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Disparities in the Prevalence of Adult Overweight and Obesity by Demographic Characteristics—Colorado BRFSS, 2011-2014

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Background

Colorado continues to lead the nation with the lowest prevalence of obesity among adults.¹ Even still, Colorado, like the rest of the United States (U.S.), has experienced an upward trend in the adult prevalence of obesity since the early 2000s. According to recent data, an estimated one in five adult Coloradans are obese and more than half (57.4%) are overweight or obese.² Comparatively, more than one-third of U.S. adults are estimated to be obese and over two-thirds are overweight or obese.³ Similar to other chronic diseases, there are differences in the prevalence of obesity by race, ethnicity, income, education level, age, sex and other demographic and socioeconomic characteristics.²

Historically, Black and Hispanic Coloradans have experienced a much higher burden of obesity compared with White, non-Hispanic Coloradans.² There are also notable regional differences in the burden of adult obesity across the state.² In this study, the combined prevalence of overweight and obesity was chosen as the outcome since similar public health prevention efforts and resources can be directed to both groups based on the findings. The purpose of the study was to investigate disparities in overweight or obesity by race/ethnicity, rural and urban residence, and other demographic characteristics.

Methods

Data sources

The Colorado Behavioral Risk Factor Surveillance System (BRFSS) is an annual, statewide telephone survey of non-institutionalized adults aged 18 years and older developed by the Centers for Disease Control and Prevention. The final sample data are weighted to allow for inference to the entire population of adult Colorado residents.⁴

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Definitions

The BRFSS collects self-reported height and weight to calculate body mass index (BMI). Individuals with a BMI greater than or equal to 25 kg/m² were defined as being *overweight* or *obese*. Adults with a normal (18.5-24.9 kg/m²) or underweight BMI (<18.5 kg/m²) were grouped into the *not overweight* or *obese* category. Employment status was categorized into *employed for wages* or *not employed*, including adults who responded that they were unemployed, a homemaker, student, retired or unable to work. Responses included in the *not married* category of marital status included those who answered one of the following: *divorced, widowed, separated, never married, or a member of unmarried couple*. Annual household income is referred to as *income*. The Hispanic-ethnicity category included all races.

Rural and urban residence was defined using individuals' county of residence and classified according to the Colorado Rural Health Center's (CRHC) programmatic designations of urban, rural and frontier.⁵ The CRHC uses the Federal Office of Management and Budget (OMB) definitions of *metropolitan* and *micropolitan* areas for urban and rural, respectively.⁶ In addition, the CRHC further delineates rural by designating frontier counties as micropolitan counties with a population density of six or fewer persons per square mile.⁵

Statistical Analyses

A four-year combined dataset, including data from the 2011, 2012, 2013 and 2014 BRFSS was used for this study. The outcome of interest was the binary-variable overweight or obese adults. Categorical independent variables of interest included: *age, sex, race/ethnicity, income, education level, marital status, employment status, survey year* and *rural-urban residence*. Responses coded as *missing, don't know, or refused* were treated as missing and excluded from the analysis.

Descriptive statistics were produced to determine the prevalence and 95-percent confidence intervals for each variable of interest. Statistical independence was assessed using the CROSSTAB procedure in SAS-callable SUDAAN which produces a Chi-square Wald F test statistic that is comparable to the Pearson Chi-square test for unweighted data. The Cochran-Mantel-Haenszel test for trend was used to examine associations between

the dependent variable and all ordinal categorical independent variables. Unadjusted prevalence ratios (PR) and 95-percent confidence intervals were calculated in bivariate analyses. Multivariable logistic regression was performed to estimate the adjusted prevalence and adjusted prevalence ratios (aPR) from predicted marginals for each independent variable found to be associated with the outcome. The final logistic regression model was fit using forward variable selection, resulting in the following covariates: sex, age group, race/ethnicity, marital status, and education level. Goodness-of-fit was assessed using the Hosmer-Lemeshow test and likelihood ratio test to compare models as more covariates were added. The significance level was set at p<0.05. All statistical analyses were performed using SAS-callable SUDAAN.⁷

Results

The final sample included 52,915 adult Colorado residents from 2011-2014. Over half (54.2%) of adults were overweight or obese. Table 1 shows the unweighted frequency and weighted percentage of demographic characteristics overall and among those who are overweight or obese. The following were independently associated with the outcome: sex, age, race/ethnicity, rural-urban residence, education level, marital status, and employment status. Significantly more males (64.3%) were overweight or obese compared with females (48.1%) (p<.0001). In general, the prevalence of overweight or obesity significantly increased with age (p<.0001). Overweight or obese significantly varied by race/ethnicity (p=0.006). Hispanic adults had the highest prevalence of overweight or obesity, 66.8 percent, followed by American Indian/Alaska Native (64.5%), Black (62.9%), other race (62.8%), White (54.1%), multiracial (52.3%) and Asian (35.0%) adults. A significantly greater proportion of employed adults (57.7%) were overweight or obese compared with those that were not employed (54.3%) (p<.0001). Married adults had a significantly higher prevalence of overweight or obesity compared to those who were unmarried (60.4% versus 51.8%; p=0.0001). Rural-urban residence was significantly associated with the outcome (p=0.01). Overweight or obesity was more prevalent among adults living in a frontier (61.9%) county compared with urban (56.8%) and rural (56.6%) counties. Overweight or obesity did not significantly differ based on income (p=0.63) or survey year (p=0.31).

Table 1. Demographic characteristics by overweight or obese, Colorado adults, BRFSS, 2011-2014 (N=52,915).

Covariates	Overweight or obese (N=28,696) n (%)	Total (N=52,915) n (%)	Chi-Squared Wald F p-value
Sex			<.0001
Male	14,955 (64.3)	22,468 (51.6)	
Female	13,741 (48.1)	27,638 (48.4)	
<i>Missing 2,809</i>			
Age group (year)			<.0001
18-24	813 (34.1)	2,351 (12.6)	
25-34	2,372 (51.4)	4,657 (18.2)	
35-44	3,955 (61.8)	6,722 (17.9)	
45-54	5,399 (62.7)	8,917 (18.7)	
55-64	7,166 (63.5)	11,672 (16.3)	
≥65	8,789 (59.0)	15,408 (16.3)	
<i>Missing 3,188</i>			
Race/Ethnicity*			0.006
White	22,584 (54.1)	40,551 (73.4)	
Black	707 (62.9)	1,032 (3.8)	
American Indian/Alaska Native	226 (64.5)	346 (1.0)	
Asian	199 (35.0)	567 (2.2)	
Native Hawaiian/Pacific Islander	39 (55.3)	61 (0.2)	
Other race	141 (62.8)	227 (0.4)	
Multiracial	402 (52.3)	738 (1.4)	
Hispanic (all races)	3,862 (66.8)	5,682 (17.7)	
<i>Missing 3,711</i>			
Rural-Urban residence (county)**			0.01
Urban	20,203 (56.8)	35,252 (85.7)	
Rural	5,477 (56.6)	9,692 (11.2)	
Frontier	2,292 (61.9)	3,718 (3.2)	
<i>Missing 4,253</i>			
Education			.0001
Less than high school	1,817 (63.2)	2,819 (10.5)	
High school graduate & some college	15,442 (57.9)	25,627 (56.0)	
College graduate +	11,395 (51.9)	21,582 (33.5)	
<i>Missing 2,887</i>			
Income			0.63
<\$15,000-\$24,999	6,194 (57.3)	10,358 (24.5)	
\$25,000-\$49,999	6,530 (58.8)	11,024 (24.3)	
≥\$50,000	13,088 (57.1)	22,904 (51.2)	
<i>Missing 8,629</i>			
Marital status			0.0001
Married	16,875 (60.4)	28,599 (53.8)	
Unmarried	11,675 (51.8)	21,244 (46.2)	
<i>Missing 3,072</i>			

Covariates	Overweight or obese (N=28,696) n (%)	Total (N=52,915) n (%)	Chi-Squared Wald F p-value
Employment status			<.0001
Employed	15,694 (57.7)	26,908 (62.0)	
Not employed	12,909 (54.3)	23,030 (38.0)	
<i>Missing 2,977</i>			
Survey year			0.31
2011	7,421 (56.2)	12,976 (24.2)	
2012	6,596 (55.7)	11,643 (25.0)	
2013	7,379 (56.4)	12,920 (25.3)	
2014	7,300 (57.4)	12,567 (25.5)	
<i>Missing 2,809</i>			

*Race groups are all non-Hispanic and Hispanic ethnicity category includes all races.

**Urban (n=17): Adams, Arapahoe, Boulder, Broomfield, Clear Creek, Denver, Douglas, Elbert, El Paso, Gilpin, Jefferson, Larimer, Mesa, Park, Pueblo, Teller, Weld.

Rural (n=24): Alamosa, Archuleta, Chaffee, Conejos, Crowley, Delta, Eagle, Fremont, Garfield, Grand, Lake, La Plata, Logan, Montezuma, Montrose, Morgan, Otero, Ouray, Phillips, Pitkin, Prowers, Rio Grande, Routt, Summit.

Frontier (n=23): Baca, Bent, Cheyenne, Costilla, Custer, Dolores, Gunnison, Hinsdale, Huerfano, Jackson, Kiowa, Kit Carson, Las Animas, Lincoln, Mineral, Moffat, Rio Blanco, Saguache, San Juan, San Miguel, Sedgwick, Washington, Yuma.

Table 2 displays the unadjusted and model-adjusted prevalence ratios for the independent variables included in the final model. Adult males had 1.3-times significantly greater likelihood of being overweight or obese compared with females (aPR: 1.34, 95% CI 1.31-1.37) after adjustment for age, race/ethnicity, marital status and education level. The burden of overweight or obesity was between 20-25 percent significantly greater among adults aged 45 or older compared with younger adults between the ages of 18 and 44 (aPR: 1.25, 95% CI 1.22-1.28; aPR 1.20 95% CI 1.17-1.23). Married adults had 16 percent significantly greater likelihood of being overweight or obese compared with unmarried (aPR: 1.16, 95% CI 1.13-1.20). Adults without a college degree experienced a small but significantly greater burden of overweight or obesity compared to adults who had earned a college degree or had more advanced training (< high school vs. college degree or more (aPR: 1.14 95% CI 1.09-1.20; high school graduate and some college vs. college degree or more: aPR: 1.12, 95% CI 1.10-1.14).

The risk of being overweight or obese varied significantly by race and ethnicity. Table 2 shows Hispanic adults were 25 percent more likely to be overweight or obese compared with White Coloradans after controlling for age, sex, education level and marital status (aPR: 1.25, 95% CI 1.20-1.29). Similarly, Black adults had a 1.2-times significantly greater likelihood of overweight or obesity compared with White adults (aPR: 1.20 95% CI 1.14-1.26). Asian adults had a significantly lower likelihood of being overweight or obese compared with White adults (aPR: 0.70 95% CI 0.61-0.80). Lastly, the burden among the remaining groups did not significantly vary from White adults. The unadjusted and adjusted prevalence ratios were similar overall, only the likelihood among Black adults compared with White adults increased after adjustment.

When examining racial differences compared to Hispanic adults, the modeled likelihood of overweight or obesity did not significantly vary for Black, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, or other race adults (data not shown). Conversely, the burden was significantly lower among Asian, multiracial and White adults compared with Hispanic adults (Asian: aPR 0.56 95% CI 0.49-0.64; multiracial: aPR 0.81 95% CI 0.74-0.89; White: aPR 0.80 95% CI 0.78, 0.83).

Table 2. Unadjusted and model-adjusted risk of overweight or obese, Colorado adults, BRFSS 2011-2014.

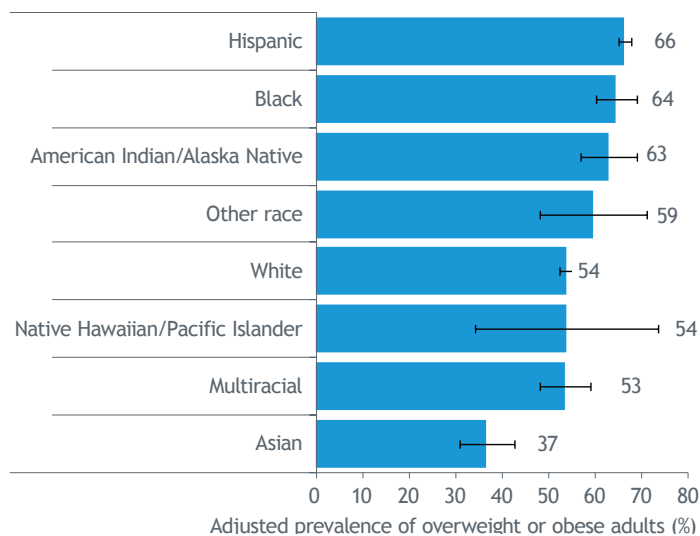
Independent variables	Unadjusted prevalence ratio (95% Confidence Interval) N=52,915	Adjusted prevalence ratio* (95% Confidence Interval) N=44,846
Sex		
Male	1.34 (1.31, 1.37)	1.34 (1.31, 1.37)
Female (ref)	-	-
<i>Missing 2,809</i>		
Age group (year)		
18-44 (ref)	-	-
45-64	1.24 (1.21, 1.27)	1.25 (1.22, 1.28)
65+	1.16 (1.13, 1.19)	1.20 (1.17, 1.23)
Race/Ethnicity#		
White (ref)	-	-
Black	1.16 (1.10, 1.22)	1.20 (1.14, 1.26)
American Indian/Alaska Native	1.19 (1.09, 1.31)	1.19 (1.08, 1.31)
Asian	0.65 (0.55, 0.76)	0.70 (0.61, 0.80)
Native Hawaiian/Pacific Islander	1.02 (0.70, 1.48)	1.03 (0.74, 1.43)
Other race	1.16 (1.00, 1.35)	1.14 (0.95, 1.36)
Multiracial	0.97 (0.87, 1.07)	1.01 (0.92, 1.12)
Hispanic (all races)	1.24 (1.20, 1.28)	1.25 (1.20, 1.29)
Marital status		
Married	1.17 (1.13, 1.21)	1.16 (1.13, 1.20)
Unmarried (ref)	-	-
Education		
Less than high school	1.22 (1.16, 1.28)	1.14 (1.09, 1.20)
High school graduate & some college	1.11 (1.09, 1.14)	1.12 (1.10, 1.14)
College graduate + (ref)	-	-

*Adjusted prevalence ratios estimated from predicted marginals produced from multivariable logistic regression model.

Race groups are all non-Hispanic and Hispanic ethnicity category includes all races.

After adjusting for differences in age, sex, marital status, and education, Black adults had the second highest prevalence of overweight or obesity, moving American Indian/Alaska Native adults to third. The top three racial and ethnic groups at highest risk for overweight or obesity are Hispanic, Black and American Indian/Alaska Native adults.

Figure 1. Adjusted prevalence of overweight or obese adults by race/ethnicity, BRFSS2011-2014.



Adjusting prevalence estimates allows for the comparison of disease prevalence between different populations, while accounting for differences in the underlying distribution of demographic characteristics that could affect the disease prevalence. Crude prevalence estimates have not been adjusted and represent the true (estimated) prevalence (Figure 1).

Conclusion

This study examined the relationships between demographic characteristics and the prevalence of overweight or obesity among adult Coloradans with a focus on disparities by race/ethnicity and rural-urban residence. After adjustment for age, sex, marital status and education level, Hispanic adults had a 25 percent greater risk of being overweight or obese compared with White adults. Similarly, the burden was higher among Black adults compared with White adults. Only Asian adults had a significantly lower risk of overweight or obesity compared with White adults. The greatest disparity in the prevalence of overweight or obesity existed between Asian and Hispanic adults as these groups had the lowest and highest prevalence, respectively. Similar to other chronic conditions, sex, age, marital status and education level were important factors associated with being overweight or obese.

In Colorado, 13 percent of the population lives in a rural county.⁸ The unadjusted prevalence of overweight or obesity was highest among adults in frontier counties, but the difference was not statistically significant after controlling for sex, age, race and ethnicity and other demographic characteristics. This finding is similar to a 2013 report by the Colorado Department of Public Health and Environment where the authors also did not find a significant difference in the prevalence of obesity by rural-urban residence.⁹ However, a significantly higher prevalence of physical inactivity in rural counties compared with urban

demonstrates the need for continued surveillance of obesity and physical activity in rural areas.⁹ There is variation in the burden of obesity by county and many of the southeastern and eastern counties are rural and have some of the highest prevalence of chronic diseases in the state. A different and more actionable classification of rural and frontier counties by grouping areas with common characteristics (ie: grouping counties with mountain ski-towns vs. southeastern plains composed of agricultural communities) may reveal unique variations in the prevalence of overweight or obesity and related risk factors compared with urban areas. The new regions or groups of counties may suggest a need to target public health resources to remote areas.

Solutions to reverse and reduce the burden of obesity exist but often require unconventional approaches and new interdisciplinary collaborations to be successful. Recently, the Institute of Medicine published a report resulting from a workgroup focused on cross-sector approaches and solutions to address the U.S. obesity epidemic at different levels of organization and government.¹⁰ According to this report, the four overarching components important to working across sectors with stakeholders that may or may not primarily work in health care or public health included: health equity, sustainability, leadership and measurement.¹⁰ The workshop participants concluded that successful models for obesity prevention and reduction exist but challenges remain to address all of the four key components listed previously. One expert pointed

out that a compelling and unifying story around health equity and obesity prevention is needed to make more progress, but is currently lacking in many communities.¹⁰ This particular point is important and applicable to the efforts of state and local public health professionals since those individuals are working in and with communities. Working at the ground level can give public health leaders powerful opportunities to witness challenges and impacts of health disparities facing individuals in the community. When these leaders share their stories in a compelling way it can drive action by motivating partners to buy-in and contribute to finding solutions to a shared issue. Successful cross-sector collaborations are essential to reducing the burden of obesity and evidence-based interventions inspired, in part, by stories have the potential to promote change.

Understanding characteristics of population subgroups at high risk for overweight and obesity can support targeted prevention efforts. It is important to continue to address the individual and social determinants of obesity for Black, Hispanic, American Indian and Alaska Native adults through culturally appropriate public health interventions in order to reduce disparities. An increase in the number of all adults maintaining a healthy weight would reduce the incidence, prevalence and severity of multiple chronic diseases that are associated with obesity. Therefore, even as the least obese state in the nation, Colorado continues to prioritize obesity prevention and reduction efforts at both state and local levels.

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