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What do our driver's licenses say about weight status among Colorado adults? An analysis of adult obesity prevalence using Colorado DMV data

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Introduction

For years, Colorado has been labeled the “leanest” state in the United States for having low adult obesity prevalence. The adult obesity prevalence has been rising in the U.S. over the past three decades, and while Colorado is considered to have the least obese population in the U.S., it is not immune from this trend.¹

Disparities in obesity prevalence affect various populations based on a number of demographic characteristics such as race, income, education and location of residence.² Individuals who have obesity are more likely to have a variety of negative health outcomes and overall reduced quality of life.³

There are several possible explanations for the increase in obesity within Colorado (e.g., physical activity, diet, genetics, built environment). However, one additional theory is that the influx of migration to Colorado⁴ has brought in heavier people and contributed to the increasing obesity trend. The purpose of this report is to explore this theory by estimating the prevalence of obesity in Colorado by various demographic factors, using driver's license data from the Colorado Department of Revenue, Division of Motor Vehicles (DMV). Additionally, we will compare the DMV data estimates for similarity to those from the Colorado Behavioral Risk Factor Surveillance System (BRFSS), the traditional public health data source for monitoring obesity prevalence.

Methods

Division of Motor Vehicles dataset

The Colorado DMV dataset contains information from both newly issued and renewal driver's licenses as well as identification cards. The DMV dataset is a unique data source as it includes nearly the entire adult population of Colorado with about 5.1 million observations. The analysis of the DMV dataset includes all current valid driver's licenses and identification records that were issued or renewed from 2011-2017 for adults ages 18-84 years. The variables used in the analysis include height, weight, age, sex and Colorado residency. Adults

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were considered new residents if they were getting a newly issued Colorado driver’s license or identification card by relinquishing an out of state driver’s license or identification card, whereas adults were considered prior residents if they were renewing a Colorado driver’s license or identification card. All observations were de-duplicated and prior residents were included only at the most recent date of their renewal. This leads to larger sample sizes in later years (2017) than earlier years (2011) for prior residents.

Behavioral Risk Factor Surveillance System

The Behavioral Risk Factor Surveillance System (BRFSS) is a national random-digit-dial telephone survey that collects data on various chronic diseases, health behaviors and other health risks among adults throughout Colorado and is weighted to represent the general population using demographic variables in the dataset.⁵ Annually, about 15,000 participants respond to the survey in Colorado. The BRFSS dataset included years 2011-2016 (most recent available year) and adults ages 18-84 years to align with the DMV dataset as best as possible.

To measure obesity prevalence in both the DMV and BRFSS datasets, a body mass index (BMI) variable was created using the self-reported height (feet and inches) and weight (pounds) information. The BMI variable was categorized into four groups: underweight (<18.5 kg/m²), healthy

weight (18.5 - 24.9 kg/m²), overweight (25.0 - 29.9 kg/m²), and obese (30+ kg/m²). We excluded implausible values for height (less than 4 feet or greater than 7 feet), weight (less than 50 pounds or greater than 600 pounds), and BMI (less than 14.5 kg/m² or greater than 65 kg/m²). After exclusions of implausible values, the DMV dataset included 4,725,829 observations and the BRFSS dataset included 71,132 observations in their final samples.

Statistical analyses

Obesity prevalence estimates were assessed in several ways. Using DMV data, we explored overall weight status for the state; looked at residency’s association with obesity prevalence then stratified that by sex and age; and examined obesity and residency by year. DMV data by residency were age adjusted after determining that younger people are more likely to migrate to a different state than an older population.⁶ Finally, we compared BMI distributions between DMV data and BRFSS data. All analyses were performed using SAS 9.4.

Results

Table 1 shows available age-adjusted demographic characteristics of the DMV sample. The average age remained relatively constant between prior and new residents over the study years. The number of new residents more than doubled from 2011 to 2017.

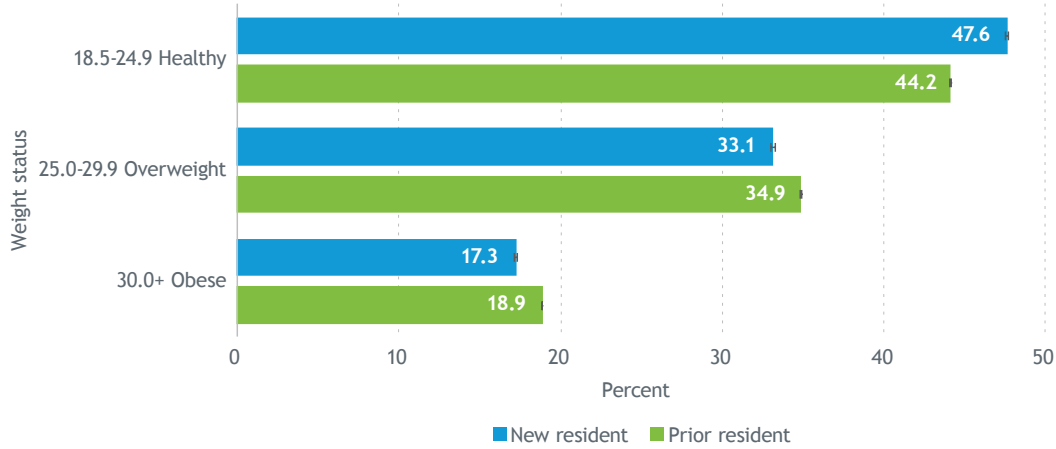
Table 1. Age-adjusted demographic characteristics of adult Coloradans ages 18-84 years who have a driver’s license or state identification card, Colorado Division of Motor Vehicles dataset, 2011-2017.

Year	Prior residents (N)	New residents (N)	Prior residents’ mean age (years)	New residents’ mean age (years)	Prior residents female (%)	New residents female (%)
2011	83,418	70,404	49.2	41.2	46.4	46.7
2012	157,563	81,679	48.7	39.9	50.0	47.3
2013	565,583	145,968	46.9	39.2	51.9	47.5
2014	590,614	158,706	46.6	39.9	48.9	46.9
2015	767,938	174,439	46.5	39.3	49.0	46.9
2016	887,343	181,440	46.2	39.5	48.8	48.0
2017	1,118,199	146,526	46.0	38.5	49.1	47.4

Obesity prevalence by Colorado residency, sex, age and year

Figure 1 shows age-adjusted weight status using BMI categories by Colorado residency status. New residents had a significantly higher prevalence of healthy weight compared to prior residents (47.6% vs. 44.2%). New residents had a significantly lower prevalence of overweight (33.1% vs 34.9%) or obesity (17.3% vs 18.9%) compared to prior residents. Underweight prevalence for prior and new residents were both about 2.0 percent and are not shown in Figure 1.

Figure 1. Age-adjusted weight status by residency among adult Coloradans ages 18-84 years, Colorado Division of Motor Vehicles dataset, 2011-2017.



To further explore the association between obesity prevalence and Colorado residency, the age-adjusted prevalence of obesity by residency was stratified by sex (Figure 2). New residents who were female had significantly lower obesity prevalence compared to prior residents who were female (16.7% vs 17.4%). No significant differences in obesity prevalence were seen by residency among men.

Figure 2. Age-adjusted obesity prevalence by residency and sex among adult Coloradans ages 18-84 years, Colorado Division of Motor Vehicles dataset, 2011-2017.

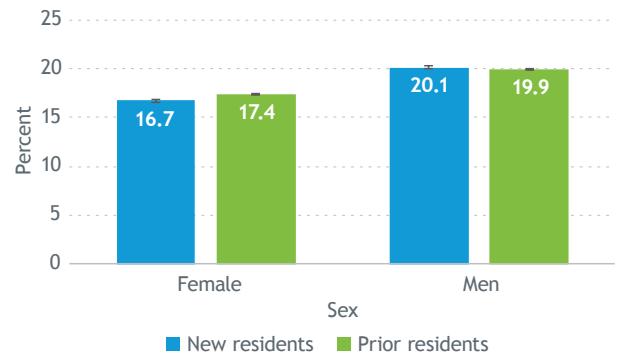
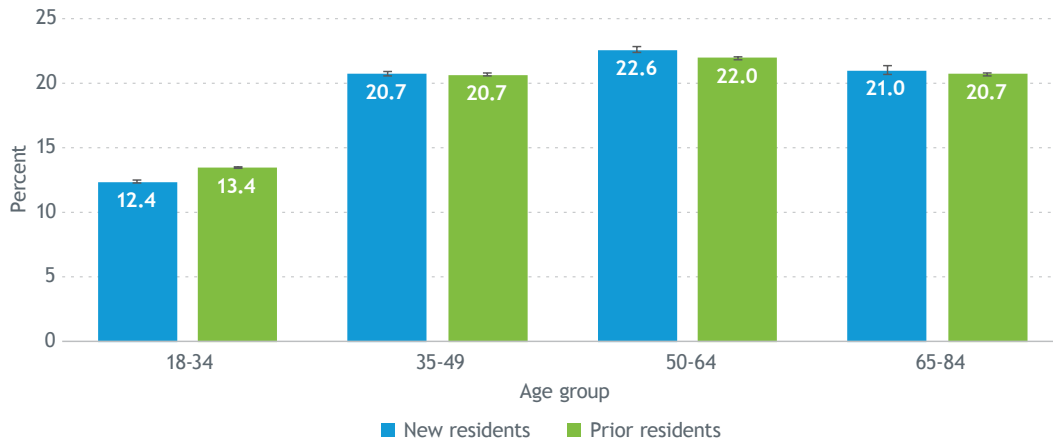


Figure 3 displays the prevalence of obesity by residency and age groups. New residents had a significantly lower obesity prevalence for ages 18-34 years (12.4% vs 13.4%). Conversely, new residents had a significantly higher prevalence of obesity among adults ages 50-64 years (22.6% vs 22.0%). Regardless of residency, obesity prevalence significantly increases from young adulthood (ages 18-34) to middle and older adulthood (ages 35-84).

Figure 3. Obesity prevalence by residency and age among adult Coloradans ages 18-84 years, Colorado Division of Motor Vehicles dataset, 2011-2017.



To examine changes in obesity prevalence over time we looked at age-adjusted trends from 2011 to 2017 by residency (Figure 4). Obesity prevalence among new residents changed little from 2011 to 2017, ranging from 18.1 percent to 19.0 percent. Conversely, obesity prevalence among prior residents gradually increased over the years from 16.2 percent in 2011 to 19.5 percent in 2017.

Comparison of DMV data to BRFSS data

BMI distributions within the DMV and BRFSS data look very similar (Figure 5). Comparing the obesity prevalence of each dataset by age showed that estimates from DMV data are lower overall as well as for each age group (Table 2).

Figure 5. BMI distributions among adult Coloradans ages 18-84 years, Colorado Division of Motor Vehicles dataset (2011-2017) and BRFSS dataset (2011-2016).

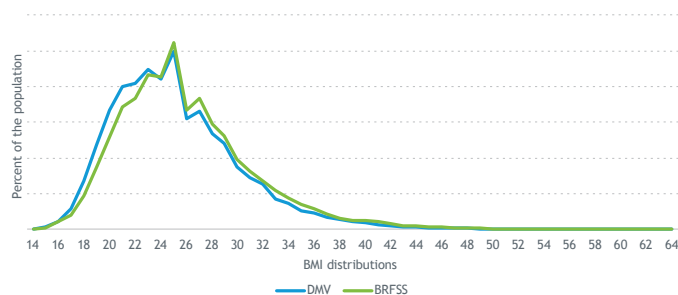


Figure 4. Age-adjusted obesity prevalence by residency and year among adult Coloradans ages 18-84 years, Colorado Division of Motor Vehicles dataset, 2011-2017.

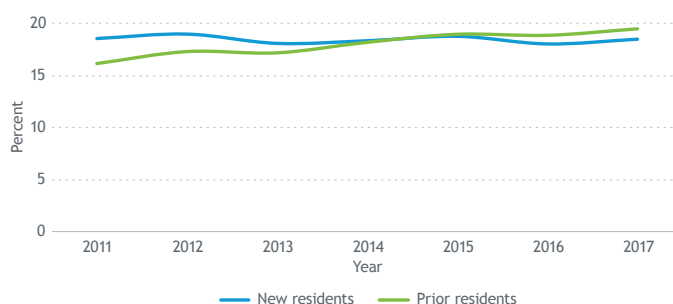


Table 2. Obesity prevalence among adult Coloradans ages 18-84 years by data source and age group, 2011-2017 (Division of Motor Vehicles) and 2011-2016 (Behavioral Risk Factor Surveillance System).

	DMV	BRFSS
Age group (years)	Obesity prevalence (%)	Obesity prevalence (%)
18-34	13.1	15.7
35-49	20.7	24.0
50-64	22.0	25.0
65-84	20.7	21.0
Overall	17.5	21.0

Discussion

The analysis of DMV data show that new residents moving to Colorado overall are younger, and they have healthier BMI status compared to prior residents even after adjusting for the age difference between the two groups. New residents who were female, ages 18-34 years, or who received a new driver's license or identification card in 2016 or 2017 had significantly lower obesity prevalence compared to prior residents.

The potential impact of age on these associations was apparent after comparing the ages of new and prior residents. The mean age of new residents (38.7 years) was significantly younger compared to prior residents (45.5 years). Additionally, the number of new residents more than doubled from 2011-2017 (Table 1). The observation of young new residents is not uncommon and it is well understood that young populations are mobile and tend to move to new states compared to older populations.⁶ These results suggest that new residents have healthier weight status than prior residents and therefore, the recent rise of individuals moving to Colorado is likely not an adequate explanation for the increase in Colorado's adult obesity prevalence.

A possible alternative explanation for this increase in obesity could be that the adult population in Colorado is aging. While Colorado has one of the youngest populations in the United States, the state is experiencing tremendous growth in the proportions of aging adults. Colorado experienced the third fastest growth among the 65+ age group in the nation from 2015-2016.⁷ As this analysis and other research shows, as age increases the prevalence of obesity increases.⁸ With such rapidly increasing populations of older adults, we would expect to see a continued rise in the overall obesity prevalence.

The analysis of obesity using DMV data showed very similar distributions compared to the BRFSS data. The DMV dataset captures a majority of Colorado's adult population, and had comparable obesity prevalence to BRFSS, which includes a smaller sample that is weighted to represent the adult population of Colorado. The DMV dataset results show slightly lower mean BMI values compared to BRFSS. The observed differences in mean BMI values may be attributed to the different methods in which the data are collected for each dataset. The DMV data are collected by residents providing their height and weight online or using a written form, while BRFSS data are collected via telephone where the respondent orally provides the interviewer with their height and weight.

The DMV data are a representative statewide dataset but do have some limitations. First, there is potential for bias in self-reported data. Individuals' subjective estimates, or self-report, of both height and weight were not measured for precision or accuracy.⁹ Another possible limitation is the use of BMI as a measure of obesity. Since BMI only takes into account height and weight and does not measure body fat percentage directly, it is only an indirect measure of obesity.¹⁰ Regardless, BMI is still the most commonly practiced way to determine weight status. An additional limitation is the current address might not be the same as the listed address on an individual's driver's license or identification card. It is possible that some licensed individuals in this dataset are currently living in another state or country or the dataset is missing individuals who currently live in Colorado but use identification from another state.

This report provides a compelling examination of Colorado's obesity status, as it uses a data source that takes into account a majority of the state; the first to do so—to our knowledge. It adds evidence that the increase in obesity in the population may not be due to the migration of people to Colorado, but rather to other factors such as the aging of the population. The DMV analysis also shows how BRFSS seems to be a reliable data source to continue to use moving forward and does a suitable job of capturing obesity trends.

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