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**Obesity Prevalence in
Rural Counties:
A National Study**

by

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The WWAMI Rural Health Research Center (RHRC) is one of six centers supported by the Federal Office of Rural Health Policy (FORHP), a component of the Health Resources and Services Administration (HRSA) of the Public Health Service. The major focus of the WWAMI RHRC is to perform policy-oriented research on issues related to rural health care. Specific interests of the Center include the training and supply of rural health care providers and the content and outcomes of the care they provide; the availability and quality of care for rural women and children, including obstetric and perinatal care; and access to high-quality care for vulnerable and minority rural populations.

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Abstract

Background: Obesity is on the rise in the United States and has been implicated in serious chronic health problems, making it one of the nation's most pressing health concerns. Obesity is also very costly both in terms of medical spending and lost productivity. While some studies have compared the prevalence of obesity among racial and ethnic minority groups, education and income, and state of residence, few studies have examined differential prevalence by rural/urban status.

Aim: The aim of this national study was to estimate the prevalence of and recent trends in obesity among U.S. adults residing in rural and urban locations.

Methods: This study involved a random-digit telephone survey of adults aged 18 years and older residing in states participating in the Behavioral Risk Factor Surveillance System (BRFSS) in 1994-1996 (n = 342,055) and 2000-2001 (n = 385,384). The main outcome measure for the study was obesity, defined as a body mass index of 30 or greater, based on self-report.

Results: In 2000-2001, the prevalence of obesity was 23.0 percent for rural adults and 20.5 percent for their urban counterparts, representing increases of 4.8 percent and 5.5 percent, respectively, since 1994-1996. The highest obesity prevalence occurred in rural counties of Mississippi, Texas and Louisiana. Only Rhode Island and Colorado had rural counties that met the Healthy People 2010 goal of a maximum of 15 percent obese for adults.

Conclusions: Despite recent attention to the prevalence of obesity, obesity rates continue to rise across the United States and differentially affect inhabitants of rural and urban areas. As efforts to reduce the prevalence of obesity proceed, special consideration should be given to obesity prevention and, insofar as possible, treatment, particularly in rural areas.

Introduction

Rapidly rising rates of obesity have imparted a sense of urgency to efforts aimed at reducing its prevalence among Americans. Healthy People 2010¹ estimated that from 1988 to 1994, 23 percent of U.S. adults aged 20 and older were obese; the report called for a reduction in the prevalence of obesity in this group to 15 percent by 2010.

Obesity contributes to serious illnesses such as hypertension,^{2,3} diabetes,²⁻⁴ breast cancer,⁵ asthma,^{3,6} gall bladder disease,² depression^{7,8} and poor Health Related Quality of Life (HRQL).⁹⁻¹² Moreover, obesity is expensive. Finkelstein et al.¹³ estimated that average annual per capita medical spending was 37.4 percent higher for obese patients when compared to patients in the normal weight range and that 5.3 percent of total medical expenditures for the U.S. adult population was attributable to obesity alone. Apart from medical expenses, obesity is costly in terms of lost productivity in the workplace¹⁴⁻¹⁷ and foregone earnings due to premature mortality.¹⁵

Because of its adverse impact on health and health care costs, studies have begun focusing on the rising prevalence of obesity by residence in a particular state,¹⁸⁻²⁰ among specific racial and ethnic minority groups,^{1,18,21,22} and by education and income.^{1,23} Rural Healthy People 2010 reported that since 1980, rural dwellers are more likely to be obese than urban inhabitants.²⁴ However, few studies have examined differential prevalence based on residence by rural/urban status, specifically in rural areas of varying size and remoteness, in spite of variation within states,²⁰ or how rural/urban residence might exacerbate obesity prevalence among high-risk groups. If the prevalence of obesity is particularly high in rural areas, this has important implications for public health planning as there are both cultural and structural challenges facing obesity intervention in remote locations.²⁴

The aim of this study is to examine the prevalence of and trends in obesity among adults living in rural and urban locations, using several years of data from the Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS). By combining several years of BRFSS data, prevalence of obesity can be ascertained even for persons living in relatively remote rural locations.

Methods

Sample and Subjects: In 1984, the CDC established BRFSS for monitoring health risk behaviors.²⁵ BRFSS collects data annually on health-related behaviors that are useful for planning, initiating, monitoring, and evaluating health promotion and disease prevention programs. 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. We obtained non-public use data retaining all county-level Federal Information Processing Standards (FIPS) codes²⁶ 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. To increase statistical power, multiple years of BRFSS data can be combined. 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 to 87.1%) in 1996 and 53.5 percent (range: 48.9 to 63.2%) in 2001. BRFSS is administered by telephone; its national estimate for obesity prevalence in 1999 of 19.4 percent was slightly lower than the estimate of 21.1 percent produced by the National Health Interview Survey (NHIS), an in-home survey with a response rate of 69.6 percent in 1999.²⁷ The BRFSS estimate of obesity among whites of 18.3 percent is lower than the corresponding NHIS estimate of 20.4 percent by approximately the same amount as the overall figures. However, for African Americans the BRFSS and NHIS estimates are quite close, 28.1 percent compared to 28.5 percent obese, respectively. The University of Washington Institutional Review Board has approved this study.

Dependent Measure: Height and weight were determined through self-report; respondents were asked, “About how tall are you without shoes?” and, “About how much do you weigh without shoes?” Body mass index (BMI) was derived from height and weight and obesity was defined as having a BMI equal to or greater than 30 kg/m².

Independent Measures: Rural residence was ascertained by classifying county FIPS codes available on BRFSS. These were broadly grouped as metropolitan (urban) or non-metropolitan (rural) county of residence, although the rural classification was further categorized using the Urban Influence Code groupings of the Economic Research Service of the United States Department of Agriculture²⁸ as follows: (1) “Rural Adjacent”—geographically adjacent to a metropolitan area; (2) “Large Rural Non-Adjacent”—not adjacent to a metropolitan county and with a city of 10,000 residents or greater; and (3) “Small Rural Non-Adjacent”—not adjacent to a metropolitan county and without a city of 10,000 residents or greater. Additional geographic classifications were 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 (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, \$75,000 or greater) and employment status (employed, unemployed, out of the workforce).

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,²⁹ which adjusts

the standard errors to account for the complex sample design of the BRFSS. Relative standard errors (RSEs) were calculated for table estimates; caution should be exercised in interpreting results with RSEs >0.3 . Temporal changes in obesity prevalence were analyzed by comparing estimates from 1994-1996 against those from 2000-2001.

Results

In 2000-2001, 23.0 percent of the rural adult U.S. population was obese. States with the highest rates of obesity in all types of rural counties were Mississippi (26.7%), Texas (25.7%) and Louisiana (25.7%) (not shown in tables). Only a handful of states had rural counties that approached or met the Healthy People 2010 goal of a maximum of 15 percent obese for adults: Hawaii (16.8%), Montana (16.5%), Massachusetts (16.1%), Rhode Island (14.9%) and Colorado (14.6%) had the lowest rural obesity prevalence. Southeastern states were overrepresented among states with rural obesity rates averaging above 24.0 percent.

Table 1 presents the state and Census Division level prevalence of obesity for 2000-2001 by the three rural categories and one urban category. Nationwide, for most Census Divisions and for many states, obesity prevalence was lowest in urban counties and highest in adjacent rural or small, non-adjacent rural counties; prevalence in large, non-adjacent rural counties tended to have prevalence similar to urban counties. The only two Census Divisions where the association between rural/urban location and obesity prevalence was not significant, *Mountain* and *Pacific*, were also two of the three Census Divisions with the lowest overall rates of obesity; in contrast, divisions with higher overall obesity tended to have disproportionately higher obesity prevalence in rural counties. Only a few states had high obesity prevalence in both urban and rural counties. The highest urban obesity prevalence occurred in Mississippi, Alabama, West Virginia, Texas, Michigan, and Indiana, and the first four of these states had consistently high prevalence of obesity (above 23.5%) across rural categories as well.

Table 2 cross-tabulates the absolute change in rural obesity prevalence between 1994-1996 and 2000-2001 with rural obesity prevalence in 2000-2001, by state. States with the highest rural obesity prevalence and the greatest increases in prevalence included Mississippi, South Carolina and Wisconsin; states with the lowest prevalence and smallest increases included Colorado, Montana, and Hawaii. States with the sharpest increases in rural obesity prevalence were rather evenly distributed geographically, though within this group the two states with the lowest prevalence were in New England while states with the highest prevalence were predominantly southeastern. States with the smallest increases in rural obesity prevalence were also evenly spread, but similarly to the group with the highest increases, southern states in this group were more likely than other states to have high current prevalence.

Table 3 shows prevalence of obesity by the three rural categories and one urban category for selected sociodemographic characteristics. African Americans had the highest obesity prevalence of any group in every rural/urban category, while Asians and Pacific Islanders had the lowest obesity prevalence across categories, but both groups had considerably higher rates of obesity in non-adjacent rural counties compared to urban counties. Obesity differences by sex, age, education and income were consistent within each rural/urban category. Groups with the highest obesity prevalence overall were those aged 50-64, those with less than a high school diploma, and those with the lowest income; men and women were not significantly different. The unemployed had higher obesity prevalence than those employed or out of the labor force; interestingly, obesity prevalence was disproportionately higher for all rural unemployed categories compared to the urban unemployed.

Figure 1 shows the absolute percent change in obesity prevalence from 1994-1996 to 2000-2001 in rural counties for each state. The increase in obesity prevalence for the U.S. overall during this period was 5.4 percent; rural obesity rose 4.8 percent and urban obesity rose 5.5 percent (data not presented in tables or figures). With the exception of rural Florida, obesity prevalence increased in rural counties of every state; however, the decline in Florida's rural counties was not statistically significant.

Figure 1 also shows no clear-cut geographic pattern in obesity prevalence for rural counties. The relatively modest increase in prevalence for a few states, notably Texas, Indiana, Missouri, Louisiana and Alabama, could reflect their already high prevalence (> 20%) in the 1994-1996 period (data not shown). Only four states had increases of more than 7 percent, Tennessee, Washington, Wisconsin and Georgia.

Discussion

Comparison of 1994-1996 data with 2000-2001 data reveals that no progress towards achieving the national health objective for 2010 of a reduction in prevalence of obesity among adults to less than 15 percent has been made for rural Americans. On the contrary, only two states had fewer than 15 percent of their adult rural populations with BMI \geq 30 in 2000-2001, and obesity prevalence rose in rural counties for all but one state.

Moreover, residence in a rural county was related to higher prevalence of adult obesity compared to urban residence. Residents of rural non-adjacent counties with a large town (population \geq 10,000) had obesity prevalence more similar to residents of metropolitan counties than to residents of other rural county types. In rural non-adjacent counties with at least one large town, the bulk of the population likely resides in or near the largest towns, so that overall obesity prevalence is weighted in favor of the average prevalence in the largest towns. Given

this, it is possible that the explanation for rural/urban differences in obesity is related to the population size of the city or town area where one lives, rather than distance from the nearest metropolitan area, and that the threshold of the size effect that non-metropolitan cities and towns have on obesity prevalence is rather low (around 10,000 persons). However, we do not have data that would allow us to test this hypothesis directly.

States with the largest increases in rural obesity prevalence were geographically dispersed. However, within the group of states with the largest rural increases, there was a spatial pattern reflecting the overall pattern of rural obesity prevalence, wherein southeastern states were overrepresented among states with the highest prevalence in rural counties. Finally, states with high increases in rural obesity prevalence were likely to also have high prevalence in 2000-2001, while states with low increases were likely to have low prevalence; comparatively few states experienced high increases but low prevalence, and vice versa.

Rural obesity is a particular issue for some racial/ethnic minority groups; African-Americans living in rural counties had the highest obesity prevalence of all groups examined. Asian and Pacific Islanders living in urban counties had an extremely low prevalence of obesity, but those living in remote rural counties without a large town had obesity prevalence approaching the national average. Living in a rural county appears to exacerbate the effect of employment status on obesity; the unemployed were especially likely to be obese if they lived in rural counties, compared to the employed or those no longer in the labor force.

This report's findings are subject to several limitations. BRFSS does not sample persons living in institutions or persons living in households without a telephone; persons living in households without a telephone may be more likely to be obese as having a telephone reflects socioeconomic status. 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. Another limitation is the use of self-reported height and weight for determining obesity. Respondents, especially women, tend to under-report their weight, while male and female respondents alike over-report their height, resulting in underestimates of obesity prevalence.^{19, 30, 31} However, it has not been established that this tendency has changed over time, or that it varies by other characteristics important to understanding rising obesity rates or the rural/urban difference in those rates. The race/ethnicity groupings available in BRFSS data would not allow any important differences between heterogeneous subgroups within these broad categories to be revealed. For example, the observed difference for Asians and Pacific Islanders living in urban as opposed to rural counties could reflect racial/ethnic heterogeneity.

Finally, just as within-state variation in health risk factors is a concern,²⁰ care must also be taken in drawing conclusions based on data aggregated by county, as there is a significant degree of variation in population characteristics between sub-county areas that are invisible when county-level measures are employed. Counties with at least one metropolitan area may also

encompass rural populations of substantial size, while many primarily rural counties have towns large enough to experience obesity rates similar to metropolitan areas. This would tend to have the effect of attenuating the rural/urban difference in obesity prevalence by county, since many county-level estimates will include both rural and urban components. Therefore, our study probably underestimates the difference in obesity prevalence between rural and urban areas if these areas were to be more precisely delineated.

The obesity epidemic, as it has been termed, is thought to be the result of a number of factors common to many industrialized countries. The widespread availability of inexpensive, densely caloric and highly flavored foods,^{32, 33} rising portion sizes,^{32, 34} and more sedentary work routines as well as reduced levels of physical activity in recreation and transportation^{32, 33, 35-37} have all been blamed for the growing prevalence of obesity among both adults and children. The Surgeon General and others have advocated a public health approach to obesity reduction and prevention as a better solution than relying solely on individual-level tactics for weight loss.³⁷⁻⁴⁰

The reduction and prevention of obesity is especially challenging in rural areas, where cultural and structural factors contribute to higher prevalence. Among these factors are favoring television and video games over more active leisure pursuits,⁴¹ lower compliance with dietary recommendations,⁴² and few sidewalks and exercise facilities.²⁴ Obesity interventions oriented toward adults that have been found to be effective in rural areas, or could be readily applied to remote populations, include televised weight-loss programs,^{43, 44} correspondence courses,⁴⁵ community-based efforts promoting the consumption of vegetables and fruits,⁴⁶ continuing nutrition education for rural physicians^{47, 48} and efforts to improve feelings of self-efficacy among rural inhabitants with respect to diet.⁴⁹ If public health policies dealing with obesity are to be implemented successfully, they must address issues directly relevant to residence in rural locales, particularly isolated ones, or such policies will be likely to fail where they are most needed.

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Table 1. Percent Obese (BMI ≥ 30) by Census Division, State and Urban-Rural (2000-01), Unadjusted *

State	Number of Respondents	Non-Adjacent						Chi-Square P-Value
		Urban		Adjacent Rural		Small Rural		
		% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	
Overall	357,384	20.5 (20.2, 20.7)	23.5 (22.9, 24.0)	21.1 (20.3, 21.8)	23.3 (22.6, 24.0)		0.000	
New England								
Connecticut	52,235	17.3 (16.8, 17.8)	18.4 (17.3, 19.6)	20.4 (17.7, 23.1)	20.1 (18.1, 22.2)		0.004	
Maine	10,544	17.6 (16.7, 18.5)	19.1 (16.2, 22.1)	-- (--, --)	-- (--, --)		0.326	
Massachusetts	6,560	18.7 (16.6, 20.9)	19.0 (17.2, 20.8)	24.1 (16.6, 31.7)	23.7 (19.7, 27.8)		0.094	
Hew Hampshire	15,139	16.8 (16.1, 17.6)	17.9 (11.9, 23.9)	-- (--, --)	11.1 (3.9, 18.2)		0.306	
Rhode Island	5,341	19.5 (17.8, 21.3)	17.7 (15.2, 20.3)	18.7 (15.5, 21.8)	-- (--, --)		0.516	
Vermont	7,237	17.7 (16.6, 18.7)	14.9 (11.6, 18.2)	-- (--, --)	-- (--, --)		0.118	
	7,414	15.6 (14.0, 17.3)	19.2 (17.2, 21.2)	20.1 (17.1, 23.2)	18.7 (17.0, 20.4)		0.008	
Middle Atlantic								
New Jersey	22,293	19.6 (18.8, 20.3)	24.4 (22.0, 26.7)	18.6 (12.6, 24.7)	24.0 (17.8, 30.3)		0.001	
New York	8,731	19.1 (18.1, 20.2)	-- (--, --)	-- (--, --)	-- (--, --)		--	
Pennsylvania	6,706	18.8 (17.6, 19.9)	23.5 (19.4, 27.6)	18.6 (12.6, 24.7)	25.7 (12.6, 38.7)		0.127	
	6,856	21.2 (19.9, 22.4)	24.9 (22.1, 27.7)	-- (--, --)	23.2 (16.4, 30.0)		0.050	
East North Central								
Illinois	32,170	21.8 (21.2, 22.5)	24.1 (22.6, 25.5)	19.3 (16.4, 22.1)	25.1 (22.6, 27.7)		0.001	
Indiana	7,431	21.1 (19.9, 22.3)	23.0 (19.7, 26.3)	20.8 (15.9, 25.7)	23.7 (19.0, 28.3)		0.533	
Michigan	6,620	23.3 (21.9, 24.7)	24.8 (22.3, 27.2)	18.5 (14.0, 22.9)	23.0 (14.9, 31.0)		0.124	
Ohio	6,051	23.3 (21.9, 24.7)	26.2 (21.9, 30.5)	19.6 (13.7, 25.4)	26.1 (21.7, 30.4)		0.200	
Wisconsin	6,213	21.8 (20.3, 23.3)	22.7 (19.4, 26.0)	12.3 (0.7, 23.9)	25.3 (15.3, 35.2)		0.377	
	5,855	19.3 (17.9, 20.7)	25.0 (22.5, 27.5)	17.6 (5.6, 29.7)	25.9 (21.3, 30.5)		0.000	

State	Number of Respondents	Non-Adjacent						Chi-Square P-Value			
		Urban		Adjacent Rural		Large Rural			Small Rural		
		%	(95% CI)	%	(95% CI)	%	(95% CI)		%	(95% CI)	
West North Central											
Iowa	49,957	20.4	(19.7, 21.2)	22.2	(21.0, 23.4)	19.4	(18.3, 20.6)	23.2	(22.1, 24.2)		0.000
Kansas	6,846	21.3	(19.6, 23.1)	22.1	(19.9, 24.4)	19.2	(15.9, 22.4)	24.7	(22.2, 27.1)		0.045
Minnesota	8,288	20.7	(19.3, 22.0)	25.3	(22.4, 28.3)	19.3	(16.9, 21.7)	21.2	(18.8, 23.6)		0.017
Missouri	6,533	18.3	(17.0, 19.6)	19.1	(16.3, 21.9)	16.4	(13.3, 19.5)	23.5	(19.9, 27.1)		0.025
Nebraska	8,182	22.3	(20.6, 24.0)	23.6	(21.0, 26.3)	23.4	(20.3, 26.5)	22.4	(20.0, 24.8)		0.811
North Dakota	6,319	20.3	(18.7, 22.0)	24.2	(20.4, 28.0)	17.8	(15.1, 20.6)	22.8	(20.5, 25.1)		0.014
South Dakota	4,148	18.0	(16.1, 20.0)	22.0	(17.7, 26.3)	20.3	(17.3, 23.4)	24.1	(21.2, 27.0)		0.006
	9,641	18.7	(17.2, 20.2)	16.8	(14.4, 19.3)	20.0	(18.2, 21.8)	25.0	(23.2, 26.8)		0.000
South Atlantic											
Delaware	59,597	19.8	(19.2, 20.3)	23.7	(22.5, 25.0)	22.1	(19.9, 24.2)	24.3	(22.4, 26.2)		0.000
District of Columbia	5,901	18.3	(16.8, 19.8)	20.7	(18.5, 22.8)	--	(--, --)	--	(--, --)		0.070
Florida	3,421	20.8	(19.2, 22.3)	--	(--, --)	--	(--, --)	--	(--, --)		--
Georgia	9,249	18.7	(17.7, 19.6)	18.5	(15.0, 21.9)	--	(--, --)	30.3	(21.0, 39.6)		0.054
Maryland	8,082	20.5	(19.0, 21.9)	24.6	(22.1, 27.2)	28.8	(24.4, 33.3)	23.8	(20.6, 27.0)		0.000
North Carolina	8,414	20.0	(18.9, 21.2)	20.0	(16.1, 23.9)	21.4	(16.2, 26.6)	23.2	(-36.2, 82.6)		0.729
South Carolina	8,680	21.4	(20.0, 22.8)	25.4	(22.7, 28.1)	16.3	(9.1, 23.4)	22.2	(17.4, 27.0)		0.031
Virginia	6,114	21.1	(19.7, 22.5)	26.3	(23.6, 29.0)	17.5	(12.7, 22.3)	35.4	(25.7, 45.1)		0.000
West Virginia	4,573	19.0	(17.5, 20.5)	23.2	(19.2, 27.1)	15.6	(7.2, 23.9)	23.4	(18.6, 28.2)		0.076
	5,163	23.5	(21.5, 25.5)	24.6	(21.3, 28.0)	23.7	(20.8, 26.6)	25.2	(22.5, 28.0)		0.756

State	Number of Respondents	Non-Adjacent						Chi-Square P-Value		
		Urban		Adjacent Rural		Large Rural			Small Rural	
		%	(95% CI)	%	(95% CI)	%	(95% CI)		%	(95% CI)
East South Central										
Alabama	28,415	22.9	(21.9, 23.8)	25.7	(24.2, 27.2)	25.1	(23.2, 27.0)	25.5	(24.0, 27.0)	0.002
Kentucky	4,811	23.6	(21.9, 25.4)	25.2	(22.4, 28.0)	--	(--, --)	27.0	(21.2, 32.8)	0.415
Mississippi	13,214	22.7	(20.9, 24.4)	24.9	(22.3, 27.4)	24.6	(22.0, 27.2)	25.1	(23.6, 26.6)	0.207
Tennessee	4,907	24.0	(21.3, 26.6)	29.1	(25.6, 32.7)	26.6	(23.8, 29.3)	25.3	(22.6, 28.0)	0.129
	5,483	22.1	(20.5, 23.7)	25.4	(22.5, 28.3)	22.5	(17.9, 27.1)	25.7	(20.4, 31.0)	0.186
West South Central										
Arkansas	32,962	23.0	(22.2, 23.8)	24.9	(23.4, 26.4)	27.0	(23.9, 30.1)	23.7	(21.5, 25.9)	0.024
Louisiana	5,641	21.3	(19.5, 23.1)	24.5	(21.8, 27.2)	25.6	(21.7, 29.5)	23.1	(20.4, 25.8)	0.099
Oklahoma	9,370	23.1	(22.0, 24.3)	25.9	(23.6, 28.2)	24.7	(15.2, 34.2)	25.1	(20.6, 29.6)	0.195
Texas	7,681	20.0	(18.5, 21.5)	23.2	(21.1, 25.2)	19.5	(15.9, 23.0)	24.3	(20.6, 27.9)	0.026
	10,270	23.4	(22.4, 24.5)	25.3	(22.6, 28.0)	30.6	(25.0, 36.3)	23.7	(19.5, 27.8)	0.069
Mountain										
Arizona	48,243	17.7	(16.9, 18.5)	18.0	(16.7, 19.4)	18.5	(17.4, 19.7)	17.9	(16.6, 19.1)	0.727
Colorado	5,450	18.9	(17.0, 20.8)	16.0	(12.8, 19.1)	16.7	(12.5, 21.0)	20.0	(16.0, 24.0)	0.290
Idaho	4,847	14.5	(13.1, 15.9)	14.0	(9.3, 18.7)	17.2	(11.4, 23.1)	13.8	(10.4, 17.3)	0.787
Montana	9,324	19.0	(17.1, 20.9)	20.2	(17.8, 22.6)	19.2	(17.7, 20.8)	20.9	(19.3, 22.6)	0.381
Nevada	6,080	20.4	(17.2, 23.5)	21.5	(17.3, 25.7)	13.4	(11.4, 15.3)	19.5	(17.8, 21.3)	0.000
New Mexico	4,443	18.9	(16.8, 21.0)	17.2	(13.9, 20.4)	19.0	(13.5, 24.6)	17.5	(13.4, 21.6)	0.787
Utah	6,546	17.9	(16.5, 19.4)	21.4	(17.9, 24.9)	23.0	(20.7, 25.3)	18.4	(14.5, 22.3)	0.002
Wyoming	6,317	19.1	(17.6, 20.7)	19.1	(16.6, 21.5)	19.7	(10.3, 29.1)	19.4	(16.7, 22.1)	0.998
	5,236	18.4	(16.3, 20.6)	18.5	(11.9, 25.1)	19.9	(17.6, 22.1)	28.6	(26.6, 30.5)	0.792

State	Number of Respondents	Urban		Adjacent Rural		Non-Adjacent		Chi-Square P-Value		
		%	(95% CI)	%	(95% CI)	Large Rural %	Small Rural %			
Pacific	31,512	20.6	(19.7, 21.6)	21.3	(18.5, 24.2)	18.0	(15.7, 20.4)	20.1	(16.0, 24.3)	0.211
Alaska	--	--	(--, --)	--	(--, --)	--	(--, --)	--	(--, --)	--
California	7,907	21.0	(19.8, 22.1)	20.8	(15.4, 26.2)	12.1	(0.8, 23.3)	12.8	(1.5, 24.1)	0.300
Hawaii	10,283	16.9	(15.4, 18.3)	--	(--, --)	16.9	(15.6, 18.3)	15.9	(13.5, 18.4)	0.772
Oregon	5,932	21.2	(19.8, 22.6)	21.1	(18.2, 24.0)	20.7	(16.7, 24.7)	23.3	(18.6, 28.0)	0.849
Washington	7,390	18.6	(17.5, 19.7)	22.4	(19.0, 25.8)	18.7	(14.4, 23.0)	24.2	(17.2, 31.2)	0.097

* Estimates with RSE > 0.3 are not bolded; caution should be used in interpreting such results.

Table 2. Absolute Change in Rural Obesity Prevalence from 1994-1996 to 2000-2001 by Rural Obesity Prevalence in 2000-2001*

Change Since 1994-1996	Current Prevalence		
	Highest Prevalence (22.8 to 26.7%)	Moderate Prevalence (20.2 to 22.7%)	Lowest Prevalence (14.6 to 20.1%)
Highest Absolute Increase (5.6 to 7.6%)	Arkansas Georgia Kentucky Michigan Mississippi South Carolina Tennessee West Virginia Wisconsin	Kansas New Mexico Oklahoma Oregon South Dakota Washington	Connecticut Massachusetts
Moderate Absolute Increase (3.7 to 5.5%)	Alabama Louisiana North Carolina Pennsylvania	Iowa Maine Nebraska New York North Dakota	Arizona Idaho <i>Rhode Island</i> Utah Vermont Wyoming
Lowest Absolute Increase (0.0 to 3.6%)	Indiana Missouri Texas	Delaware Illinois Maryland Ohio Virginia	California <i>Colorado</i> Florida Hawaii Minnesota Montana Nevada New Hampshire

* Does not include Alaska (county FIPs codes unavailable), or New Jersey and the District of Columbia (no rural counties); states in italics have rural obesity prevalence below 15 percent.

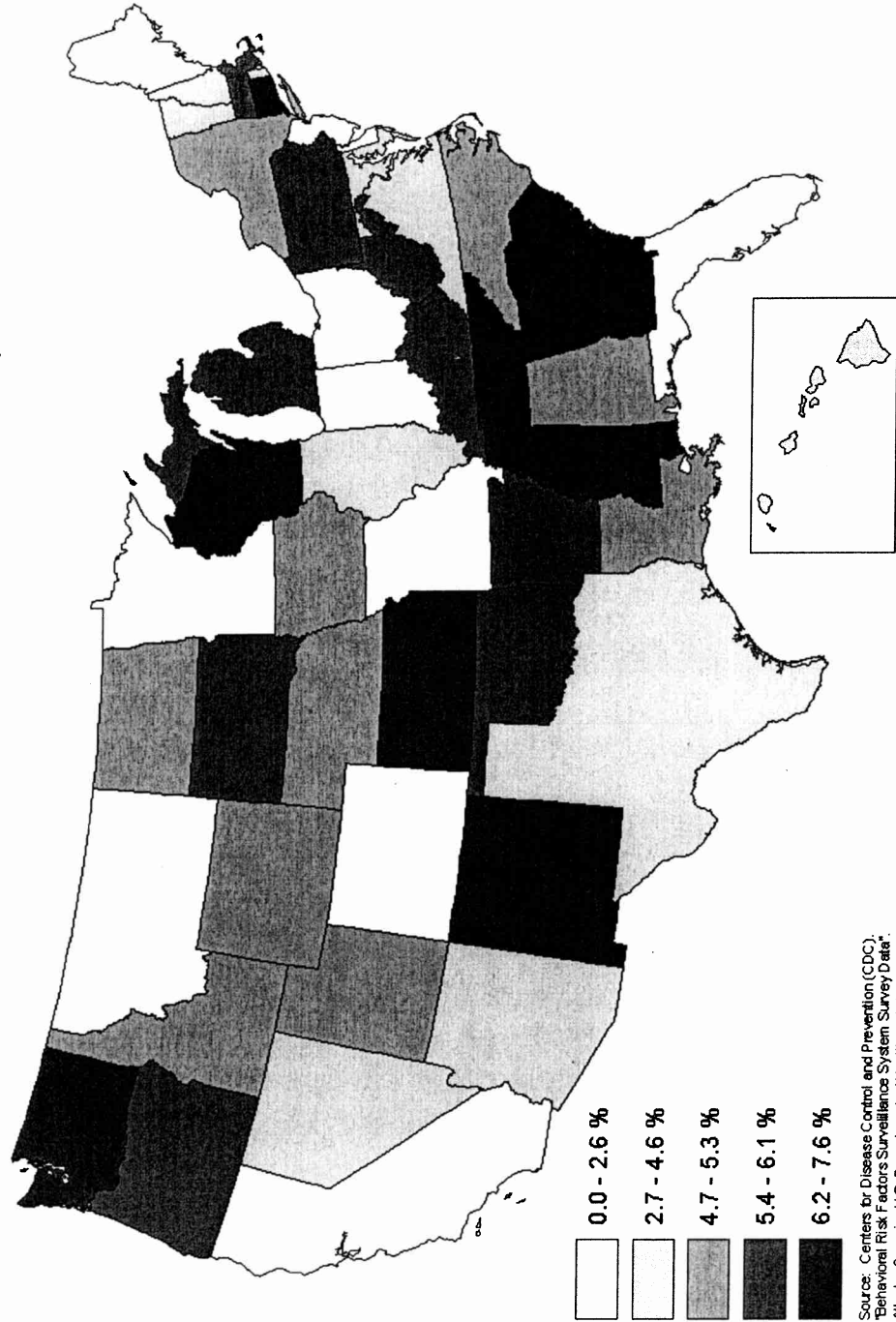
Table 3. Percent Obese (BMI ≥ 30) by Urban-Rural and Selected Characteristics (2000-01), Unadjusted

Factor	Number of Respondents	Urban		Adjacent Rural		Non-Adjacent		Chi-Square P-Value		
		%	(95% CI)	%	(95% CI)	Large Rural %	Small Rural %			
Overall	357,384	20.5	(20.2, 20.7)	23.5	(22.9, 24.0)	21.1	(20.3, 21.8)	23.3	(22.6, 24.0)	0.000
Race										
white	284,308	18.9	(18.3, 19.4)	22.3	(21.9, 22.8)	19.7	(18.9, 20.6)	22.4	(21.7, 23.1)	0.000
African American	28,250	30.4	(29.5, 31.4)	35.1	(32.7, 37.4)	34.9	(31.2, 38.5)	32.5	(29.2, 35.8)	0.001
Asian/Pac islander	8,394	6.3	(5.1, 7.4)	4.4	(1.4, 7.4)	10.0	(7.2, 12.7)	17.9	(9.0, 26.8)	0.004
Native American	5,197	25.9	(22.5, 29.3)	29.6	(23.7, 35.5)	30.1	(23.4, 36.7)	29.8	(24.9, 34.7)	0.446
Hispanic	22,595	24.7	(23.6, 25.8)	26.1	(22.6, 29.6)	25.2	(21.3, 29.2)	23.1	(18.8, 27.4)	0.756
Gender										
male	150,120	20.8	(20.4, 21.2)	23.5	(22.6, 24.4)	20.7	(19.6, 21.8)	23.0	(22.0, 24.1)	0.000
female	207,264	20.1	(19.8, 20.5)	23.4	(22.6, 24.2)	21.4	(20.3, 22.5)	23.5	(22.6, 24.5)	0.000
Age										
18-34	95,247	15.7	(15.2, 16.1)	18.5	(17.4, 19.5)	16.8	(15.4, 18.1)	18.6	(17.3, 19.9)	0.000
35-49	113,768	22.9	(22.3, 23.4)	26.5	(25.4, 27.6)	23.5	(22.1, 25.0)	26.6	(25.3, 28.0)	0.000
50-64	79,192	25.8	(25.2, 26.5)	28.0	(26.7, 29.3)	26.6	(24.8, 28.4)	28.5	(27.1, 30.0)	0.001
65+	67,417	18.9	(18.3, 19.5)	21.1	(19.8, 22.3)	18.4	(16.7, 20.0)	19.2	(17.8, 20.6)	0.014

Factor	Number of Respondents	Non-Adjacent						Chi-Square P-Value		
		Urban		Adjacent Rural		Non-Adjacent				
		%	(95% CI)	%	(95% CI)	Large Rural %	Small Rural %			
Education										
< high school	39,904	27.9	(26.8, 29.0)	27.9	(26.2, 29.5)	25.8	(23.5, 28.2)	26.7	(24.8, 28.5)	0.357
high school	210,592	21.7	(21.3, 22.1)	23.9	(23.2, 24.6)	21.4	(20.4, 22.4)	23.6	(22.7, 24.5)	0.000
college degree	106,310	15.5	(15.1, 15.9)	18.7	(17.5, 19.8)	17.8	(16.4, 19.3)	18.8	(17.3, 20.3)	0.000
Income										
< 25K	94,968	24.8	(24.2, 25.5)	27.0	(25.9, 28.2)	24.7	(23.2, 26.2)	26.0	(24.8, 27.3)	0.004
≥ 25K, < 50K	108,969	22.0	(21.5, 22.5)	23.7	(22.7, 24.7)	21.3	(20.0, 22.7)	23.6	(22.4, 24.8)	0.002
≥ 50K, < 75K	51,963	19.8	(19.1, 20.4)	22.1	(20.6, 23.7)	19.7	(17.6, 21.7)	21.5	(19.5, 23.5)	0.023
75K +	53,541	15.7	(15.2, 16.2)	18.7	(17.0, 20.5)	17.5	(15.1, 19.8)	17.0	(14.8, 19.1)	0.005
Missing	47,943	17.2	(16.5, 18.0)	19.8	(18.4, 21.3)	16.4	(14.7, 18.1)	21.1	(19.3, 22.9)	0.000
Employment Status										
employed	227,708	20.3	(19.9, 20.6)	23.3	(22.5, 24.0)	20.8	(19.9, 21.8)	22.8	(22.0, 23.7)	0.000
unemployed	12,413	22.7	(21.2, 24.2)	27.0	(23.8, 30.2)	26.3	(21.8, 30.8)	28.2	(24.1, 32.4)	0.012
out of labor force	116,736	20.6	(20.1, 21.0)	23.4	(22.4, 24.3)	20.9	(19.5, 22.2)	23.4	(22.2, 24.5)	0.000

* Estimates with RSE > 0.3 are not bolded; caution should be used in interpreting such results.

Figure 1.
Absolute Change in the Prevalence of Obesity within Rural Counties
by State (1994 - 1996 to 2000 - 2001)



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.

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