ADA CE Program ARTICLE 2

County-level correlation between adult obesity rates and prevalence of dentists

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ABSTRACT

Background. Investigators of previous studies regarding the correlation between area-level health care resources and obesity have not examined the association between the prevalence of dentists and rates of adult obesity. The authors conducted a study to address that knowledge gap.

Methods. Using data compiled in the Robert Wood Johnson County Health Rankings and Roadmaps database, the authors conducted multivariable analyses of the relationship between the prevalence of dentists (from the 2011 Health Resources and Services Administration Area Resource File) and rates of obesity within counties. The authors controlled for prevalence of primary care providers, measures of the built environment (for example, number of recreational facilities per 10,000 population, the percentage of restaurants serving fast food) and county-level sociodemographic and economic factors.

Results. When the authors conducted a multivariable analysis adjusted for state-level fixed effects, they found that having one additional dentist per 10,000 population was associated significantly with a 1-percentage point reduction in the rate of obesity ($P < .001$). This effect was significantly larger in counties in which 25 percent of children or more (versus less than 25 percent of children) lived in poverty and in counties that had more primary care physicians per 10,000 population ($P \leq .009$).

Conclusions. The association between the prevalence of dentists and obesity, even after adjusting for primary care resources and sociodemographic factors, was evident. Although these data could not be used to assess causality, given the strength of the ecological, cross-sectional association, additional research involving person-level, longitudinal data is warranted.

Practical Implications. The correlation between the prevalence of dentists and obesity rates highlights the potential for dental professionals, as well as other primary care providers, to provide meaningful health education and support for improved nutritional behaviors, although the increased obesity rates in counties with fewer dentists per capita present challenges.

Key Words. Dentists; obesity; poverty; counties; determinants of health.

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The United States has the highest obesity rate in the world; more than 30 percent of the population is obese, and more than $150 billion per year is spent on related health care costs and lost productivity.[1,2] Obesity's prevalence and related costs are expected to increase in the decade ahead barring a major shift in behaviors. Despite the overall high prevalence of obesity, substantial geographical variation is apparent; for instance, in Colorado, only 21 percent of the population is obese, whereas in Louisiana, 35 percent of the population is obese.[3]

Investigators in previous studies[4-12] have examined several area-level correlates of obesity with mixed results. They conducted these studies in selected populations or small samples, or they focused on single factors such as access to recreation or to food stores or proximity to foreclosed homes. In a review of 20 studies in which investigators examined the effect of the built environment on obesity, the reviewers found that the results from 17 studies showed that features of the physical environment, such as lack of access to recreation facilities or presence of fast-food restaurants, were associated significantly with obesity.[13] On the other hand, investigators in three of these studies,[4,14,15] as well as those of an additional study conducted in Detroit,[7] found no relationship between built environment factors and obesity. We could find only one national study of county-level factors in which the investigators examined geographical variability in obesity rates by using multivariable analysis.[16] They concluded that higher obesity rates were associated with counties with higher percentages of the population who identified as black, higher unemployment rates, more families headed by single mothers, greater numbers of hospital outpatient visits per 1,000 population, lower educational rates and fewer adults who engaged in regular physical activity. Although the results of that study provided contemporary, national evidence, the investigators omitted a key health care factor that we hypothesize might be associated with obesity rates: the number of dentists per capita in the county.

The literature also suggests the importance of primary care in addressing obesity rates via health education and prevention efforts.[17-19] However, investigators in empirical studies have not examined the association between the prevalence of dental care—a key part of primary

care—and obesity rates. Although 2010 data indicate that only a minority of dentists provide counseling related to obesity,[20] the prevalence of dentists may be a marker for stronger primary care resources in an area and may highlight an opportunity for greater engagement of dentists in nutritional education and obesity prevention efforts. Given calls in 2012 within the dental profession for contributing to systemic health[21] and to become more involved in health care for people who are obese,[22,23] understanding the correlation between the prevalence of dentists and obesity rates can underscore areas of greater need and opportunities for improvement.

Accordingly, we sought to examine the association between the number of dentists per capita and adult obesity rates by using county-level data for health care resources, measures of the built environment and sociodemographic and economic factors. Because poverty was associated with obesity rates in previous studies,[24,25] we also examined whether the effect of having more dentists per 10,000 population differed significantly for counties with higher rates of children living in poverty and those with lower rates. The findings may be useful in identifying the largely neglected but potentially important role dentists play in addressing obesity in the United States.

METHODS

Study design and sample. We conducted a cross-sectional analysis by using data from the 2013 County Health Rankings and Roadmaps program,[26] a database that integrated county-level data from the Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System, the CDC's National Center for Health Statistics, the Health Resources and Services Administration, the U.S. Census Bureau, the U.S. Department of Agriculture Economic Research service, the U.S. Bureau of Labor Statistics and the Dartmouth Atlas for Health Care for any county or county equivalent that had its own Federal Information Processing Standard. The eTable (shown in the supplemental data to the online version of this article [found at http://jada.ada.org/content/145/9/932/suppl/DC1]) presents a complete list of the data sources and years for the variables we included in our sample. Overall, we compiled data for 3,141 counties across the United States. We excluded 300 counties because their data did not include our independent variables, resulting in a final analytic sample of 2,841 counties (inclusion rate, 90.4 percent).

Measures. ***Dependent variable***. Our primary dependent variable was percentage of adults who were obese (body mass index [BMI] of 30 or greater) within a county. The CDC calculated BMI from self-reported height and weight estimates obtained as part of its Behavioral Risk Factor Surveillance System, and the CDC's Division of Diabetes Translation, National Center for Chronic Disease Prevention and Health Promotion, compiled the BMI data into county-level estimates.

Independent variables. We included several independent variables that on the basis of the literature[5,13,27-31] we hypothesized were related to obesity rates. These variables included health care resources, measures of the built environment and sociodemographic and economic factors.

We assessed health care resources, according to the number of primary care physicians (PCPs) per 10,000 population and the number of dentists per 10,000 population. We obtained data regarding the number of dentists and the number of PCPs in 2011 from the Health Resources and Services Administration Area Health Resource Files,[32] as we expected greater primary care resources to be associated with lower obesity rates. Measures of the built environment included the number of recreational facilities (expected to be associated with lower obesity rates) per 10,000 population, the percentage of adults who reported having no leisure-time physical activity, the percentage of fast-food restaurants from among the total number of restaurants in the county and the percentage of the population that reported having limited access to healthy food (all expected to be associated with higher obesity rates). Sociodemographic and economic factors included the percentage of the population 65 years or older, the percentage of adults aged from 25 through 44 years who had some postsecondary education, racial and ethnic composition (percentage black, percentage Hispanic), the percentage of children living below the poverty threshold, the percentage of children living in a single-parent household, the percentage of people younger than 65 years who were uninsured, the percentage of the labor force that was unemployed (calculated as people 16 years or older who were unemployed as a percentage of the civilian labor force). We expected all of these sociodemographic and economic factors to be associated with higher obesity rates except for the percentage of the population 65 years or older, which we expected to be associated with lower obesity rates. We also adjusted the analysis for the percentage of the population living in a rural area (defined as all population, housing and territory not included within an urban area) and overall county population size (per 10,000 population), both of which we anticipated would be associated with either higher or lower obesity rates.

Data analysis. We described the sample characteristics by using standard frequency analysis. We conducted bivariate and multivariable linear regression analyses to estimate unadjusted and adjusted associations between independent variables and the percentage of adults who were obese within a county. We included state-level fixed effects in our bivariate and multivariable models to account for clustering of observations within states. Before

ABBREVIATION KEY. **BMI:** Body mass index. **CDC:** Centers for Disease Control and Prevention. **PCP:** Primary care physician.