four decades. Together with commodity food programs, a marked decline in physical activity has also contributed to obesity among AI/ANs in less than a decade.^{49,50}

Two types of interventions for obesity prevention and treatment are currently being implemented in the Northern Plains communities. One type is a program aimed at patients with diabetes, heart disease, and other chronic health problems. Another type targets school-aged children. Partly due to a lack of resources and technical expertise, evaluation data are not consistently collected to assess the effectiveness and impact of these interventions. However, one school-based intervention showed that the intervention resulted in a reduction in the fat content of school menus and in the dietary fat intake of children.⁵¹ The intervention also showed a positive but insignificant trend in the level of physical activity during school time.

The persistence and seriousness of the AI/AN obesity epidemic requires more resources to develop intervention programs that are culturally appropriate and acceptable to AI/AN communities across the U.S. Emerging ecological models and a systems science approach may be useful to address obesity from individual, community, and societal levels, which may ultimately be more effective and long-lasting than relying on individual-level intervention, the primary focus for obesity intervention thus far.

Commercial tobacco use

As shown in the analysis of BRFSS data, approximately 50% of AI/AN adults in the Northern Plains are current smokers, compared with 20% among NHW adults in the region. Data from the Youth Tobacco Survey, most recently conducted in Nebraska in 2004 and South Dakota in 2005, demonstrate that smoking prevalence and other forms of commercial tobacco use are much higher for AI/AN young people than for their non-AI/AN counterparts. In addition to a high smoking prevalence, AI/AN young people have been

shown to initiate smoking much earlier than other young people in their respective states.^{52,53} Northern Plains AI/AN smokers who attempt to quit smoking face several challenges. First, addictive smoking has become a social norm. Second, much of the mainstream tobacco-control effort does not reach rural tribal communities of the Northern Plains. Third, access to cessation resources, such as pharmacotherapy and cessation counseling, are inequitable when compared with the general population.

Regional efforts are beginning to emerge that show promise for reducing tobacco abuse among this very unique population. Since the mid-1990s, the GPTCHB-Northern Plains Tobacco Prevention Project (NPTPP) has played an important role in leading regional efforts to reduce addictive tobacco use and exposure to secondhand smoke. NPTPP leads strategic planning for commercial tobacco use reduction, coordinates intertribal tobacco-control initiatives, and provides culturally competent training and technical assistance.

In 2008, NPTPP partnered with the University of Nebraska Medical Center to interview 30 elders to learn about traditional tobacco use in the Lakota communities in South Dakota. During the interviews, traditional stories on tobacco were also collected. Educational materials (e.g., booklets and videos) are currently being developed for use at schools and in other settings.

Limitations

This study had several limitations. There is a small possibility that the same individuals were sampled more than once and may have participated in the BRFSS survey in multiple years. Because BRFSS public data used in this study do not contain a participant identifier, it is not possible to determine whether the same individuals appear in the data for different time periods. Therefore, we made the assumption that samples from the two time periods were independent of each other.

Although the BRFSS is an excellent population-based data source, it is limited in regard to analyses related to AI/AN populations. BRFSS data may not be generalizable because BRFSS is a telephone interview survey and excludes individuals who do not have phones. Many AI/ANs residing in rural Northern Plain communities do not have landlines. In addition, BRFSS survey participants have a higher socioeconomic status and better health behaviors than nonparticipants; thus, BRFSS data are more likely to overestimate favorable health behaviors and screening use.

The IHS has reported much lower screening rates than the BRFSS. For example, according to 2007 IHS

data, only 42% of the active user population in the four-state Northern Plains region used mammography in the past two years, which was much lower than our 69.7% estimate based on BRFSS data for Northern Plains AI/ANs during 2003–2006.⁵⁴ A true estimate of health behaviors and cancer screening use are probably somewhere between the results suggested from these two data sources. We also noted some methodological changes that have been made to the BRFSS over time to maintain the data quality.^{55–57}

The current limitations of the BRFSS also represent opportunities for improvement in monitoring the health status of AI/AN communities. Across the U.S., including the Northern Plains, different approaches are used to increase collection of AI/AN-specific data. Examples include a tribally administered BRFSS survey, targeted sampling of tribal communities focusing on BRFSS respondents in Contract Health Service Delivery Area counties, and oversampling of AI/ANs in the regular BRFSS survey conducted by the states.

CONCLUSIONS

This study provides important information about the historical trend and current status of cancer-related health behaviors and screening among Northern Plains AI/ANs. With the passage of the Patient Protection and Affordable Care Act in March 2010, new opportunities are presented to develop the infrastructure for more comprehensive preventive care to improve health status and begin to close gaps in health disparities. The magnitude and persistence of the problems among AI/ANs in the Northern Plains and other regions reported in this study and previous studies demonstrate the need for the immediate investment of more resources to change this devastating trend.

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