2007

Assessing Behavioral Health Risks, Health Conditions, and Preventive Health Practices among American Indians/Alaska Natives in Nevada

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Keywords

Cover Page Footnote

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Abstract

The 2004 Behavioral Risk Factor Surveillance System (BRFSS) survey was administered to American Indian/Alaska Native (AI/AN) adults in Nevada to determine whether health disparities exist between AI/ANs and the state's general population. Results showed AI/ANs were 1.5 times more likely to smoke cigarettes, 3.5 times more likely to be exposed to secondhand smoke, 3.2 times more likely to lack leisure-time physical activity, 9.7 times more likely to report fair/poor health status, and 7.7 times more likely to have a disability. In addition, AI/ANs were more likely to have current asthma (OR=5.0) and diabetes (OR=1.8). AI/AN women were 4.8 times as likely to report no Pap test in the past 3 years. Our findings suggest that Nevada's AI/AN population face many health disparities related to risk behaviors, poor health status and health conditions, and healthcare access. Partnerships among tribal, state and federal public health systems are needed to address these disparities.

Key Words: health behavior, American Indian/Alaska Native, BRFSS, health disparity

Introduction

Previous studies have shown that significant health disparities exist between the American Indian/Alaska Native (AI/AN) population and the U.S. general population (Agency for Healthcare Research and Quality [AHRQ], 2005; Denny, Holtzman, Goins, & Croft, 2005; Denny, Holtzman, & Cobb, 2003;

Rhoades, 2005; U.S. Commission on Civil Rights [USCCR], 2004). Life AI/AN expectancy for AI/ANs is about 2.4 years shorter (74.5 versus 76.9 years), and mortality rates due to numerous causes have been significantly higher. Specifically, higher rates have been documented for mortality due to tuberculosis (600% higher), alcoholism (510%), motor vehicle crashes (229%), diabetes (189%), unintentional injuries (152%), homicide (61%), and suicide (62%) (Indian Health Service [IHS], 2006). The underlying causes for these disparities are complex; some may be due to lack of access to health care (AHRQ; IHS; USCCR, 1999; USCCR, 2003). Although the federal government maintains an ongoing legal responsibility to provide access to health services to AI/AN people, the IHS faces significant structural and financial challenges (Roubideaux, 2002; Westmoreland, & Watson, 2006).

While having access to the IHS should offset some disparities, significant proportions of AI/ANs lack access to this network. As a group, they are less likely than Whites to have health insurance, and they experience continued gaps in access to some preventive services (AHRQ, 2005; Zuckerman, Haley, Roubideaux, & Lillie-Blanton, 2004). Other behavioral and biological factors unique to this population may also contribute to disparities. Regardless, despite the need for lessening health disparities between the AI/AN population and the general population, there is little data available on health risk behaviors among this population. Such data could be useful for tracking health trends, identifying needs, and linking tribal health programs with state and federal resources.

Currently, states rely on the Behavioral Risk Factor Surveillance System (BRFSS) survey, a standardized national health survey developed and administered by the Centers for Disease Control and Prevention (CDC), to help justify the need for federal public health resources. All states, the District of Columbia, and three U.S. territories conduct the BRFSS annually. The survey includes measures for chronic disease behavioral risk factors and conditions (e.g., cigarette use, physical activity, high blood pressure, diabetes, obesity, asthma), preventive health practices (e.g., cancer screening), and access to health care services among adult (aged 18 years or older) population groups (Centers for Disease Control and Prevention [CDC], 2006). Because the percentage of AI/ANs in the general population is limited, population data with specific health estimates for this group are not available within most state BRFSS reports (Andresen, Diehr, & Luke, 2004; Denny, et al., 2003). Consequently, state public health systems may be unaware of the actual needs for health services and resources within AI/AN communities.

Several national health behavior surveillance studies have been conducted using BRFSS data focusing on AI/AN population groups (Denny, et al. 2005; Denny, et al. 2003; Taylor, Denny, & Freeman, 1999). These studies used ag-

gregate data, that grouped AI/AN health behavior data into large geographic regions representing multiple tribes across the US. This practice prevents any differentiation of temporal trends within states and makes it impossible to identify state-specific health risk behaviors and resource needs among AI/AN population groups (Andresen, et al., 2004). Only a few states (MT, OK, NM) have had experience in administering modified BRFSS surveys within AI/AN populations (Bursac, Z., Tutor, C., & Campbell, J. E., 2004; Gilliland, Mahler, Hunt & Davis, 1999; Harwell, et al., 2001a; Harwell, et al. 2003; Oser, Harwell, Strasheim, Fogle, Blades, & Dennis, 2005).

In Nevada, there is a strong need for state-specific data. Nevada has an AI/AN population (alone or in combination) of 2.1% and ranks as 1 of 19 states with an AI/AN population that exceeds the U.S. estimate (1.5%) (U.S. Census, 2006). It is important for Nevada policy makers to understand the health needs of tribal communities so that state and federal resources may be shared and allocated for maximum benefit.

The purpose of this study was to demonstrate that inclusion of Nevada AI/AN adults within the statewide BRFSS is feasible and provides useful data for tracking health needs and linking tribal programs with state, and federal public health resources.

Methods and Procedures

In 2003, the Nevada State Health Division began work with the Inter-Tribal Council of Nevada (an official tribal organization composed of elected tribal chairpersons) and the Nevada Indian Commission (a state agency) to develop strategies for including Nevada's AI/AN population within the state BRFSS. The State Health Division sought tribal support to obtain an adequate sampling frame across Nevada's tribal communities; tribal leaders recommended requesting direct support for the project be requested through individual tribal councils.

Official resolutions, representing 24 of the 26 federally recognized Tribal Nations and one Urban Indian organization within Nevada were obtained between January and August 2004. Each resolution endorsed the BRFSS AI/AN project and authorized the release of tribal household telephone numbers. As the tribal resolutions were obtained, the Nevada State Health Division team worked with individual tribal staff to develop a sampling frame. Tribal staff worked with various official tribal departments, including the tribal enrollment office, the housing authority, and the health agency, to develop a telephone listing of tribal households. The standard BRFSS protocol was followed to include the telephone numbers in a random-digit dialing sample pool grouped by tribe, yielding a stratified random AI/AN sample. The standard BRFSS protocol is

described elsewhere (CDC, 2006). In all, 4,223 telephone numbers were released for inclusion in the study.

It was determined that a minimum sample of 598 would be necessary for meaningful data comparisons with state and national estimates of population prevalence. Sample size was calculated using the formula: $n = z\,\alpha/2\ 2\ \{\pi\,(1-\pi)\,/\,d2\}$, with following assumptions: simple random sampling, 95% confidence intervals, $d = +/- 4\%$ (difference in prevalence), $\alpha = 0.50$ (50% prevalence to assure most conservative sample size estimate) (McNeil, 1996).

Each respondent was screened for self-identification as an enrolled member of a federally recognized tribe. Interviews were terminated for respondents who did not self-identify, refused to participate, or were uncertain of their tribal enrollment. The 2004 BRFSS core items and standard optional modules for the state of Nevada were administered to participants.

Interviews were performed between July and December 2004. Specific questions related to behavioral risk factors (cigarette use, exposure to second hand smoke, alcohol use, and physical activity), health conditions (fair or poor health status, disability, diabetes, asthma, hypertension, high cholesterol, overweight and obesity), and preventive practices (screening for colorectal, breast, cervical, and prostate cancer) were analyzed for this study.

The data collected in this study were all self-reported. To assess alcohol use and cigarette use among Nevada's AI/ANs, respondents were asked to report their daily use of alcohol and cigarettes within the past month. Heavy drinkers were identified by average drinks per day in the past month: men, 2 or more; women, 1 or more. Men and women who had 5 or more drinks on at least 1 occasion during the past month were identified as binge drinkers. Respondents who reported smoking at least 100 cigarettes during their lifetimes and currently smoked some days or every day were identified as current smokers. To assess second hand smoke exposure, respondents were asked if smoking was allowed within their homes.

For health status, respondents were asked to rate their general health as "excellent," "very good," "good," "fair," or "poor"; "fair" and "poor" health were combined for this study's analysis. To assess disability, participants were asked whether they were limited in any way because of physical, mental, or emotional problems. Respondents were also asked whether a doctor, nurse, or other health care professional had ever told them they had diabetes, asthma (including history and current status), hypertension, or high cholesterol.

Weight status was assessed with the body mass index (BMI), cal-

culated by dividing the weight (in kilograms) by the height (in meters squared). Respondents with a BMI less than 30 but ≥25 were identified as being overweight. Those with a BMI of ≥30 were identified as being obese. Finally, respondents were asked whether they had participated in any physical activities or exercise during the past month, other than as part of one's regular job.

Both male and female respondents over age 50 were asked whether they had ever had an occult blood screen or a sigmoidoscopy/colonoscopy to screen for colon cancer. All female respondents were asked whether they ever had a Pap test to screen for cervical cancer. Female respondents aged 40 years or older were asked whether they ever had a mammogram to screen for breast cancer. Women were also asked to indicate how long it had been since their last Pap test or mammogram. Male respondents aged 40 or older were asked whether they ever had a prostate-specific-antigen (PSA) test or a digital rectal exam (DRE) to screen for prostate cancer. Men were also asked to indicate how long it had been since their last prostate cancer screening tests.

All data collected in this study were adjusted to reflect the age and sex distributions of Nevada AI/ANs using 2004 estimates obtained from the Nevada State Demographer. The data were then analyzed to determine prevalence estimates for each behavioral risk factor, health condition, and preventive practice. Ninety-five percent confidence intervals (CI) were examined for comparison with the Nevada state general population. Odds ratios (OR) were then calculated using multivariable logistic regression to identify health disparities while controlling for the confounding effects of age, sex, marital status, family size, education, employment status, family income, and BMI.

Results

The 2004 BRFSS interviews were completed by 652 AI/AN adults in Nevada, representing 24 Tribal Nations across four cultural groups (Western Shoshone [WS], Northern Paiute [NP], Southern Paiute [SP], and Washoe [WA]) and one Urban (Reno area) Indian group [UR]. The Northern Paiute (50.5%) and Western Shoshone (26.7%) cultural groups had the greatest representation. Southern Paiutes represented 11.7% of the sample; Washoe, 8.5%; and Urban-Reno, 2.7%.

The AI/AN response rate (over the six month data collection period) was 33.8% using the methodology recommended by the Council of American Survey Researchers Organizations (CASRO); this measure shows the ratio of the number of completed interviews to the number of eligible households in the sample (CASRO, 1982)). AI/AN cooperation

rate (percentage of interviews initiated that were actually completed) was 93.5%. The average length of an interview was 34.5 minutes.

Forty-seven percent of the AI/AN participants were male; 62% were 25-54 years, 16.8% were aged 18-24 years; 62% were 25-64 years, and 8.6% were >64 years (mean age: 41.29; SD = 18.46). Five out of 6 AI/ANs (83.6%) had had at least a high school education. Somewhat less than a quarter (23.2%) of the population had an annual household income of less than $15,000; 24.6%, $15,000 to $24,999; and 16.2%, $25,000 to $34,999. The remaining 36.0% had an annual household income of $35,000 or more. The population was divided almost equally with respect to marital status, with 51.7% single (divorced, widowed, separated, or never married) and 48.3% married or living with a partner. Finally, 51.6% of the population received wages for employment.

Shown in Figure 1 are differences in the distributions of household income and educational attainment between the AI/AN and the general population in Nevada. Variation between the two populations was sig-nificant at the extremes of income and at the upper level of educational attainment (college graduate).

Prevalence Estimates

Estimates of prevalence from the 2004 BRFSS for Nevada's AI/AN adults and the state's general population are shown in Table 1; the find-ings of statistical significance presented in this table were based on a comparison of CI. Results of multivariable logistic regression are pre-sented later in this paper.

A greater percentage of AI/AN adults used cigarettes (33.1% vs. 23.2%) and were obese (42.2% vs. 21.1%), while lack of physical ac-tivity (23.7% vs. 24.2%), binge drinking (15.4% vs. 18.0%), and being overweight (36.1% vs. 38.9%) were statistically similar between the 2 population groups. Just under one-fourth (23.1%) of the AI/AN popula-tion reported fair/poor health, and the same percentage had a disability (physical, mental, or emotional). Based on CI comparisons, fair/poor health status was not significantly different among AI/ANs than in the general population. However, reported rates of disability were signifi-cantly higher within the AI/AN population (23.1% vs. 16.5%).

FIGURE 1. Differentials in household income and education distribution AI/AN vs. NV (2004).
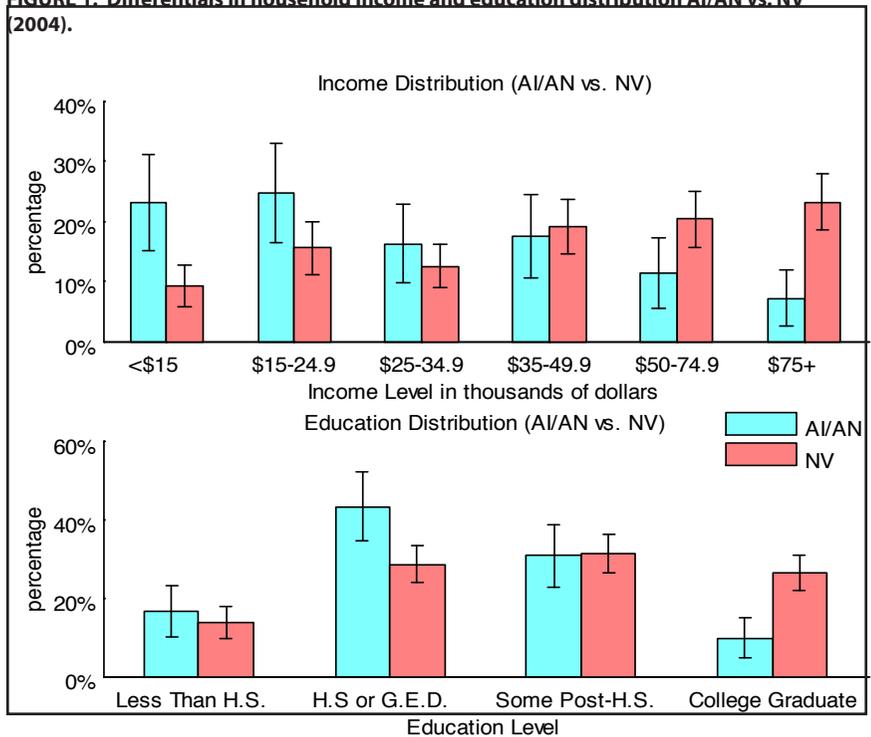
Among specific health conditions, diabetes, hypertension, and obesity were more prevalent among AI/ANs than in the general population. Diabetes and obesity were twice as common, and hypertension was 40% more common. As shown in Figure 2, the BMIs for AI/ANs and the general population were far from normally distributed in 2004 by the Anderson Darling test for normality (D'Agostino, & Stephens, 1986). In addition, the mean and variance of the BMI within the AI/AN population differed significantly from those values in the Nevada population (p<0.0001).

Also shown in Table 1, AI/ANs in Nevada had screening tests for occult blood at a rate similar to that for the general population. Colorectal cancer screening with colonoscopy/sigmoidoscopy was more frequent among AI/ANs (36.4% vs. 46.7% having never screened); however, this finding was not significant based on CI comparisons. Rates for mammography and Pap testing were similar between the groups. Additionally, prostate cancer screening rates were lower in AI/AN men for both PSA (63.3% vs. 52.2%) and DRE (34.8% vs. 27.9%).

TABLE 1. 2004 BRFSS prevalence estimates for Nevada for behavioral risk factors, health conditions, and preventive health practices.

Behavioral Risk Factors	AI/AN (%[a], CI[b])	State (%, CI)[d]
[c] Cigarette use	33.1 (28.9-37.7)	23.2 (21.0-25.4)
Binge drinking	15.4 (12.2-18.6)	18.0 (16.0-20.1)
No physical activity	23.7 (20.1-27.3)	24.2 (21.9-26.6)
Health Conditions		
Health status (fair/poor)	23.1 (19.5-26.7)	18.1 (16.0-20.2)
[c] Disability (limited in any way)	23.1 (19.5-26.8)	16.5 (14.6-18.4)
[c] Diabetes	12.5 (9.9-15.1)	6.4 (5.2-7.6)
Ever asthma	15.3 (12.2-18.4)	12.6 (10.8-14.3)
Current asthma	10.4 (7.8-13.0)	7.1 (5.8-8.5)
[c] High blood pressure	33.1 (28.9-37.2)	23.6 (21.5-25.7)
High cholesterol	34.7 (29.6-39.8)	36.8 (33.9-39.7)
Overweight (25.0<BMI<30.0)	36.1 (31.9-40.4)	38.9 (36.2-41.5)
[c] Obesity (BMI>30.0)	42.2 (37.7-46.6)	21.1 (18.8-23.4)
Preventive Health Practices		

Colorectal cancer
  Never had occult blood screen[e]
  Never had colonoscopy/sigmoidoscopy[e]
	31.4 (24.7-38.0)
	36.4 (29.4-43.3)
		37.8 (34.3-41.4)
		46.7 (43.0-50.4)

Breast cancer No mammogram within the past 2 yrs[f]	31.2 (24.9-37.4)	30.7 (26.6-34.8)
Cervical cancer No Pap within the past 3 yrs[g]	15.8 (11.1-20.5)	15.2 (12.1-18.4)

Prostate cancer
  No PSA within the past 2 yrs[h]
  Never had DRE[h]
	63.3 (53.7-72.8)
	34.8 (25.8-43.8)
		52.2 (47.7- 56.7)
		27.9 (23.7-32.2)

[a] Weighted (using age and sex) to the 2004 Nevada population estimates for AI/ANs

[b] CI (Confidence interval)

[c] Indicates significant differences between Nevada AI/AN estimates and Nevada general population rates at p<0.05 using a comparison of confidence intervals

[d] Nevada state prevalence rates may be accessed at: http://www.health2k.state.nv.us/nihds/publications/BRFSS%202004%20REPORT.pdf

[e] Male and female aged ≥ 50 years

[f] Female aged ≥40 years

[g] Female aged ≥ 18 years

[h] Men aged ≥ 40 years

BMI (body mass index), PSA (prostate-specific-antigen), DRE (digital rectal exam)

Health Needs of Nevada's AI/AN Population

Results of the multivariable logistic regression analysis showed that Nevada's AI/ANs had greater health needs than the general population after adjustment for the eight potentially confounding variables listed in
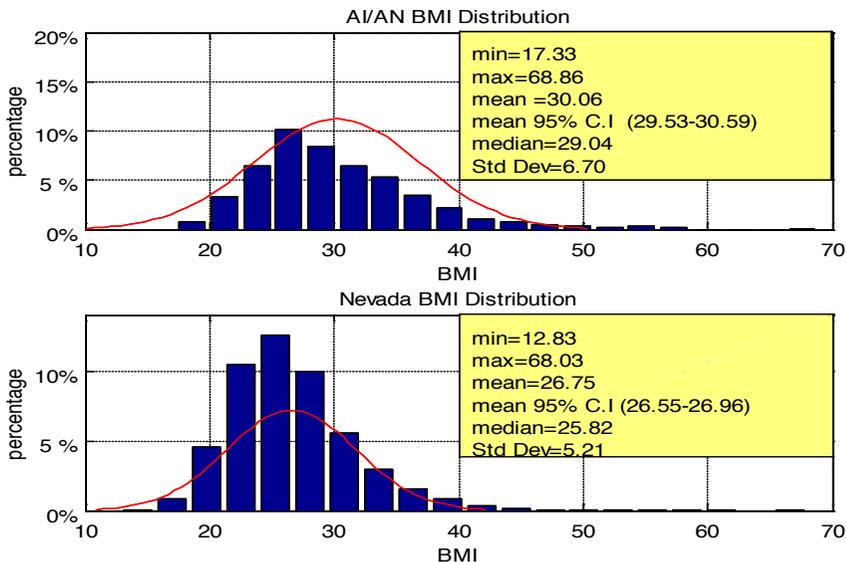
FIGURE 2. Differentials in BMI distribution AI/AN vs. Nevada population (2004).

AI/AN BMI Distribution

min=17.33
max=68.86
mean =30.06
mean 95% C.I (29.53-30.59)
median=29.04
Std Dev=6.70

Nevada BMI Distribution

min=12.83
max=68.03
mean=26.75
mean 95% C.I (26.55-26.96)
median=25.82
Std Dev=5.21

Table 2's footnote. AI/AN were 1.5 times more likely to smoke cigarettes, 3.5 times more likely to be exposed to secondhand smoke at home, and 3.2 times more likely to lack leisure-time physical activity. Nevada AI/ANs were 9.7 times more likely to have fair or poor health status, and they were 7.7 times more likely to have a disability. In addition, Nevada's AI/AN were more likely to have current asthma (OR=5.0) and diabetes (OR=1.8).

Markers of access to health services showed conflicting differences in needs between AI/ANs and the general population. With respect to cancer screening practices, after adjustment for age, sex, marital status, family size, education, employment status, family income, and BMI, the results showed that AI/ANs were more likely than the general population to have been screened for colorectal cancer (as measured by a lower rate of having not received an occult blood test in the last 2 years or to have never had colonoscopy/sigmoidoscopy). In contrast, after adjustment, AI/AN women were 4.8 times more likely to have not had a Pap test in the past 3 years. There were no statistical differences between the groups in screening for breast cancer and prostate cancer.

Discussion

Our experience shows that including the AI/AN population within the statewide BRFSS is possible, although it takes commitment, persever

TABLE 2. Odds ratios identifying health disparities between Nevada's AI/AN population and the state's general population.

Health Indicator	Adjusted Odds Ratio[a] (95% CI[c])	P value	ROC[b]
Behavioral Risk Factors			
Cigarette use	*1.46 (1.08-1.97)*	*p=0.0142*	0.67
Exposure to secondhand smoke at home	*3.45 (2.13-5.61)*	*p<0.0001*	0.65
Binge drinking	0.68 (0.33-1.41)	p=0.3058	0.72
Heavy drinking	1.83 (0.96-3.49)	p=0.0654	0.60
No leisure-time physical activity[d]	*3.17 (1.71-5.89)*	*P<0.0001*	0.65
Health Conditions			
Fair/poor health status	*9.67 (4.79-19.52)*	*p<0.0001*	0.72
Current asthma	*4.98 (2.94-8.43)*	*p<0.0001*	0.60
Diabetes	*1.76 (1.08-2.85)*	*p=0.0221*	0.80
Hypertension	*1.51 (1.10-2.10)*	*p=0.0112*	0.79
High cholesterol	*0.72 (0.96-3.49)*	*p=0.0634*	0.66
Disability	*7.67 (4.61-12.75)*	*p<0.0001*	0.68
Preventive Health Practices			
Colorectal Cancer Screening:			
No occult blood test within the past 2 years[e]	*0.38 (0.20-0.71)*	*P=0.0026*	0.56
Have never had sigmoidoscopy or colonoscopy[e]	*0.44 (0.22-0.88)*	*P=0.0199*	0.61
Breast and Cervical Cancer Screening:			
No mammogram within the past 2 years[f]	*0.77 (0.48-1.22)*	p=0.2644	0.61
No Pap test within the past 3 years[g]	*4.84 (2.13-10.99)*	*P=0.0002*	0.65
Prostate Cancer Screening:			
No PSA test within the past 2 years[h]	*0.75 (0.41-1.38)*	p=0.3557	0.75
Never had DRE[h]	*0.75 (0.37-1.55)*	p=0.4432	0.75

[a] All logistic models used are adjusted for age, sex, marital status, family size, education, employment status, family income, and BMI, with Nevada's general population estimates as the reference

[b] ROC curve: statistical model discrimination measure

[c] CI (Confidence interval)

[d] No leisure-time physical activity or exercise during the past 30 days other than regular job.

[e] Male and female aged ≥ 50 years

[f] Female aged ≥40 years

[g] Female aged ≥ 18 years

[h] Men aged ≥ 40 years

PSA (prostate-specific-antigen), DRE (digital rectal exam)

ance, and the support of state public health officials, tribal leaders, and health administrators. We found it essential to involve tribal leaders from the inception with frequent meetings and explanations of the purpose and need for including Nevada's AI/AN communities in the statewide BRFSS. Only two Nevada Tribal Nations declined endorsement of the project, citing organizational challenges within the tribe and small enrollment as obstacles to supporting a tribal resolution.

Studies have consistently shown health disparities between AI/AN adults and the general population. While our results seem to reaffirm these findings, we should point out the biases inherent in our methodology. One challenge we faced was defining an appropriate sampling

frame. The sampling frame included only tribal households identified by participating Nevada Tribal Nations and one urban organization. AI/AN adults living in urban areas and without Nevada tribal affiliation may not have been included in the sample.

While Nevada area codes were primarily used, we also included state area codes and prefixes for tribal reservations with boundary areas crossing state lines (CA, ID, UT). Approximately 8.3% of the sample had out-of-state area codes (beyond the identified reservation border), thus introducing a small sampling bias. In addition, seasonal bias might have been at play. The statewide BRFSS samples an approximate number of participants each month over a calendar year to lower bias caused by seasonal variation in health risk behaviors or prevention practices. This study, however, experienced unexpected sampling delays, which limited the data collection period to six months possibly introducing seasonal bias. This limited data collection period could also have impacted the overall participant response rate.

The Nevada State Health Division will continue collaborating with the Nevada Tribal Nations and Urban Indian organization to conduct the AI/AN BRFSS every 3-5 years. Continued dialogue with tribal leaders and representatives will help to further define and establish the protocol for the AI/AN sampling frame. We also expect to administer the AI/AN survey across the calendar year in accordance with standard BRFSS procedures.

The BRFSS survey itself has inherent limitations. It is administered with the CATI (computer-assisted telephone interviewing) system, a system that by itself presents limitations. In addition, as a telephone survey, BRFSS includes only households with household telephone service. U.S. Census data for 2002 (2002a) showed that 93.2% of households in Nevada that were exclusively AI/AN reported telephone service, and thus bias due to exclusion of those without telephone service may be small. Also, 1.8% of exclusively AI/AN households were linguistically isolated in Nevada in 2002, speaking a primary language other than English and reporting difficulties with the English language (U.S. Census, 2002b). Although a small limitation, linguistic isolation may have contributed to nonresponse rates.

Another limitation of this investigation is that the data collected in this study were self-reported. Self-reported responses cannot be verified and are subject to recall and response bias. In a study in Montana, a comparison of data from BRFSS and data obtained from medical chart reviews from the IHS found that while there was both some overreport-

ing and underreporting of data on health and use of health services, the overall results were quite comparable and consistent with self-reported biases found in other populations (Harwell, et al., 2001b).

BMI is known to be a strong confounding variable for most health conditions (Bray, 2004), and thus our adjustment for this measure in our multivariate analysis is appropriate. Calculations of BMI, however, that are based on self-reported weight and height introduce population-level bias, with a probability of underestimating this index (Ezzati, Martin, Skjold, Vander Hoorn, & Murray, 2006; Mokdad, Bowman, Ford, Vinicor, Marks, & Koplan, 2001; Mokdad, Serdula, Dietz, Bowman, Marks, & Koplan, 1999).

In this study we categorized variables into behavioral risk factors (alcohol use, cigarette use, and physical activity), health conditions (asthma, diabetes, hypertension, high cholesterol, and obesity), and preventive practices (screening for colorectal, breast, cervical, and prostate cancer). Among the behavioral risk factors, cigarette use was found to be significantly more prevalent among Nevada's AI/AN population than in the state's general population. Among the health conditions we examined, asthma, fair/poor health status, disability hypertension, diabetes, and obesity were found to be significantly more common among AI/ANs. The significantly higher rates of hypertension, diabetes and obesity are consistent with findings from other AI/AN studies and contribute to the higher AI/AN cardiovascular disease mortality rates (Howard, et al. (1999).

Finally, when controlling for demographic and other possible confounding factors, we found that AI/AN women were 4.84 times as likely as Nevada women generally to have not had a Pap test in the past 3 years. This finding suggests a need to evaluate issues of utilization and access that may affect screening for cervical cancer among Nevada's AI/AN women. On the other hand, we found in our multivariate analysis that the record for screening to detect colorectal cancer was better in the AI/AN population than it was in the general population. However, it should be emphasized that the cancer screening rates were far from ideal in either population group.

Conclusion

Our findings suggest a need for targeting interventions to reduce cigarette use and exposure to secondhand smoke, to encourage physical activity and weight loss, and to increase awareness of cancer screening and self-management of diabetes, asthma, and hypertension. Successfully addressing these disparities within AI/AN communities will require

partnerships and coordination across multiple public health systems.

Additionally, our findings showed that just over three-fourths (76.3%) of the AI/AN population used an IHS or tribally operated health center as their primary source of health care. We also found that 57.2% of the population had health care coverage beyond the federal IHS (private health insurance, prepaid plan, or government plan). Potential sources of care other than the IHS include other federally administered health programs (i.e. Veterans Administration), state-based public and private healthcare systems. Thus, enhancing partnerships and identifying resources across these multiple systems may help impact health disparities that may be responsive to system interventions.

Our study also suggests that addressing individual health behaviors such as leisure-time physical activity may also be important in reducing health disparities. Changing these will likely require interventions addressed at public awareness, socioeconomic conditions, and community empowerment. Strengthening partnerships among tribal, federal, and state public health systems to focus resources and efforts toward these multiple intervention targets are critical if we are to reduce or eliminate disparities between AI/ANs and the general population.

Acknowledgments

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