

11/20/13

Obesity and Mississippi Families

An In-depth Analysis of Contextual Domains

Researchers

John McCown, M.S.
Ben Walker, M.S.

Research Assistants

Jack Bryan
Trey Hardin (Graphic Design)
Justin Johnson
Sarah Rutland (Technical Writing)
Xuan Zhou, M.A. (GIS Mapping)

Project Director

Linda Southward, Ph.D.



Submitted to:
The Center for Mississippi Health Policy

Prepared by:
Family and Children Research Unit
Social Science Research Center
Mississippi State University



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Introduction

In 2007, state legislatures passed the Mississippi Healthy Students Act (MHSA) of 2007 in order to address issues related to student fitness, student nutrition, and obesity. The purpose of this legislation is to improve the physical well-being of Mississippi students from kindergarten through 12th grade by implementing new standards of physical activity, health education, and nutrition. In 2008, a multi-year evaluation of the MHSA was commissioned by the Robert Wood Johnson Foundation (RWJF) through the Center for Mississippi Health Policy. During this evaluation the Family and Children Research Unit (FCRU) at the Social Science Research Center (SSRC) conducted a four-year (annual) telephone survey of Mississippi parents to assess their attitudes and knowledge with regard to MHSA. These extensive surveys also yielded a wealth of data on family environment, health and nutritional behaviors, key demographics, and weight status (of both parents and children). Nearly 15,000 surveys (N = 14,808) were completed between 2009 and 2012 by the Wolfgang Frese Survey Research Laboratory at the SSRC. The total number of refusals was 7,858. This yielded a four-year cooperation rate of 65.3%, $(14,808 / (14,808 + 7,858))$. Telephone numbers were provided by the Mississippi Department of Education (MDE) and all survey methodologies were approved by the Mississippi State University's Institutional Review Board. The data for each survey year was presented in an annual report by the FCRU research team.

Although the final report for each year provided a number of themes and key findings, the parent/child survey was only one component of a much larger analysis which also sought to understand the perspectives of legislators, school board members, superintendents, and state health officers. Given the particular depth and complexity of the parent/child survey data, a

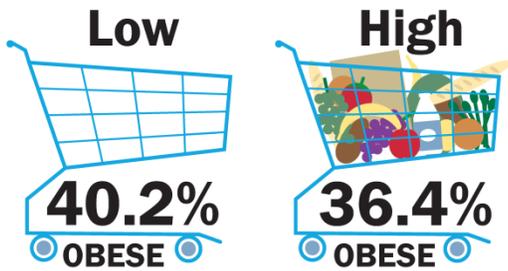
number of additional research questions were not able to be adequately explored prior to this report.

The purpose of this analysis is to investigate four research questions that may be associated with obesity in Mississippi:

- How does access to food within one's community relate to obesity?
- Does obesity in one's social network affect their susceptibility to obesity?
- Does obesity hinder student's academic performance in school?
- What factors are associated with access to regular health care?

Within each research question, represented in this report as a chapter, each variable of interest (i.e., food access, social networks, academic performance, and health care/insurance) will be analyzed in relation to geography, nutrition, physical activity, and obesity.

FOOD ACCESS



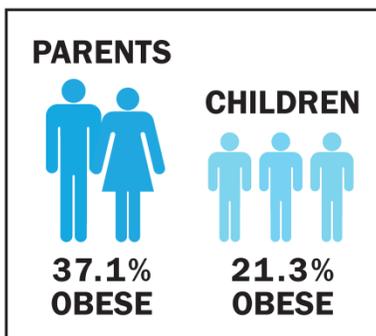
THOSE LIVING IN AREAS OF LOW FOOD ACCESS HAVE A GREATER RISK OF OBESITY

SOCIAL NETWORKS



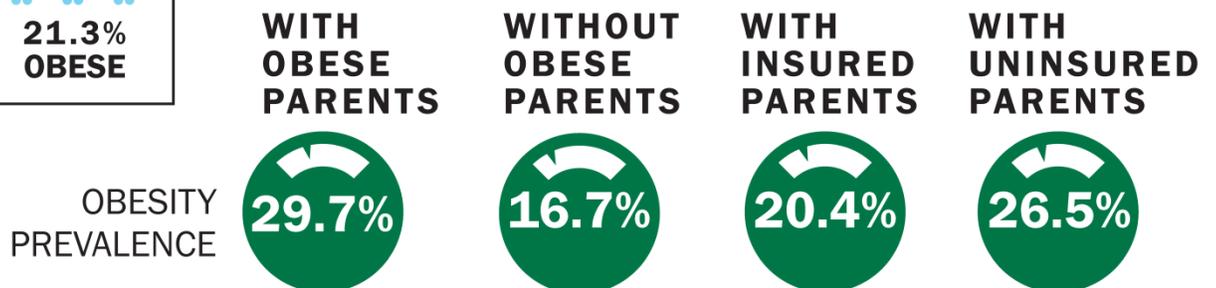
FOR PARENTS, HAVING A GREATER NUMBER OF OVERWEIGHT/OBESSE FRIENDS INCREASES THE LIKELIHOOD OF BEING OBESSE

OVERALL PREVALENCE



PARENTAL OBESITY IS A STRONG PREDICTOR OF CHILDHOOD OBESITY

CHILDHOOD OBESITY



ACADEMIC PERFORMANCE

CHILDREN WITH LOW GPA'S COME FROM FAMILIES THAT SERVE FEWER FRUITS AND VEGETABLES AND MORE SODAS

	CHILDREN WITH LOW GPA	CHILDREN WITH HIGH GPA
FRUIT*	3.66	4.20
VEGETABLE*	4.66	5.03
SODA*	3.67	3.41



MISSISSIPPI STATE UNIVERSITY

* $p < 0.05$

(AVERAGE DAYS PER WEEK)

Food Access: Overview

Obesity rates in adults and children continue to be a major concern in the United States. In 2009-2010, approximately one-third (35.7%) of U.S. adults were obese and 16.9% of children and adolescents were obese (Ogden, Carol, & Flegal, 2012). Food access is a developing area of interest in relation to health outcomes such as obesity and adverse dietary behaviors. The association between obesity rates and food access has not been strongly established (Budzynska et al., 2013). However, a significant body of research demonstrates that food access plays a crucial role in peoples' diets (Walker, Keane, & Burke, 2010). At its' most basic level, food access is essentially a question of whether or not individuals have easy access to healthy foods. Research has found that as grocery store access decreases, obesity increases, controlling for education and income (Gallagher, 2006). However, the USDA (2009) argues that easy access to all foods may also contribute to obesity in areas of high food access. That is, food access can become a public health issue if either lack of access or "overaccess" impacts making healthy food choices.

Historically, food access has been measured in several ways including surveys (Block & Kouba, 2009; Lopez, 2007), focus groups (Hendrickson, Smith, & Eikenberry, 2006; Smith & Morton, 2009), and food store assessments (Zenk et al., 2006; Morland & Filomena, 2007). One of the most common methods to measure low food access is determining the share of residents where the distance to a supermarket is greater than one mile in urban areas and more than ten miles in rural areas (USDA, 2010). Reliable access to a supermarket is associated with more affordable and diverse options for a healthy diet compared to reliable access to convenience stores and smaller grocers (Kaufman, MacDonald, Lutz, & Smallwood, 1997; Hendrickson et al.,

2006). Other researchers use the presence of supermarkets and produce at the zip code level or census tract level (Morland & Filomena, 2007; Powell, Slater, Mirtcheva, Bao, & Chaloupka, 2007) to measure food access in neighborhoods.

A report from the USDA (2009) suggests that low food access is strongly associated with racial segregation in urban and rural environments. In the United States, half of all Black neighborhoods lack full-service grocery stores and supermarkets (Raja, Ma, & Yadaz, 2008, p. 470). Black neighborhoods also have fewer supermarkets than White neighborhoods (Walker et al., 2010). Racially segregated neighborhoods of Blacks and Whites both display different negative outcomes. Morland et al. (2002) found in a multi-state analysis of neighborhoods that supermarkets were 4 times more common in mostly White neighborhoods compared to mostly Black neighborhoods. However, mostly White and racially mixed neighborhoods had twice as many fast food and carryout restaurants compared to mostly Black neighborhoods (Morton & Blanchard, 2007). Additionally, quality fresh produce can be significantly more accessible in racially mixed neighborhoods than in Black neighborhoods (Morland & Filomena, 2007; Zenk et al., 2006). Black neighborhoods may not have ready access to affordable and quality food, but racially mixed neighborhoods tend to have higher access to both supermarkets with quality produce and restaurants. Current research often focuses on racial disparities regarding low access areas. However, with overaccess to both healthy and unhealthy foods, racial disparities can appear in high access areas as well.

Although supermarket access is an important determinant of what types of foods people purchase, personal food preferences are also very important (Walker et al., 2010). Furthermore, in Mississippi Delta regional studies, food culture heavily influenced eating habits,

and family is expressed as one of the strongest influences on the diet (McGee et al., 2008, p. 106; McCracken, 2008, p. 44). Given the alarming obesity problem in Mississippi, food culture may serve as a barrier to healthy eating in *both* low and high food access areas. An exploration of racial disparities in food environments would open a discussion of who is disadvantaged by and benefits from food access. Accordingly the goal of the current study was to extend beyond simply examining obesity in areas of high versus low food access to examining the conditions (e.g., socioeconomic, racial) under which high food access is beneficial in Mississippi.

Methods

In order to operationalize food access, researchers used data collected from the Census Bureau's Zip Business Patterns (ZBP) database. This tool has data on the type and number of businesses that operate in over 40,000 zip codes. For each zip code in Mississippi the number of supermarkets was identified and recorded. Zip codes that did not have a supermarket were labeled "low food access," whereas zip codes that had *at least* one supermarket were labeled "high food access." It is important to note that a supermarket is distinct from other businesses that sell food, such as gas stations and convenient stores, because these are not locations that offer healthy eating choices such as fresh produce and vegetables. Using the ZBP data, each respondent in the RWJ dataset was labeled as living in either a low or high food access area based on their zip code.

Results

The overall percentage of respondents living in an area of low food access was 16.6%. Map 1 presents the zip codes within Mississippi for low and high food access. Areas that are more urban tend to have zip codes with high food access, whereas the macro regions of the

Delta and Southwest appeared to have a number of zip codes with low food access. When food access was analyzed by public health district (Map 2), three areas (districts 3, 4, and 7) had a significant over-representation of their population living in low food access zip codes, $\chi^2(8, N = 14,485) = 266.1, p < .001$.

In terms of nutrition, there were several significant differences between areas of low food access and high food access (Table 1). Respondents living in areas of low food access had a lower frequency of days during the week of eating fresh fruit and 100% juice and a higher frequency of drinking soda. There were a number of significant differences between Whites and Blacks on nutrition (Table 2). Whites had a higher weekly frequency of eating fruits and vegetables, but they also had a higher frequency of soda drinking. Conversely, Blacks ate less high-fat foods and drank more 100% juice, but they also had a higher average of fast food meals per week.

With regard to obesity, researchers conducted a logistic regression (Table 3) in order to examine the relationship between this outcome and relevant predictors, such as food access. The regression model revealed that food access was a significant predictor of adult obesity. (Food access did not predict childhood obesity.) Respondents living in an area of high food access had 16 percent lower odds of obesity than those living in low food access areas (OR, .84; 95% CI, .76-.93). For race, Black respondents had 93% greater odds of obesity than Whites (OR, 1.93; 95% CI, 1.78-2.10). Income and education were also significant, with respondents who had higher incomes and more education having lower odds of obesity. Two of the adverse dietary behaviors in the model were significant. Respondents who drank soda at least one day a week had 12% greater odds of obesity than those who did not drink soda at all (OR, 1.12; 95%

CI, 1.02-1.22). Those who ate fast food at least twice a week had 9% greater odds of obesity than respondents who had fast food no more than once a week (OR, 1.09; 95% CI, 1.00-1.18).

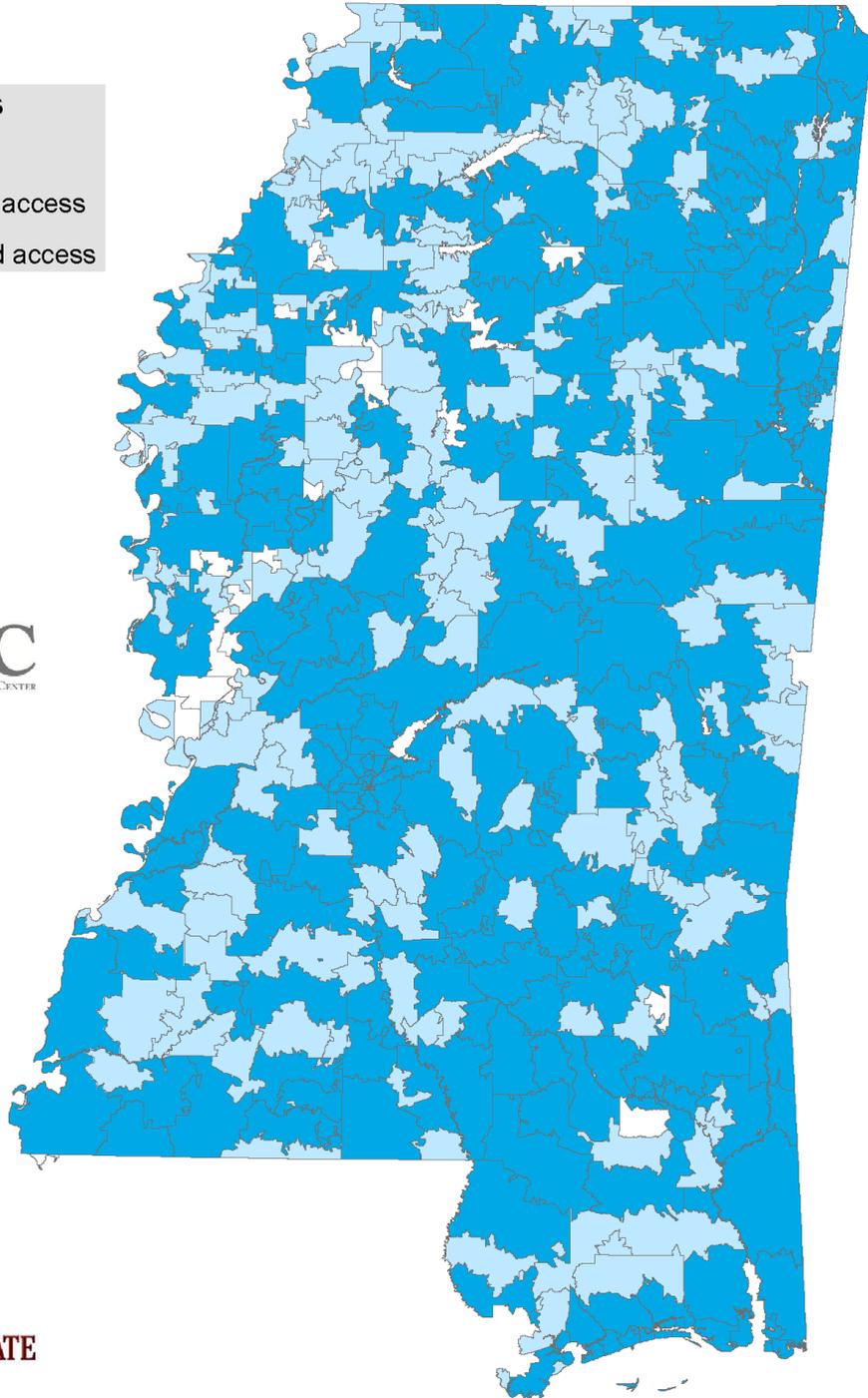
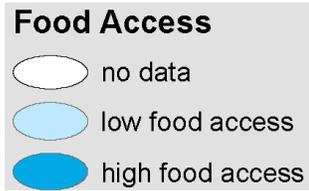
In an additional step, a race by food access interaction term was added to clarify the relationship between these two variables in relation to obesity. The interaction term was significant in the model (OR, 1.27; 95% CI, 1.04-1.56). Regression interactions can be difficult to interpret; therefore a visual graph is presented in Figure 1. The plot demonstrates that not only is there is a disparity in obesity between Whites and Blacks, but that this disparity is much stronger in areas of high food access than areas of low food access. Or to rephrase this, Whites appear to benefit from living in an area of high food access, whereas Blacks do not enjoy these same benefits (i.e., by having lower odds of obesity).

Summary

Those living in areas of low food access reported engaging in a greater number of negative dietary behaviors. When respondents were not in close proximity to a supermarket, they were more likely to reporting drinking soda and less likely to reporting eating fruit and drinking natural fruit juice. Our analysis found that people were less obese in areas with high food access. However, this finding did not transfer across racial groups. Our analysis showed that racial disparities in obesity actually increased in areas of high food access. Although the odds of obesity decreased for Whites living in areas of high food access, the odds of obesity were essentially unchanged for Blacks. This finding raises questions about the cost and quality of food in supermarkets located in predominantly Black neighborhoods in Mississippi.

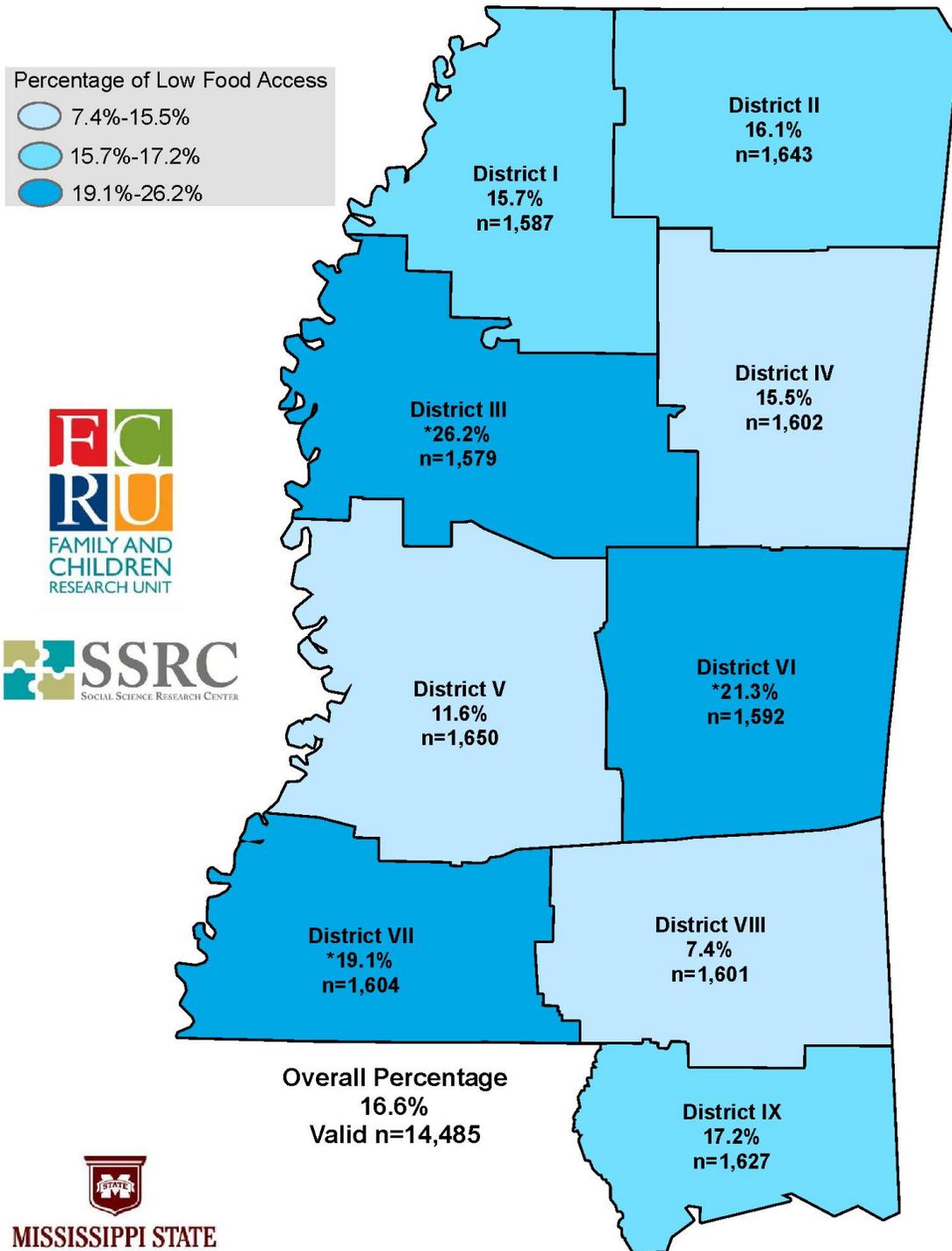
Map 1

Food Access in Mississippi by Zipcode



Map 2

Percentage of District with Low Food Access 2009-2012



*Statistically Significant Over-Representation (p < .05)

Table 1: Food Access and Nutrition

Dietary Measure	Low Food Access		High Food Access		<i>df</i>	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Days in past week eating fruit**	4.03	2.38	4.18	2.39	14234	-2.65	.008	-.060
Days in past week eating vegetables	5.11	2.09	5.12	2.06	14373	-0.21	.836	-.005
Days in past week eating high- fat foods	3.10	2.14	3.12	2.12	14386	-0.42	.677	-.009
Days in past week drinking 100% juice**	3.11	2.77	3.28	2.83	14313	-2.73	.006	-.061
Days in past week drinking milk	5.65	2.16	5.62	2.20	14428	0.54	.588	.012
Days in past week drinking soda**	3.48	2.74	3.32	2.79	14406	2.63	.008	.059
Average times eating fast food per week	2.22	3.23	2.31	3.06	14396	-1.34	.182	-.030

Table 2: Race and Nutrition

Dietary Measure	White		Black		<i>df</i>	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Days in past week eating fruit**	4.29	2.37	3.94	2.41	14116	8.56	<.001	.145
Days in past week eating vegetables**	5.46	1.89	4.67	2.19	14251	23.1	<.001	.388
Days in past week eating high- fat foods**	3.26	2.12	2.96	2.11	14264	8.49	<.001	.143
Days in past week drinking 100% juice**	3.04	2.85	3.49	2.77	14192	-9.46	<.001	-.159
Days in past week drinking milk**	5.94	1.98	5.22	2.38	14304	19.9	<.001	.334
Days in past week drinking soda**	3.75	2.82	2.87	2.65	14283	19.2	<.001	.323
Average times eating fast food per week**	2.22	3.00	2.39	3.19	14272	-3.41	<.001	-.057

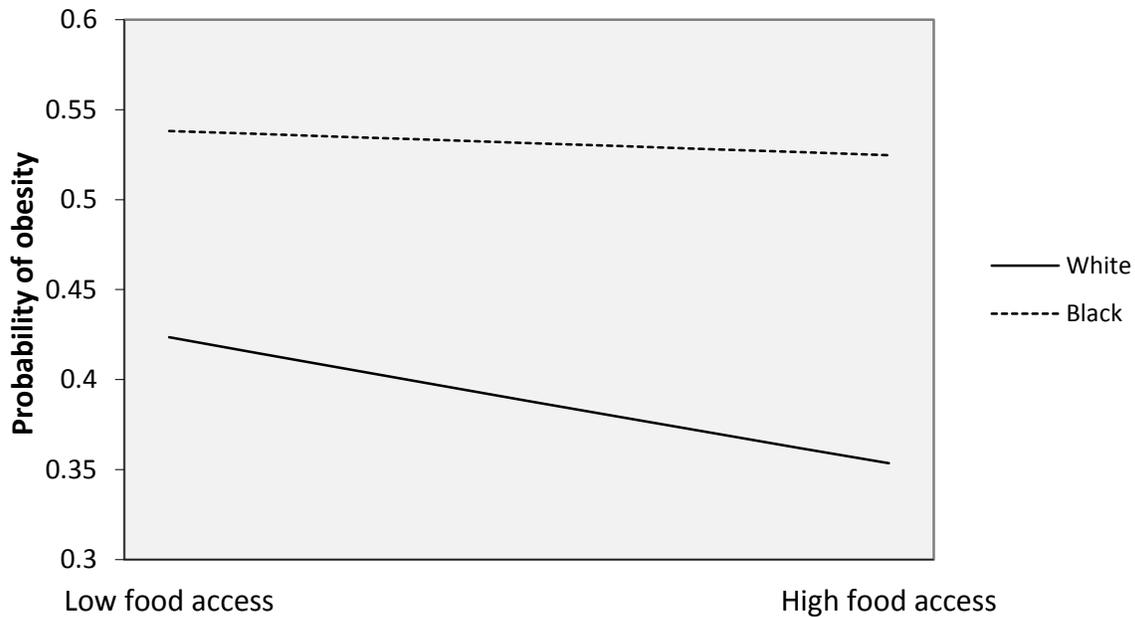
Table 3: Logistic Regression on Adult Obesity

Predictor	Step 1 – Main Effects ^a		Step 2 – Interaction Effects	
	B (SE)	OR (95% CI)	B (SE)	OR (95% CI)
Intercept	-.40 (.11)		-.31 (.11)	
Food Access (0 = Low; 1 = High)	-.18 (.05)**	.84 (.76-.93)	-.30 (.07)**	.74 (.65-.86)
Race (0 = White; 1 = Black)	.66 (.04)**	1.93 (1.78-2.10)	.46 (.09)**	1.59 (1.32-1.91)
Income	-.18 (.02)**	.84 (.81-.86)	-.18 (.02)**	.84 (.81-.86)
Education	-.06 (.02)*	.95 (.91-.99)	-.05 (.02)*	.95 (.91-.99)
High-fat foods (0 = No; 1 = Yes)	.07 (.08)	1.07 (.91-1.25)	.06 (.08)	1.07 (.91-1.24)
Soda (0 = No; 1 = Yes)	.11 (.05)*	1.12 (1.02-1.22)	.11 (.05)*	1.12 (1.02-1.23)
Fast food (0 = 1 or fewer times; 1 = 2 or more times)	.08 (.04)*	1.09 (1.00-1.18)	.08 (.04)*	1.08 (1.00-1.17)
Race x Food Access			.24 (.10)*	1.27 (1.04-1.56)

* $p < .05$. ** $p < .01$.

^a $R^2 = .061$ (Cox & Snell), $.083$ (Nagelkerke). Model $\chi^2(7) = 735.634$, $p < .001$.

Figure 1: Race by Food Access (Interaction Term)



Social Network: Overview

Researchers have begun investigating the impact that social networks may have on peoples' health. Social networks can affect a wide variety of health outcomes including the spread of sexually transmitted diseases, smoking, and obesity (Christakis & Fowler, 2007). Since obesity has been popularly labeled as an "epidemic", the idea that obesity can spread like a contagious disease from person to person has become a focal point of research examining impact of social networks on health (Blanchflower, Van Landeghem, & Oswald, 2009). The work of Christakis and Fowler (2007, 2009) looked specifically at friend networks' effects on obesity in individuals. They found that people embedded in social networks where obesity was common were more likely to be obese themselves than those in non-obese networks.

Christakis and Fowler's (2009) major finding was that obese people were more likely to have obese friends, friends of friends, and friends of friends of friends by a third degree separation scenario, with nonobese people experiencing the opposite effect. Mutual friendship naming was essential to having an effect on a person's weight, and other close relationships like marriage and having a sibling also have similar impact as friend networks (Christakis & Fowler, 2009). It has been argued that effects of social networks on food consumption are due in large part to adherence to social norms about the acceptability of excessive eating (Herman, Roth, & Polivy, 2003). In a social network, acceptable norms for eating are set by the group, which could either promote or restrict healthy eating. For example, Howland, Hunger, & Mann (2012) found that people ate more cookies when their friends ate more cookies and fewer cookies when eating alone and when friends showed restraint.

This study seeks to understand how friend networks impact adult obesity in Mississippi. A natural assumption is that family members are more influential on adult obesity than friends. Prior research about healthy eating barriers in the Mississippi Delta emphasizes the importance of family influence, with direct friend influence receiving less attention (McCracken, 2008; McGee et al., 2008). Given the high prevalence of obesity in Mississippi adults (34.6%) (CDC, 2012) and increasing support for the role of social networks into the spread of obesity, the influence of friends is likely to figure significantly in the landscape of the obesity epidemic in Mississippi. Yet, little is known about the variety of routes in which social networks affect the spread of obesity. As such, the goal of this study was to examine the effects of social network obesity not only on individuals' weight status, but also their dietary behaviors, exercise habits, and attitudes towards obesity.

Methods

Identifying one's social network was measured through *Question 86* of the RWJF Parent/Youth Survey. This question asked respondents, "Considering your three closest friends, how many would you say are overweight or obese?" Possible outcomes included none, one, two, or all three. This "friendship" network question was treated as an ordinal variable in the regression analysis. The purpose of using this variable is to test the hypothesis that the heavier (i.e., more obese) one's social network is, that in turn may have a relationship with their own weight status. In other words, does having a more obese network of friends predict the likelihood that one is also obese? In addition to weight status, the "friendship" network question was also analyzed in relation to relevant nutritional and geographical outcomes in order to examine shared behaviors within these networks.

Results

A frequency analysis yielded the following percentages for each friendship category: respondents with no overweight/obese friends, 30.5%; one of their three closest friends, 28.3%; two of their three closest friends, 22.3%; and all three of their closest friends, 18.8%. No significant geographical patterns were detected when friendship network was analyzed by public health district, $\chi^2(24, N = 14,435) = 29.3, p = .210$. The district percentages for those with all three of their closest friends being overweight/obese are shown in Map 1.

With regard to nutrition, there were several significant differences across these social networks (Table 1). Respondents with more overweight/obese friends tended to report more days in eating high-fat foods and a higher average number of times per week in eating fast food meals. Yet, there were no significant differences on healthy nutritional outcomes such as days per week eating fruits or vegetables. Conversely, respondents with no overweight/obese friends exercised more days per week on average (3.5 vs. 3.3) than respondents whose three closest friends in their social network were overweight/obese.

In order to examine the relationship between obesity and social networks, researchers conducted a logistic regression with the network variable and other relevant predictors (Table 2). The regression model found that friendship network was a significant predictor of adult obesity; however, it did not predict childhood obesity. For each additional overweight or obese friend in a respondents' social network, the odds that they were obese increased by 18 percent (OR, 1.18; 95% CI, 1.14-1.22). Since this model is nearly identical to the one presented in the food access section, many of the variables presented here have the same odds ratios, such as race, income, and education level.

A number of possible interaction effects were explored. For example, a race by friendship network interaction might demonstrate that Blacks with a high number of overweight/obese friends are more susceptible to obesity than Whites with the same number of overweight/obese friends. However, there were no significant differences between Blacks and Whites and their friendship networks in relation to obesity. There was one interaction that was significant, soda by friendship network (OR, 1.12; 95% CI, 1.03-1.22). Figure 1 shows that individuals who drink soda and have several overweight/obese friends have a greater likelihood of being obese than one who does not drink soda but still has the same number of overweight/obese friends.

Summary

The current study demonstrates that friendship networks impact how likely people are to be obese. In particular, being in an obese social network significantly increased the odds that one would also be obese. One way in which social networks may affect obesity is through dietary behaviors. For instance, being embedded in an obese social network increased the frequency of engaging in negative dietary behaviors (eating fast food). However, this did not change the frequency in which people engage in positive ones (eating fruits and vegetables). In contrast, people in thinner social networks reported engaging in more exercise. Those with no close friends who were overweight or obese were more likely than those who had several close friends who were obese to engage in exercise. Finally, obesity in one's network was shown to moderate the relationship between soda drinking and obesity. In other words, there are no differences between soda drinkers and non-soda drinkers if they have no overweight/obese friends; but, as their friendship network becomes "heavier," (i.e., having more

overweight/obese friends) the behavior of drinking soda increases the probability of obesity by a greater amount than if they did not drink any soda. This finding suggests that if negative dietary behaviors are avoided, the health consequences of being embedded in an obese social network may also be reduced.

Map 1

Percentage of District with Three Overweight/Obese Friends 2009-2012

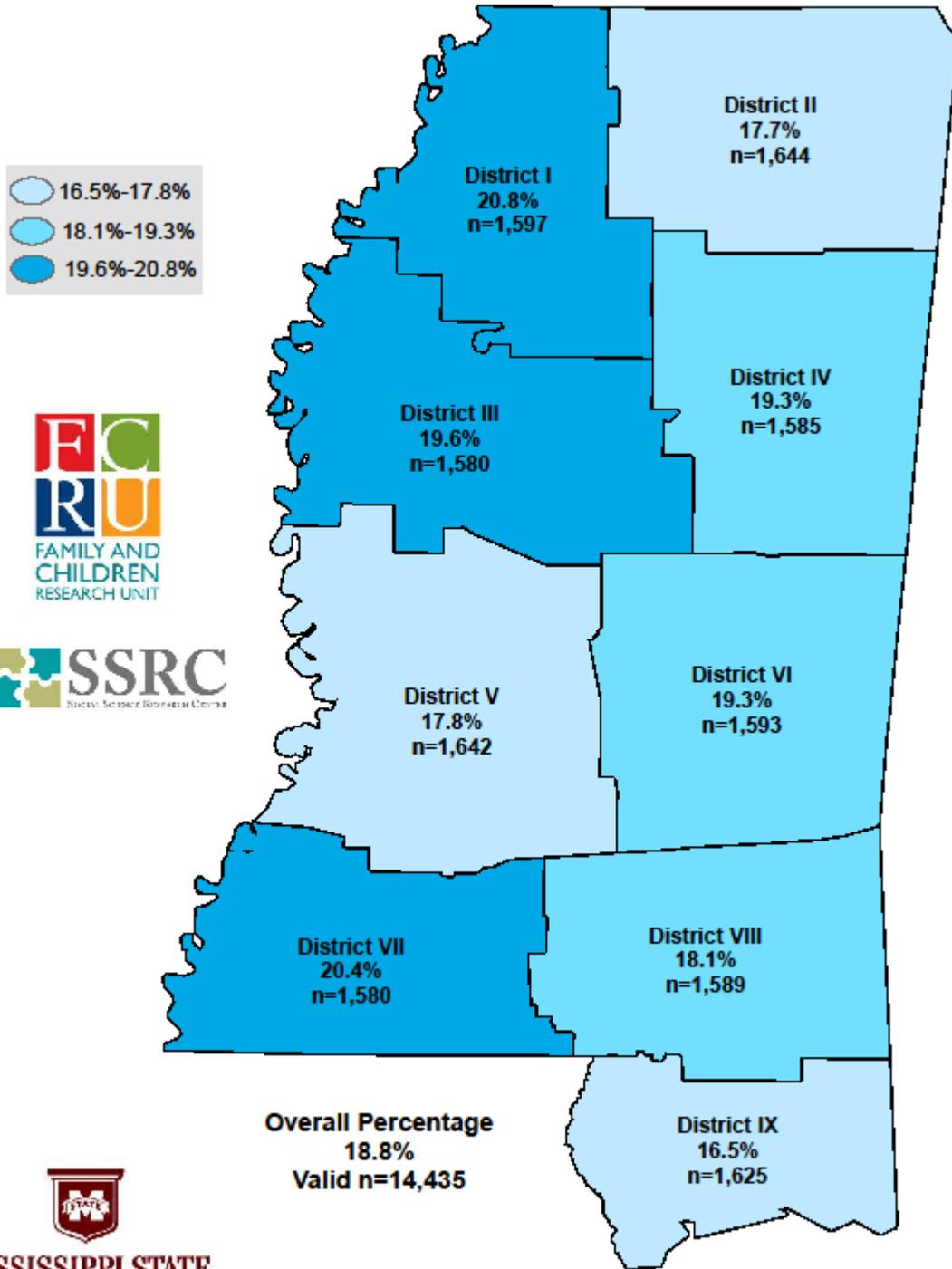


Table 1: Friendship Network with Nutrition and Exercise

Dietary Measure	Friendship Group Means				<i>F</i>	<i>df1</i>	<i>df2</i>	<i>p</i>
	<i>None</i>	<i>1/3</i>	<i>2/3</i>	<i>3/3</i>				
Days in past week eating fruit	4.18	4.13	4.13	4.17	.5	3	14190	.656
Days in past week eating vegetables	5.10	5.12	5.12	5.10	.1	3	14324	.932
Days in past week eating high-fat foods*	3.06	3.11	3.17	3.20	3.0	3	14343	.029
Days in past week drinking 100% juice	3.28	3.30	3.22	3.12	2.5	3	14271	.058
Days in past week drinking milk	5.66	5.64	5.61	5.58	.8	3	14377	.493
Days in past week drinking soda	3.33	3.29	3.38	3.42	1.5	3	14359	.212
Average times eating fast food per week**	1.96	2.35	2.59	2.32	29.1	3	14347	<.001
Days in past week exercising**	3.49	3.44	3.35	3.29	4.2	3	14412	.006

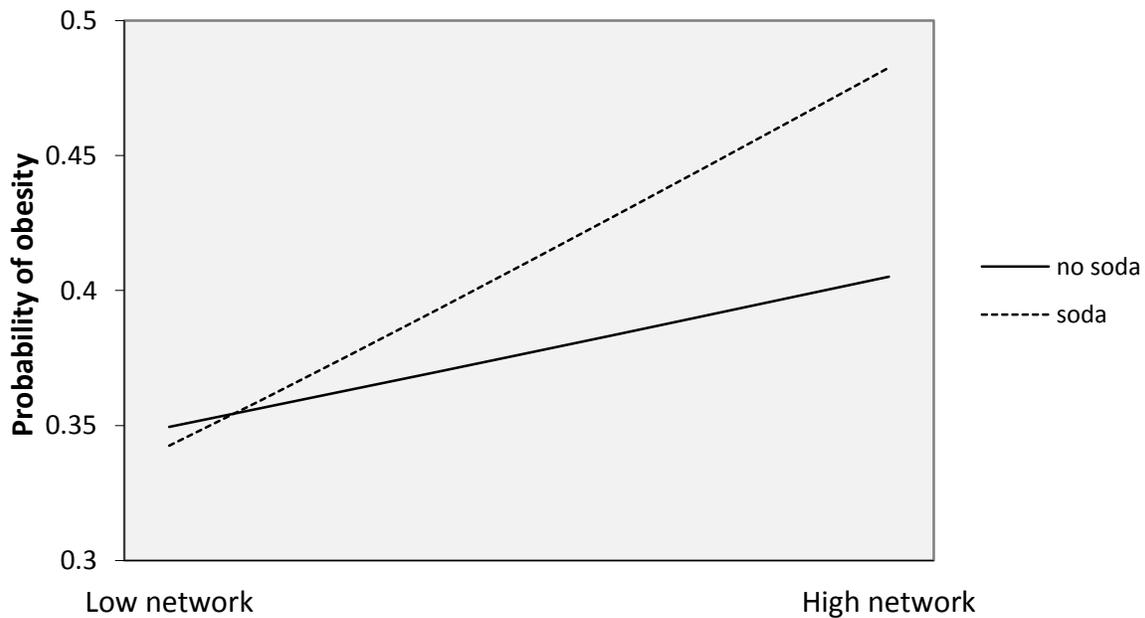
Table 2: Logistic Regression on Adult Obesity

Predictor	Step 1 – Main Effects ^a		Step 2 – Interaction Effects	
	B (SE)	OR (95% CI)	B (SE)	OR (95% CI)
Intercept	-.74 (.10)		-.62 (.11)	
Friendship network	.17 (.02)**	1.18 (1.14-1.22)	.08 (.04)*	1.08 (1.01-1.16)
Race (0 = White; 1 = Black)	.66 (.04)**	1.93 (1.78-2.10)	.66 (.04)**	1.93 (1.78-2.11)
Income	-.18 (.02)**	.84 (.81-.86)	-.18 (.02)**	.84 (.82-.86)
Education	-.07 (.02)**	.93 (.89-.98)	-.07 (.02)**	.93 (.89-.98)
High-fat foods (0 = No; 1 = Yes)	.07 (.08)	1.07 (.92-1.25)	.07 (.08)	1.07 (.92-1.25)
Soda (0 = No; 1 = Yes)	.12 (.05)*	1.13 (1.03-1.24)	-.03 (.07)	.97 (.84-1.12)
Fast food (0 = 1 or fewer times; 1 = 2 or more times)	.05 (.04)	1.05 (.97-1.14)	.05 (.04)	1.05 (.97-1.14)
Soda x Friendship network			.12 (.04)*	1.12 (1.03-1.22)

* $p < .05$. ** $p < .01$.

^a $R^2 = .067$ (Cox & Snell), $.091$ (Nagelkerke). Model $\chi^2(7) = 814.370$, $p < .001$.

Figure 1: Soda by Friendship Network (Interaction Term)



Academic Performance: Overview

Obesity has been identified as an impeding factor in children's academic performance (Datar, Sturm, & Magnabosco, 2004; Dwyer et al., 2001; Shore et al., 2008). Conversely, better physical fitness has been associated with academic achievement (Aktop, 2010; Castelli, Hillman, Buck, & Erwin, 2007). However, few studies (and fewer still in Mississippi) have studied the relationship between obesity and academic performance while controlling for diet, eating habits, exercise, family background/SES, gender, and race. Because these predictors are well known correlates of obesity, including them in this analysis will help clarify the relationship between obesity and academic performance. It is possible that the relationship between obesity and academic achievement is not as direct as previously thought. Rather, obesity may serve as a "marker" of poor academic performance with other factors related to obesity taking on more causal roles. We propose to examine these predictors in order to better understand the relationship between obesity and children's overall academic performance. A more detailed understanding of the relationship between obesity and academic achievement will also help parse out the relative importance of diet and exercise in how well children succeed in school in Mississippi.

Methods

In order to operationalize a child's academic performance, researchers used *Question 53* of the RWJF Parent/Youth Survey. This question asked respondents, "During the past 12 months, how would you describe [your child's] grades in school?" Parents could describe their child as receiving mostly A's, B's, C's, D's, or F's. Respondents who didn't know their child's grades or refused the question were excluded from the analysis. This variable was

dichotomized into either “poor” academic performance (mostly C’s, D’s, or F’s) or “good” academic performance (mostly A’s or B’s). The primary research question of this chapter was to ascertain if childhood obesity is related to poor academic performance. Specifically, do obese children have worse academic performance than non-obese children? Additional analyses will examine academic performance in relation to geographical and nutritional outcomes.

Results

The majority of children in the sample would be classified as having good academic performance (84.8%), whereas only 15.2% of children had poor academic performance. There was a racial disparity between White and Black children. White children were less likely to have poor academic performance than were Black children (12.5% vs. 18.4%). When analyzed by public health district there were two districts, three and five (Map 1), which had a significant over-representation of children with poor academic performance, $\chi^2(8, N = 10,882) = 53.2, p < .001$.

In terms of nutrition there were significant differences between the families of children with either poor or good academic performance (Table 1). Children that had poor academic performance tended to live in families that served less fruit, less vegetables, less natural juice, less milk, and more soda throughout the week. However, there were no differences in the frequency of fast food meals per week. There was a significant difference in exercise. Children with poor academic performance came from families that exercised less than families with children who had good academic performance.

A regression model was constructed to investigate the relationship between childhood obesity and other predictors in relation to academic performance (Table 2). This model

revealed that childhood obesity was a statistically significant predictor of academic performance; children who were obese had 25% higher odds of poor academic performance than non-obese children (OR, 1.25; 95% CI, 1.07-1.46). There was a similar effect for adult (parental) obesity. Children with an obese parent had 24% higher odds of poor academic performance (OR, 1.24; 95% CI, 1.08-1.41). There were also a number of disparities with regard to race, income, and parental education. Children from low-income families, African American children, and children with parents who had less education had a greater chance of being classified as having poor academic performance.

In a second step, a race by childhood obesity interaction term was added to the regression model (Figure 1); this variable was significant (OR, .70; 95% CI, .52-.95). The interaction presented in Figure 1 demonstrates that for White children, the difference between being obese and not-obese makes a large difference in the likelihood of poor academic performance. However, for Black children, there does not appear to be a difference in relation to obesity and academic performance. Or in other words, White children benefit from not being obese, but Black children do not enjoy the same benefit (i.e., by having better academic achievement).

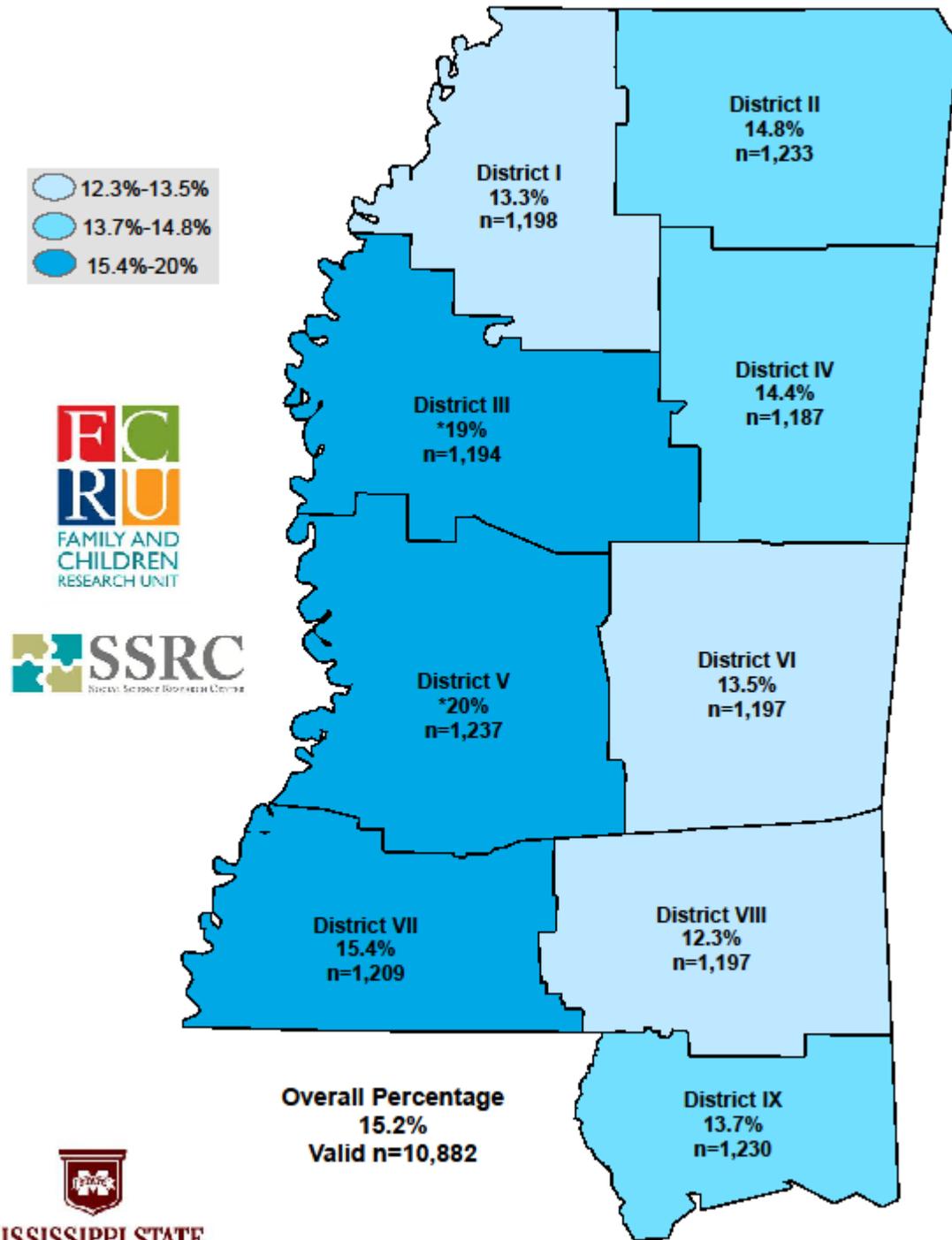
Summary

The current study revealed several important findings about academic achievement and obesity. First, parents of high academic achievers tended to report more healthy dietary habits in the household (e.g., serving more fruits and vegetables per week) and less unhealthy ones (e.g., drinking soda). Second, obese children had higher odds of poor academic achievement. However, an important caveat to this finding emerged; the effects of obesity were contingent

upon race. For White children, higher rates of obesity were associated with poor academic performance and lower rates with better academic performance. However, Black children tended to have lower academic achievement than White children, regardless of their weight status. That is, when controlling for socioeconomic predictors (e.g., income and parental education), obesity appeared to affect academic achievement more strongly in Whites than Blacks.

Map 1

Percentage of Children in District with Poor Academic Performance 2009-2012



*Statistically Significant Over-Representation (p < .05)

Table 1: Academic Performance with Nutrition and Exercise

Dietary Measure	Poor School GPA		Good School GPA		<i>df</i>	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Days in past week eating fruit**	3.66	2.43	4.20	2.37	10695	8.32	<.001	.225
Days in past week eating vegetables**	4.66	2.21	5.03	2.09	10798	6.51	<.001	.175
Days in past week eating high- fat foods	3.15	2.17	3.11	2.10	10813	-.63	.531	-.017
Days in past week drinking 100% juice**	2.81	2.74	3.21	2.82	10753	5.33	<.001	.143
Days in past week drinking milk**	5.45	2.33	5.64	2.18	10845	3.18	.001	.085
Days in past week drinking soda**	3.67	2.82	3.41	2.78	10821	-3.54	<.001	-.095
Average times eating fast food per week	1.58	2.28	1.52	1.69	10832	-1.21	.228	-.032
Days in past week exercising**	3.16	2.64	3.48	2.53	10861	4.75	<.001	.127

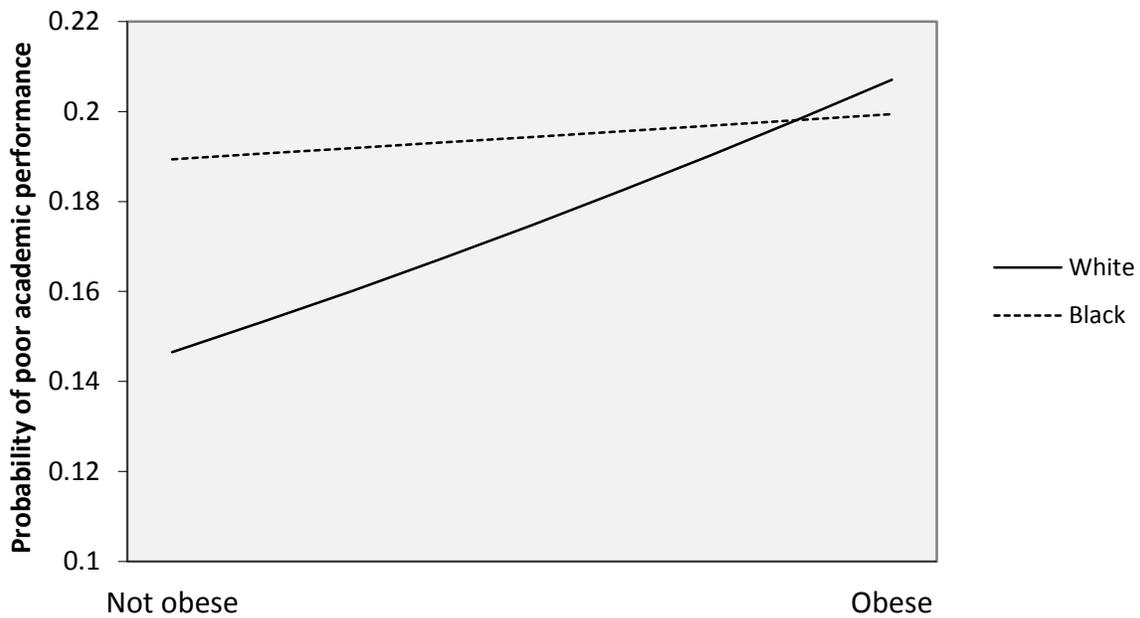
Table 2: Logistic Regression on Academic Performance

Predictor	Step 1 – Main Effects ^a		Step 2 – Interaction Effects	
	B (SE)	OR (95% CI)	B (SE)	OR (95% CI)
Intercept	-1.72 (.14)		-1.76 (.14)	
Child obese (0 = No; 1 = Yes)	.22 (.08)**	1.25 (1.07-1.46)	.42 (.12)**	1.52 (1.21-1.90)
Adult obese (0 = No; 1 = Yes)	.21 (.07)**	1.24 (1.08-1.41)	.21 (.07)**	1.23 (1.08-1.41)
Race (0 = White; 1 = Black)	.22 (.07)**	1.25 (1.08-1.43)	.31 (.08)**	1.36 (1.16-1.59)
Income	-.18 (.03)**	.83 (.79-.88)	-.18 (.03)**	.83 (.79-.88)
Child grade	.10 (.01)**	1.11 (1.08-1.13)	.10 (.01)**	1.11 (1.08-1.13)
Parent Education	-.21 (.04)**	.81 (.75-.87)	-.21 (.04)**	.81 (.75-.87)
Race x Child obese			-.36 (.15)*	.70 (.52-.95)

* $p < .05$. ** $p < .01$.

^a $R^2 = .067$ (Cox & Snell), $.091$ (Nagelkerke). Model $\chi^2(7) = 814.370$, $p < .001$.

Figure 1: Race by Childhood Obesity (Interaction Term)



Health Care Access and Insurance: Overview

Research has shown that seeing a physician on a regular basis is an excellent way to ensure access to preventive medicine (McIsaac, Fuller-Thompson, & Talbot, 2001). Health care professionals are first-hand witnesses to the effects of childhood obesity and are often the first to identify the presence of obesity in a child. Therefore, physicians and nurses play a fundamental role in identifying and combating child obesity. The purpose of this study was to analyze the association of select variables in relation to having a regular doctor (or some type of regular health care provider). Weight status, socioeconomic status, educational background, geographic variation, race, and health insurance status could shed light on what factors inhibit Mississippi parents from having general health care access. Furthermore, having a doctor for regular care was studied in relation to various habits of diet and exercise. It is possible that some of these habits may be related to general health care access. Most importantly, having access to quality healthcare may be associated with a lower likelihood of childhood obesity.

Methods

Health care access and insurance was measured through *Questions 73, 74, and 75* of the RWJF Parent/Youth Survey. These questions asked if they had health insurance, did their child have health insurance, and did they have a regular doctor or health care provider. For the purpose of this study, only respondents who answered either yes or no were included in the analyses. This chapter will examine these measures of health care access and insurance in relation to relevant geographical, nutritional, socio-economic, and health (weight status/obesity) outcomes.

Results

A frequency analysis showed that the majority of respondents have regular health care access and health insurance. Eighty-four percent of parents and 93.9% of children have health insurance. For regular health care access, 91% of parents said that they do have a regular doctor. There were significant geographical patterns for parent, $\chi^2(8, N = 14,784) = 41.1, p < .001$, and child, $\chi^2(8, N = 14,767) = 27.2, p < .001$, health insurance in relation to public health districts. The district percentages for parents and children without health insurance are shown in Map 1 and Map 2 respectively.

Having access to a regular doctor or health care provider was associated with a number of positive dietary behaviors (Table 1). Respondents with regular health care had more weekly servings of fruits, vegetables, 100% juice, milk, and few servings of high-fat foods. There were no significant differences in relation to fast food, soda, or weekly exercise. Regular health care was also associated with (parental) obesity and income (Table 2). Respondents who saw a regular health care provider were less likely to obese and more likely to have health insurance. As shown in Table 3, parental health insurance was also associated with obesity, race, and income. Parents who were insured were less likely to be obese and less likely to have obese children.

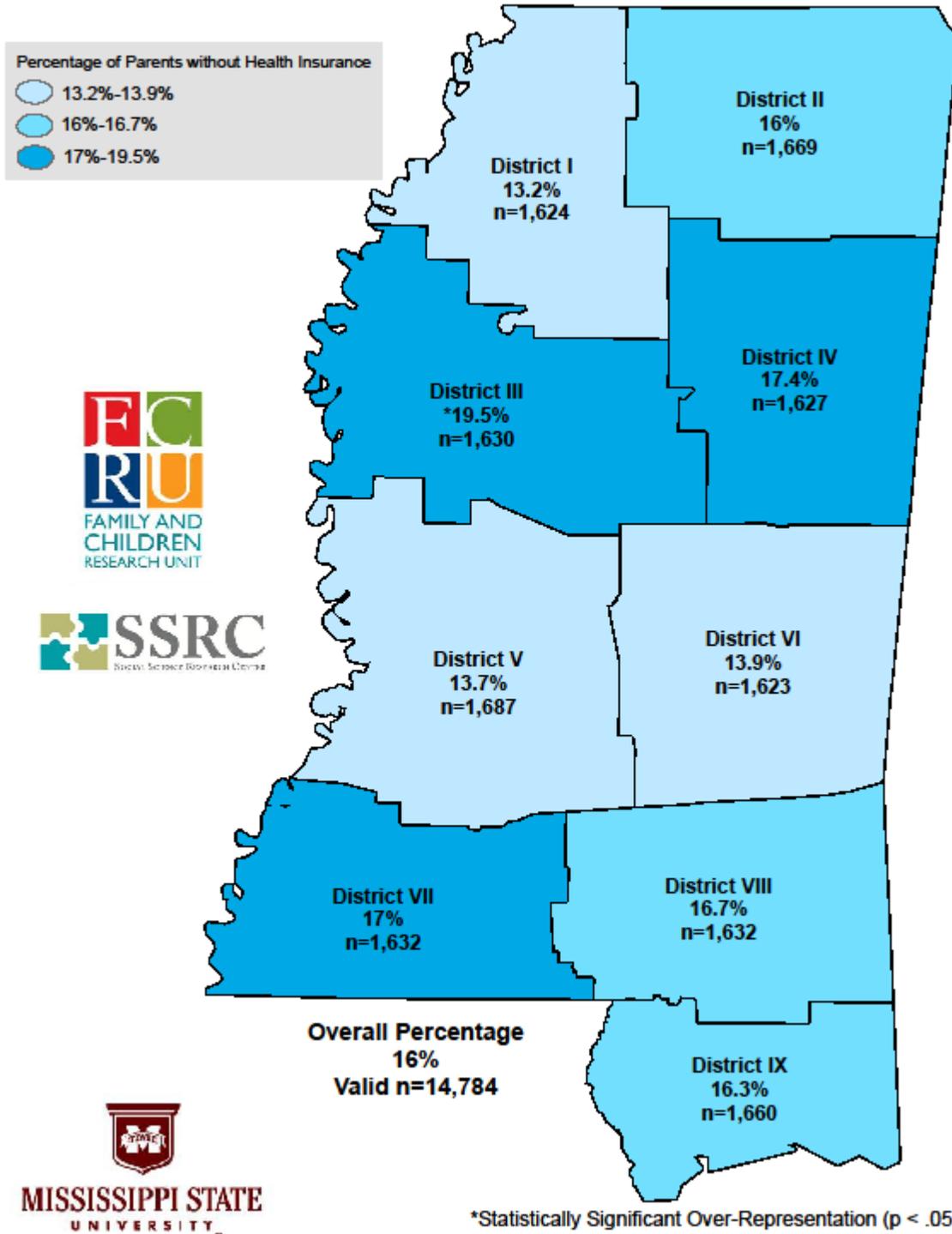
Summary

As these analyses have demonstrated, health care and health insurance are related to a variety of different outcomes. Individuals who have health insurance and regular health care are less likely to obese and engage in positive dietary behaviors (e.g., fruits and vegetables). It is possible; however, that many of these relationships may covary with other socioeconomic and

demographic factors. In other words, those with higher incomes and more education are both more likely to have regular health care and have lower rates of obesity.

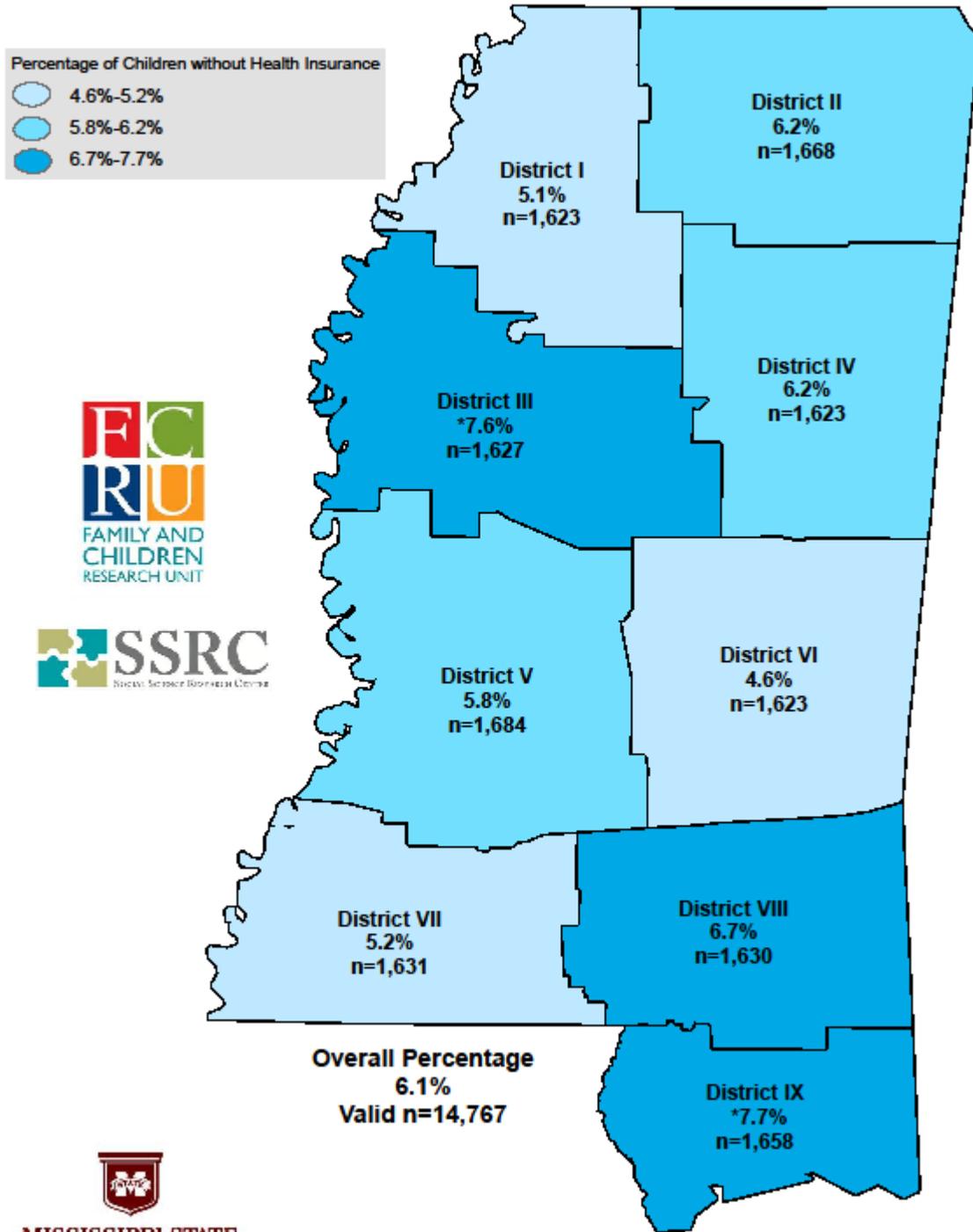
Map 1

Percentage of Parents without Health Insurance 2009-2012



Map 2

Percentage of Children without Health Insurance 2009-2012



*Statistically Significant Over-Representation (p < .05)

Table 1: Regular Access to Health Care with Nutrition and Exercise

Dietary Measure	No Regular Health Care		Regular Health Care		<i>df</i>	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Days in past week eating fruit**	3.86	2.51	4.18	2.38	14529	-4.62	<.001	-.135
Days in past week eating vegetables**	4.86	2.23	5.13	2.05	14668	-4.62	<.001	-.134
Days in past week eating high- fat foods**	3.33	2.24	3.09	2.11	14685	3.86	<.001	.112
Days in past week drinking 100% juice**	2.97	2.83	3.28	2.82	14606	-3.86	<.001	-.112
Days in past week drinking milk**	5.44	2.32	5.64	2.18	14726	-3.21	.001	-.093
Days in past week drinking soda	3.47	2.80	3.32	2.78	14703	1.80	.073	.052
Average times eating fast food per week	2.30	3.31	2.28	3.05	14694	.26	.793	.008
Days in past week exercising	3.97	2.38	4.07	2.25	12353	-1.45	.147	-.047

Table 2: Regular Health Care with Socio-economic, Race, and Health (Obesity) Outcomes

	χ^2	<i>N</i>	<i>df</i>	<i>p</i>
Obesity*	5.54	13540	1	.019
Child obesity	1.39	11824	1	.239
Race	1.07	14349	1	.300
Income**	167.90	13305	5	<.001

Table 3: Parental Health Insurance with Socio-economic, Race, and Health (Obesity) Outcomes

	χ^2	<i>N</i>	<i>df</i>	<i>p</i>
Obesity**	47.47	13542	1	<.001
Child obesity**	33.11	11821	1	<.001
Race**	15.86	14348	1	<.001
Income**	1115.56	13301	5	<.001
Regular health care**	1515.91	14775	1	<.001

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