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Prevalence and Trends in Smoking: A National Rural Study

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by

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WWAMI RURAL HEALTH RESEARCH CENTER

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ABSTRACT

CONTEXT

Cigarette smoking is the leading preventable cause of death in the United States.

PURPOSE

To estimate the prevalence of and recent trends in smoking among adults residing in three types of rural locations.

DESIGN, SETTING, AND PARTICIPANTS

Random-digit telephone survey of adults aged 18 years or older who participated in the Behavioral Risk Factor Surveillance System in 1994-1996 (n=342,055) and 2000-2001 (n=385,384).

MAIN OUTCOME MEASURES

Current cigarette smoking defined as persons who smoke every day or some days, while non-smokers are those who smoke not at all or reported never having smoked as many as 100 cigarettes.

FINDINGS

The prevalence of smoking changed little from the mid-1990s; it was 22.0 percent in urban areas, 24.9 percent in rural adjacent areas, 24.0 percent in large rural non-adjacent areas, and 24.9 percent in small rural non-adjacent areas. For rural locations combined, its prevalence was not below the 12 percent goal of HealthyPeople 2010 for any state, although the 12.5 percent prevalence in rural Utah approached this target. Its prevalence was ≥ 28 percent for rural residents of Kentucky, Ohio and Indiana. Since the mid-1990s, the prevalence of smoking for rural respondents decreased by more than 2 percent in six states, California, Connecticut, Maryland, North Carolina, Tennessee, and Utah. However, it increased by 2 percent or more in ten states, Alabama, Delaware, Georgia, Massachusetts, Michigan, Mississippi, New Hampshire, Oklahoma, South Carolina, and Texas.

CONCLUSIONS

Smoking remains a refractory public health problem. Better ways to curb smoking in rural America are needed.

INTRODUCTION

Tobacco use, particularly cigarette smoking, is the leading preventable cause of death in the United States and is responsible for approximately 440,000 deaths each year, 5.6 million years of potential life lost, $75 billion in direct medical costs, and $82 billion in lost productivity.[1] Tobacco use ranked sixth among the HealthyPeople 2010 focus areas in terms of rural health priority rating,[2] as selected by key stakeholders, such as state and local public health department personnel. One of the national health objectives from HealthyPeople 2010 is to reduce the prevalence of cigarette smoking among adults to 12 percent.[3] To achieve this goal, a better understanding of factors associated with smoking is needed.

Regional differences in smoking-related morbidity and mortality exist,[4,5] but information on recent trends in smoking rates by type of rural location and sociodemographic characteristics is incomplete. Nationally, adults living in the most rural counties were the most likely to smoke in 1997/1998.[6] Among men aged 18 to 44 years who participated in the National Health Interview Study (NHIS), smoking rates were lowest in the West and greatest in the South and Midwest, and among women of that age range the rates were lowest in the West and greatest in the Midwest.[7] Among adults aged 20 to 31 years who participated in either of two large epidemiologic studies—the Coronary Artery Disease Risk Development in Young Adults (CARDIA) study or the Bogalusa Heart Study—more white than black women were current smokers, but no ethnic differences were observed among men. In Chicago, Minneapolis, and Oakland, more blacks were current smokers than were whites. For all sites, low educational attainment was strongly related to current smoking status and ethnic differences were more apparent among those with up to a high school education.[8] However, since the late 1990s, national data have not been used to examine sociodemographic factors associated with current smoking among adults residing in rural settings.

Exploration of recent data characterizing rural location and sociodemographics may help better target efforts to reduce smoking towards the highest risk populations.

In 1984, the Centers for Disease Control and Prevention (CDC) established the Behavioral Risk Factor Surveillance System (BRFSS) for monitoring health risk behaviors.[9] BRFSS collects data annually on health-related behaviors that are useful for planning, initiating, monitoring, and evaluating health promotion and disease prevention programs. BRFSS data are collected from all 50 states and have the advantage of including a sufficiently large sample to allow in-depth examination of the prevalence of and recent trends in smoking among rural residents.

The aim of this study is to examine the current prevalence of and recent trends in smoking among adults living in rural and urban locations using several years of data from BRFSS. By combining several years of BRFSS data, rates of smoking can be ascertained even for persons living in relatively remote rural locations. Because state policy plays a critical role in efforts to control tobacco use, findings reported in this study emphasize the prevalence of smoking at the state level.

METHODS

SAMPLE AND SUBJECTS

BRFSS is a state-based, random-digit–dialed telephone survey of the non-institutionalized U.S. adult population aged 18 years and older. BRFSS is conducted in the 50 states as well as the District of Columbia, Guam, Puerto Rico, and the Virgin Islands. This study focuses on 49 states and the District of Columbia. Non-public use data retaining all county-level Federal Information Processing Standards (FIPS) codes[10] were obtained by written request from the CDC. Guam, Puerto Rico and the Virgin Islands were excluded. Alaska also was excluded because county-level FIPS codes for Alaska were not available, making it impossible to differentiate rural from urban residents of this state. To increase statistical power, multiple years of BRFSS data can be combined. Consequently, data from 1994 to 1996 (n = 342,055) and 2000 to 2001 (n = 385,384) were examined. The median response rate was 63.2 percent (range: 45.6%-87.1%) in 1996 and 53.5 percent (range: 48.9%-63.2%) in 2001. Although BRFSS is administered by telephone, its national estimate for current smoking in 1997 of 23.1 percent was similar to the estimate of 24.7 percent produced by the National Health Interview Survey (NHIS), an in-home survey with a response rate of 74 percent in 2001.[11] However, the BRFSS estimate of current smoking among African Americans of 22.7 percent was about 4 percent lower than the corresponding NHIS estimate of 26.8 percent.[12]

DEPENDENT MEASURE

Current cigarette smoking was derived from two questions. Respondents were asked, "Have you smoked at least 100 cigarettes in your entire life?" followed by, "Do you now smoke cigarettes every day, some days, or not at all?" if they answered "yes" to the first question. "Current smokers" were defined as those who smoked every day or some days, while non-smokers were those who smoked not at all or reported never having smoked as many as 100 cigarettes.

INDEPENDENT MEASURES

Rural residence was ascertained by classifying county FIPS codes available on BRFSS. These were broadly grouped as metropolitan (urban) or nonmetropolitan (rural) county of residence, although the rural classification was further categorized using the Urban Influence Code groupings of the United States Department of Agriculture[13] as follows: (1) "Rural Adjacent"—physically adjacent to a metropolitan area; (2) "Large Rural Non-Adjacent"—not adjacent to metropolitan counties and with a city with a population of 10,000 residents or greater; and (3) "Small Rural Non-Adjacent"—not adjacent to metropolitan counties and without a city with a population of 10,000 residents or greater. Geography was also classified by Census Division and state. Other measures included: race/ethnicity (Hispanic, African American, American Indian/Alaska Native, Asian/Pacific Islander, and non-Hispanic white); sex; age (ages 18-34, 35-49, 50-64, and 65 years or older); educational attainment (less than high school degree, high school degree or equivalent, greater than high school degree); annual household income (less than $25,000, $25,000-$49,999, $50,000-$74,999, and $75,000 or greater) and employment status (employed, unemployed, and out of the workforce). Because Alaska was excluded from these analyses, the term American Indian is used in lieu of American Indian/Alaska Native, although some BRFFS respondents residing outside of Alaska may be Alaska Natives.

ANALYTICAL PLAN

Estimates were weighted using the BRFSS weighting formula by the sex, age, and race/ethnicity distributions of the population in each area. Chi-square testing and 95 percent confidence intervals (CIs) were calculated by using SUDAAN software,[14] which adjusts the standard errors to account for the complex sample design of the BRFSS. Temporal changes in current smoking were analyzed by comparing estimates from 1994-1996 against those from 2000-2001.

RESULTS

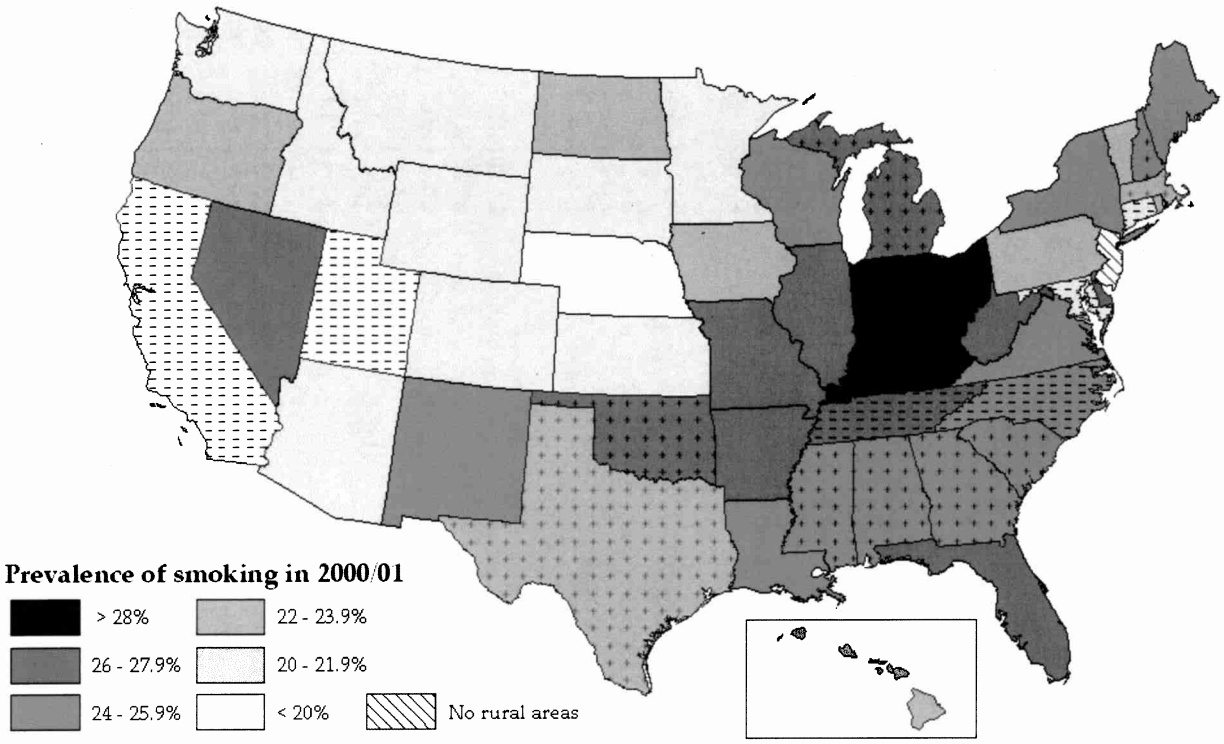
For the United States overall, the prevalence of smoking between 1994-1996 and 2000-2001 did not change substantially. For urban residents, smoking decreased by 0.4 percent, while for rural residents, it increased by 0.2 percent (data not shown in tables).

Figure 1 presents the state-level prevalence of current smoking among adults aged 18 years and older in 2000-2001 who resided in rural locations. The prevalence of smoking was not below the 12 percent goal of HealthyPeople 2010 for residents of all types of rural counties in any state, although the 12.5 percent prevalence in rural Utah was close to this goal. The prevalence of smoking was less than 20 percent among rural residents in two additional states—16.8 percent in California and 19.7 percent in Nebraska. The greatest prevalence for rural residents was 31.8 percent in Kentucky, followed by a prevalence of 28.9 percent in Ohio and 28.2 percent in Indiana.

Figure 1 also depicts the change in current smoking between 1994-1996 and 2000-2001 among rural residents. The prevalence of current smoking for rural respondents decreased by more than 2 percent in six states — California, Connecticut, Maryland, North Carolina, Tennessee, and Utah. Four of the six states that had a decrease of 2 percent or more also had a relatively low (< 22%) prevalence of smoking in 1994-1996. In contrast, the prevalence of smoking between 1994-1996 and 2000-2001 increased by 2 percent or more in ten states—Alabama, Delaware, Georgia, Massachusetts, Michigan, Mississippi, New Hampshire, Oklahoma, South Carolina, and Texas. None of these ten states had a low (<22%) baseline prevalence in 1994-1996. However, three of the states that had an increase in prevalence of 2 percent or more also had a relatively high (≥ 26%) baseline prevalence of smoking in 1994-1996.

Table 1 shows the state-level prevalence of current smoking using 2000-2001 BRFFS data categorized by the four rural-urban categories. Among persons residing in urban areas, the overall prevalence in 2000-2001 was 22.0 percent, ranging from 13.2 percent in Utah to 29.5 percent in Kentucky. For urban residents, it was less than 20 percent in six states and greater than 28 percent in two states. Among persons residing in rural adjacent areas, the prevalence was 24.9 percent, ranging from 9.8 percent in Utah to 33.1 percent in Kentucky; the prevalence was less than 20 percent in six states, and greater than 28 percent in six states. Among persons residing in large rural non-adjacent areas, the prevalence was 24.0 percent, ranging from 18.5 percent in Montana to 32.8 percent in Ohio; it was less than 20 percent in four states, and

Figure 1: Trends in Smoking Among Rural Residents, by State (1994/6–2000/1)



Data Source: Centers for Disease Control and Prevention (CDC). "Behavioral Risk Factors Surveillance System Survey Data". Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 1994, 1995, 1996, 2000, 2001.

Table 1: Percentage Currently Smoking by Census Division, State, and Urban-Rural (2000-2001)

State	Number of Respondents	Urban		Adjacent Rural		Non-Adjacent Large Rural		Non-Adjacent Small Rural		Chi-Square P-Value
		%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	
Overall	373,046	**22.0**	(21.8 , 22.3)	**24.9**	(24.3 , 25.5)	**24.0**	(23.2 , 24.8)	**24.9**	(24.2 , 25.7)	0.000
Division 1	54,724	**20.7**	(20.2 , 21.3)	**23.5**	(22.3 , 24.8)	**24.3**	(21.5 , 27.1)	**22.3**	(20.1 , 24.5)	0.000
Connecticut	11,063	**20.6**	(19.6 , 21.7)	**20.1**	(17.2 , 22.9)	**--**	(-- , --)	**--**	(-- , --)	0.705
Maine	6,841	**23.1**	(20.7 , 25.6)	**24.8**	(22.6 , 26.9)	**26.4**	(19.1 , 33.7)	**21.6**	(17.6 , 25.5)	0.440
Massachusetts	15,866	**19.7**	(19.0 , 20.5)	**22.2**	(15.7 , 28.6)	**--**	(-- , --)	**27.8**	(15.1 , 40.4)	0.374
Hew Hampshire	5,620	**24.3**	(22.4 , 26.2)	**26.1**	(23.3 , 28.8)	**23.7**	(20.3 , 27.2)	**--**	(-- , --)	0.492
Rhode Island	7,632	**23.7**	(22.5 , 24.9)	**22.7**	(18.8 , 26.7)	**--**	(-- , --)	**--**	(-- , --)	0.628
Vermont	7,702	**20.6**	(18.7 , 22.6)	**21.9**	(19.7 , 24.0)	**23.0**	(19.7 , 26.4)	**21.9**	(20.1 , 23.8)	0.605
Division 2	23,295	**22.5**	(21.8 , 23.3)	**23.5**	(21.2 , 25.8)	**25.7**	(19.1 , 32.4)	**32.6**	(25.8 , 39.4)	0.025
New Jersey	9,159	**21.0**	(19.9 , 22.0)	**--**	(-- ,--)	**--**	(-- , --)	**--**	(-- , --)	--
New York	7,023	**22.1**	(20.9 , 23.3)	**23.9**	(19.8 , 27.9)	**25.7**	(19.1 , 32.4)	**14.2**	(-0.4 , 28.8)	0.061
Pennsylvania	7,113	**24.4**	(23.1 , 25.7)	**23.3**	(20.6 , 26.0)	**--**	(-- , --)	**28.6**	(21.4 , 35.8)	0.378
Division 3	33,443	**24.5**	(23.8 , 25.2)	**27.4**	(25.9 , 28.9)	**25.0**	(21.9 , 28.2)	**27.8**	(25.0 , 30.6)	0.002
Illinois	7,778	**22.4**	(21.2 , 23.6)	**27.7**	(24.2 , 31.1)	**21.1**	(16.0 , 26.3)	**26.6**	(21.8 , 31.5)	0.014
Indiana	6,818	**26.7**	(25.3 , 28.2)	**28.0**	(25.5 , 30.5)	**27.0**	(21.7 , 32.3)	**34.3**	(25.3 , 43.3)	0.363
Michigan	6,266	**24.1**	(22.7 , 25.5)	**28.9**	(24.4 , 33.3)	**26.3**	(20.1 , 32.6)	**26.8**	(22.3 , 31.3)	0.159
Ohio	6,543	**26.6**	(25.0 , 28.2)	**27.8**	(24.2 , 31.3)	**32.8**	(16.8 , 48.8)	**37.4**	(24.5 , 50.3)	0.371
Wisconsin	6,038	**23.4**	(21.8 , 24.9)	**25.0**	(22.5 , 27.5)	**28.6**	(14.1 , 43.2)	**24.0**	(19.6 , 28.3)	0.657
Division 4	52,365	**23.3**	(22.5 , 24.1)	**22.7**	(21.5 , 23.9)	**23.8**	(22.5 , 25.1)	**22.3**	(21.2 , 23.3)	0.274
Iowa	7,217	**23.6**	(21.8 , 25.5)	**23.1**	(20.8 , 25.4)	**24.9**	(21.3 , 28.5)	**19.2**	(17.0 , 21.4)	0.007
Kansas	8,730	**21.7**	(20.3 , 23.0)	**24.3**	(21.6 , 26.9)	**22.3**	(19.8 , 24.8)	**19.3**	(17.0 , 21.5)	0.039
Minnesota	6,772	**20.9**	(19.6 , 22.3)	**19.0**	(16.2 , 21.9)	**22.8**	(19.0 , 26.7)	**22.5**	(18.9 , 26.2)	0.337
Missouri	8,496	**26.2**	(24.4 , 28.0)	**25.2**	(22.7 , 27.7)	**28.8**	(25.5 , 32.1)	**29.1**	(26.4 , 31.8)	0.106
Nebraska	6,746	**22.0**	(20.3 , 23.7)	**19.2**	(15.9 , 22.6)	**20.4**	(17.7 , 23.1)	**19.5**	(17.3 , 21.7)	0.243
North Dakota	4,341	**22.6**	(20.6 , 24.7)	**22.2**	(18.0 , 26.4)	**22.8**	(19.8 , 25.8)	**23.0**	(20.1 , 25.8)	0.993
South Dakota	10,063	**23.3**	(21.6 , 24.9)	**22.8**	(19.7 , 25.8)	**22.1**	(20.3 , 24.0)	**20.5**	(18.8 , 22.3)	0.167

State	Number of Respondents	Urban		Adjacent Rural		Non-Adjacent Large Rural		Non-Adjacent Small Rural		Chi-Square P-Value
		%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	
Division 5	62,301	**22.9**	(22.3 , 23.5)	**25.4**	(24.1 , 26.7)	**24.4**	(22.1 , 26.6)	**26.1**	(24.1 , 28.0)	0.000
Delaware	6,211	**23.1**	(21.4 , 24.7)	**28.0**	(25.7 , 30.3)	--	(-- , --)	--	(-- , --)	0.001
District of Columbia	3,594	**20.8**	(19.3 , 22.4)	--	(-- ,--)	--	(-- , --)	--	(-- , --)	--
Florida	9,668	**22.6**	(21.5 , 23.6)	**25.4**	(21.4 , 29.4)	--	(-- , --)	**32.3**	(22.5 , 42.1)	0.076
Georgia	8,442	**22.5**	(21.0 , 24.0)	**25.3**	(22.9 , 27.7)	**24.1**	(20.1 , 28.2)	**26.3**	(23.0 , 29.7)	0.087
Maryland	8,769	**20.9**	(19.6 , 22.1)	**19.4**	(15.9 , 22.9)	**26.0**	(20.7 , 31.2)	**20.3**	(14.6 , 25.9)	0.235
North Carolina	9,102	**26.3**	(24.7 , 27.9)	**25.0**	(22.4 , 27.7)	**26.3**	(17.9 , 34.8)	**25.7**	(20.2 , 31.1)	0.880
South Carolina	6,376	**25.4**	(23.9 , 26.9)	**25.8**	(23.1 , 28.5)	**20.9**	(15.8 , 26.1)	**31.8**	(22.4 , 41.3)	0.195
Virginia	4,736	**21.0**	(19.4 , 22.6)	**24.9**	(21.0 , 28.9)	**23.1**	(13.1 , 33.0)	**23.9**	(19.2 , 28.6)	0.245
West Virginia	5,403	**26.7**	(24.7 , 28.8)	**31.9**	(28.4 , 35.5)	**25.3**	(22.3 , 28.2)	**26.7**	(24.0 , 29.4)	0.034
Division 6	29,771	**25.3**	(24.4 , 26.3)	**26.8**	(25.3 , 28.3)	**27.0**	(25.1 , 29.0)	**28.3**	(26.6 , 29.9)	0.015
Alabama	4,968	**24.5**	(22.8 , 26.1)	**24.6**	(21.9 , 27.3)	--	(-- , --)	**24.1**	(16.6 , 31.7)	0.023
Kentucky	13,881	**29.5**	(27.6 , 31.4)	**33.1**	(30.3 , 35.8)	**28.1**	(25.4 , 30.8)	**32.3**	(30.7 , 33.9)	0.009
Mississippi	5,123	**23.9**	(21.1 , 26.6)	**25.6**	(22.2 , 29.1)	**26.3**	(23.4 , 29.1)	**22.6**	(20.0 , 25.2)	0.252
Tennessee	5,799	**24.2**	(22.5 , 25.8)	**25.8**	(23.0 , 28.7)	**27.4**	(22.5 , 32.4)	**30.3**	(24.5 , 36.1)	0.145
Division 7	34,531	**22.6**	(21.9 , 23.4)	**25.6**	(24.1 , 27.1)	**24.3**	(21.5 , 27.2)	**23.5**	(21.4 , 25.6)	0.007
Arkansas	5,841	**22.5**	(20.7 , 24.3)	**29.2**	(26.2 , 32.2)	**26.2**	(22.5 , 30.0)	**26.6**	(23.8 , 29.3)	0.001
Louisiana	9,786	**24.2**	(23.1 , 25.3)	**25.2**	(23.0 , 27.3)	**24.6**	(15.4 , 33.8)	**26.2**	(21.7 , 30.8)	0.756
Oklahoma	8,166	**25.6**	(23.9 , 27.2)	**26.9**	(24.7 , 29.0)	**25.3**	(21.6 , 29.1)	**26.8**	(23.1 , 30.5)	0.748
Texas	10,738	**22.0**	(21.0 , 23.0)	**24.4**	(21.7 , 27.1)	**23.0**	(17.9 , 28.0)	**20.1**	(16.2 , 24.0)	0.266
Division 8	50,157	**20.8**	(19.9 , 21.7)	**20.7**	(19.3 , 22.0)	**21.7**	(20.4 , 22.9)	**20.8**	(19.4 , 22.2)	0.665
Arizona	5,762	**19.5**	(17.5 , 21.5)	**22.7**	(19.4 , 25.9)	**26.2**	(21.4 , 31.1)	**17.3**	(13.6 , 21.0)	0.014
Colorado	5,040	**21.1**	(19.5 , 22.7)	**19.9**	(14.8 , 25.0)	**20.5**	(14.3 , 26.6)	**22.4**	(18.4 , 26.4)	0.881
Idaho	9,731	**22.6**	(20.6 , 24.7)	**22.8**	(20.3 , 25.2)	**18.6**	(17.1 , 20.1)	**19.5**	(17.8 , 21.1)	0.002
Montana	6,333	**19.9**	(16.7 , 23.0)	**23.7**	(18.3 , 29.1)	**18.5**	(16.3 , 20.7)	**22.6**	(20.6 , 24.6)	0.030
Nevada	4,592	**28.1**	(26.0 , 30.2)	**28.4**	(24.4 , 32.4)	**29.9**	(22.8 , 37.0)	**22.2**	(17.9 , 26.5)	0.078
New Mexico	6,795	**23.0**	(21.4 , 24.6)	**26.0**	(22.5 , 29.4)	**24.0**	(21.6 , 26.4)	**25.7**	(21.5 , 29.9)	0.462
Utah	6,523	**13.2**	(11.9 , 14.5)	**9.8**	(8.1 , 11.5)	**24.8**	(15.1 , 34.5)	**15.8**	(13.4 , 18.2)	0.000
Wyoming	5,381	**26.5**	(24.1 , 29.0)	**21.3**	(14.1 , 28.6)	**24.3**	(22.1 , 26.6)	**19.5**	(17.6 , 21.4)	0.000

Table 1 continued

State	Number of Respondents	Urban		Non-Adjacent						Chi-Square P-Value
				Adjacent Rural		Large Rural		Small Rural		
		%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	
Division 9	32,459	**17.9**	(17.1 , 18.8)	**19.2**	(16.4 , 22.0)	**20.9**	(18.2 , 23.5)	**23.1**	(18.6 , 27.7)	0.025
Alaska	--	--	(-- , --)	--	(-- , --)	--	(-- , --)	--	(-- , --)	--
California	8,076	**17.2**	(16.2 , 18.3)	**15.4**	(10.1 , 20.7)	**24.4**	(9.1 , 39.7)	**20.5**	(6.0 , 35.0)	0.679
Hawaii	10,498	**19.3**	(17.9 , 20.7)	--	(-- , --)	**22.3**	(20.9 , 23.8)	**22.1**	(19.2 , 25.1)	0.009
Oregon	6,181	**19.8**	(18.4 , 21.1)	**23.4**	(20.5 , 26.4)	**19.6**	(15.5 , 23.7)	**22.9**	(18.5 , 27.4)	0.104
Washington	7,704	**21.5**	(20.3 , 22.6)	**22.0**	(18.9 , 25.1)	**19.5**	(14.9 , 24.1)	**26.6**	(19.8 , 33.5)	0.407

greater than 28 percent in four states. Among persons residing in the small rural non-adjacent areas, the prevalence was 24.9 percent, ranging from 14.2 percent in New York to 37.4 percent in Ohio; it was less than 20 percent in eight states, and greater than 28 percent in nine states.

Table 2 presents the prevalence of smoking by respondents' sociodemographic characteristics for each of the four rural-urban categories. Of the racial and ethnic groups that can be identified using BRFSS data, American Indians had the greatest prevalence of current smoking and Asians had the lowest prevalence. Among persons residing in rural areas, American Indians residing in rural adjacent locations had a prevalence of smoking of 45.2 percent, which is over 20 percent greater than for members of any other racial/ethnic group residing in rural adjacent locations. Rural seniors aged 65 years and older were no more likely to smoke than their urban counterparts. However, for all other age groups, rural residents were more likely to smoke than urban residents. Men were more likely to smoke than women regardless of where they lived. Lower socioeconomic status, as measured by educational attainment, income and employment, was associated with a greater prevalence of smoking. Nearly half of rural residents who reported they were unemployed were current smokers. A significant increase of about 3 percent in the prevalence of smoking between 1994-1996 and 2000-2001 among rural respondents was observed for two socio-demographic groupings—the youngest age category (18-34 years) and the lowest income category (< $25,000 per year) (data not presented in tables).

DISCUSSION

Comparison of 1994-1996 data with 2000-2001 data reveals that little progress towards achieving the national health objective for 2010 of < 12 percent of adults smoking cigarettes has been made for rural Americans. By 2000-2001, the rate of smoking among rural residents approached this mark only in Utah, which might reflect, at least in part, stronger cultural norms against tobacco use than in other states.

Tobacco control efforts may have the greatest influence when they are tailored towards persons at high risk for smoking. We observed that rural residence itself is a risk factor for smoking and that many well-known risk factors for smoking, such as male gender and low socioeconomic status,[15,16] are especially important among persons residing in rural locations. In rural America, persons who are unemployed are especially likely to smoke. Among minority group members residing in rural locations, American Indians, particularly those living in rural adjacent locations have a prevalence of current

Table 2: Percentage Currently Smoking by Urban-Rural and Selected Characteristics (2000-2001)

	Number of Respondents	Urban		Adjacent Rural		Non-Adjacent Large Rural		Non-Adjacent Small Rural		Chi-Square P-Value
		%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	
Overall	373,046	**22.0**	(21.8 , 22.3)	**24.9**	(24.3 , 25.5)	**24.0**	(23.2 , 24.8)	**24.9**	(24.2 , 25.7)	0.000
Race										
White	295,902	**22.6**	(22.3 , 22.9)	**25.0**	(24.3 , 25.6)	**24.1**	(23.2 , 25.0)	**25.1**	(24.3 , 25.9)	0.000
African American	29,616	**22.3**	(21.4 , 23.1)	**21.3**	(19.2 , 23.4)	**22.6**	(19.3 , 25.8)	**21.7**	(18.5 , 24.9)	0.838
Asian	8,675	**14.1**	(12.4 , 15.8)	**20.2**	(11.5 , 28.9)	**16.2**	(12.4 , 20.1)	**21.4**	(11.6 , 31.1)	0.223
American Indian	5,391	**34.4**	(30.8 , 38.0)	**45.2**	(39.2 , 51.2)	**25.8**	(19.7 , 32.0)	**36.3**	(31.0 , 41.6)	0.001
Hispanic	24,078	**19.4**	(18.4 , 20.4)	**20.9**	(18.0 , 23.9)	**22.9**	(19.1 , 26.7)	**21.2**	(16.8 , 25.6)	0.242
Gender										
Male	151,697	**24.1**	(23.7 , 24.5)	**26.6**	(25.6 , 27.5)	**26.2**	(24.9 , 27.4)	**26.3**	(25.1 , 27.5)	0.000
Female	221,349	**20.1**	(19.8 , 20.4)	**23.4**	(22.6 , 24.1)	**22.0**	(21.0 , 23.1)	**23.7**	(22.8 , 24.6)	0.000
Age										
18-34	98,818	**26.5**	(25.9 , 27.0)	**30.4**	(29.1 , 31.6)	**28.8**	(27.2 , 30.5)	**31.7**	(29.8 , 33.5)	0.000
35-49	118,966	**25.6**	(25.1 , 26.2)	**31.0**	(29.9 , 32.1)	**28.4**	(26.9 , 30.0)	**30.7**	(29.3 , 32.0)	0.000
50-64	82,789	**19.9**	(19.4 , 20.5)	**23.1**	(21.9 , 24.2)	**23.6**	(21.9 , 25.3)	**24.1**	(22.6 , 25.5)	0.000
65+	69,794	**9.7**	(9.3 , 10.1)	**10.5**	(9.6 , 11.4)	**9.9**	(8.7 , 11.1)	**10.4**	(9.3 , 11.4)	0.340
Education										
< High school	42,068	**29.4**	(28.3 , 30.4)	**33.3**	(31.6 , 35.0)	**31.3**	(28.8 , 33.9)	**31.3**	(29.2 , 33.5)	0.001
High school	219,944	**25.7**	(25.3 , 26.1)	**26.9**	(26.1 , 27.6)	**27.2**	(26.1 , 28.2)	**26.4**	(25.5 , 27.3)	0.007
College degree	110,192	**12.6**	(12.2 , 13.0)	**11.6**	(10.8 , 12.5)	**11.8**	(10.7 , 12.9)	**13.4**	(12.1 , 14.7)	0.061
Income										
< 25K	98,640	**27.6**	(26.9 , 28.2)	**30.6**	(29.5 , 31.8)	**30.6**	(28.9 , 32.2)	**30.9**	(29.4 , 32.3)	0.000
>= 25K, < 50K	112,662	**25.3**	(24.8 , 25.8)	**26.4**	(25.4 , 27.5)	**24.8**	(23.4 , 26.3)	**24.6**	(23.4 , 25.8)	0.114
>= 50K, < 75K	53,627	**20.5**	(19.8 , 21.1)	**19.8**	(18.4 , 21.2)	**18.8**	(16.7 , 20.9)	**20.7**	(18.5 , 22.9)	0.407
75K +	54,860	**14.9**	(14.4 , 15.5)	**15.9**	(14.2 , 17.5)	**13.9**	(11.7 , 16.1)	**16.2**	(13.7 , 18.6)	0.383
Missing	53,257	**17.5**	(16.9 , 18.2)	**20.3**	(18.9 , 21.8)	**20.0**	(18.2 , 21.8)	**20.4**	(18.6 , 22.3)	0.000
Employment Status										
Employed	237,016	**24.1**	(23.8 , 24.5)	**26.9**	(26.1 , 27.7)	**26.2**	(25.2 , 27.2)	**27.1**	(26.1 , 28.2)	0.000
Unemployed	13,043	**34.0**	(32.4 , 35.7)	**44.6**	(41.1 , 48.2)	**45.7**	(40.1 , 51.2)	**45.0**	(40.3 , 49.6)	0.000

smoking that is nearly double that of other groups. Moreover, younger adults and those with low income were observed to have a rising prevalence of smoking.

Monitoring trends in the rate of current smoking is needed to determine whether tobacco control efforts have been effective. Comparison of the prevalence of smoking in 1994-1996 with 2000-2001 reveals that smoking is declining slightly in urban areas, although states vary considerably on this measure. However, no comparable decline in smoking was found for rural respondents, and in several states, the prevalence of smoking among rural residents increased by 2 percent or more over this period.

The findings in this report are subject to several limitations. BRFSS does not sample persons living in institutions or persons living in households without a telephone, both of which are subgroups at higher risk for smoking. Prevalence estimates and trend data could have been affected by low response rates. However, demographic characteristics of BRFSS responders are consistent with U.S. census data. Further, data were based on self-report, which might be subject to recall bias, and no biochemical verification was used to assess smoking status. However, self-report of smoking generally has been found to be accurate in population-based surveys among adults, although under-reporting of smoking by African Americans recently has been documented in BRFSS compared to the NHIS.[12] Also, BRFSS has not collected recent national data on smokeless tobacco use, which is a relatively greater problem in rural locations than urban ones. [17] Finally, care must be taken in drawing conclusions based on data aggregated by county, as there is a significant degree of variation in population characteristics within many counties. For example, counties classified as urban may also encompass rural populations. This may have the effect of attenuating the observed rural-urban difference in the prevalence of smoking.

The overall rate of smoking in rural America is double the HealthyPeople 2010 target. Furthermore, between 1994-1996 and 2000-2001 the prevalence of smoking among residents of rural counties rose by 2 percent or more in ten states. This finding is somewhat surprising because during this interval the detrimental health effects of smoking were well-known, effective smoking cessation pharmacotherapy had become available,[18,19] and several states increased spending on smoking cessation, through revenues from increases in excise taxes on the sales of cigarettes[20] and by applying some of the funds arising from the Master Settlement Agreement between states and the tobacco industry in 1998. However, in fiscal year 2000, the overall average per capita funding for tobacco control was only $1.22 (range across states: $0.08 to 12.69) and most states were spending far less on tobacco control than the $5.98–15.85 annual per capita funding recommended in a CDC guideline for comprehensive programs.[21] Furthermore, many states have not provided any coverage for smoking cessation treatment services, such as pharmacotherapy, through Medicaid or other publicly-financed state-level programs,[22] which may partially explain the lack of improvement observed here. In fact, in 2000, only one state, Oregon, offered coverage for all tobacco control treatments recommended by the Public Health Service.[22] Of the six states that had a decline of 2 percent or more in the prevalence of smoking among rural respondents between 1994-1996 and 2000-2001, three, Connecticut, Tennessee and Utah, did not provide coverage for smoking cessation in their Medicaid program; two, Maryland and North Carolina, did not provide coverage for nicotine replacement therapy; and only California covered all types of recommended smoking cessation pharmacotherapy.[23]

These state-level obstacles to tobacco control are compounded in rural areas. Relatively low income and rates of health insurance, and poor availability of health care limit access to smoking cessation services.[24] In rural areas, resources for substance abuse treatment disproportionately fall to hospitals,[24] many of which face competing demands for limited resources. Also, many rural communities are too small to provide mass media messages about smoking prevention and treatment.

To counter the enormous market forces that promote tobacco use, substantial increases in funding for tobacco control are required. The persistently high rates of smoking among persons living in rural locations suggests that better public health strategies to prevent smoking initiation among nonsmokers and promote cessation among current smokers also need to be developed and implemented. In particular, efforts aimed at younger persons, those with low socio-economic status, and American Indians are warranted. Identification of factors explaining the improvements observed for rural residents of states such as Utah and California may provide new insights into strategies to address this refractory public health issue.

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