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Policy perceptions related to physical activity and healthy eating in Mississippi

Rachel G. Tabak, PhD^[1], Ellen Jones, PhD^[2], Julie A. Jacobs, MPH^[1], Thomas Dobbs, MD, MPH^[3], Victor Sutton, PhD^[4], Cassandra Dove, MPH^[4], and Ross C. Brownson, PhD^{[1],[5]}

^[1]Prevention Research Center in St. Louis, Brown School, Washington University in St. Louis, St. Louis, MO

^[2]School of Health Related Professions, University of Mississippi Medical Center, Jackson, MS, USA

^[3]State Epidemiologist, Mississippi State Department of Health, Jackson, MS, USA

^[4]Office of Preventive Health, Mississippi State Department of Health, Jackson, MS, USA

^[5]Division of Public Health Sciences and Alvin J. Siteman Cancer Center, Washington University School of Medicine, Washington University in St. Louis, St. Louis, MO

Abstract

Objective—Determine the public perceptions about policies related to physical activity and healthy eating to inform efforts to change policy for these important public health issues

Design—Cross sectional, structured phone interview survey

Setting—10 counties in Mississippi (5 counties with the highest and 5 with the lowest obesity prevalence)

Participants—Random sample of 2,800 adults

Main Outcome Measure—Level of support for each individual policy and summary of support for ten policies related to healthy eating and activity and four related to local funding for infrastructure for physical activity

Results—This survey showed strong policy support among Mississippi residents for a diverse set of policies aimed at promoting healthy eating and physical activity behaviors. This was particularly true for those in counties with the highest levels of obesity. Support for policies related to healthy eating and activity was highest for: Requiring at least 30 minutes of physical activity or physical education everyday for children in kindergarten through 12th grade (93%) and lowest for: Taxing soda and soft drinks and using the money for public education campaigns to fight obesity in children (65%). Support for the use of local government funds to build and maintain infrastructure for physical activity was high across all categories, ranging from 86% (recreation centers) to 74% (swimming pools). The levels of support for each policy, varied according to several demographic characteristics; in general, support for nearly every policy was

greater among African Americans, females, and those in counties with higher levels of obesity. Logistic models predicting level of support for healthy eating and physical activity found significant associations with several demographic factors.

Keywords

Nutrition policy; physical activity policy; public perception; obesity prevention

Introduction

Obesity is a major public health threat in the US.¹ It is linked to many chronic diseases including diabetes, coronary heart disease, stroke, hypertension, and certain types of cancer, and is expected to account for \$147 billion in annual costs.² According to the Centers for Disease Control and Prevention (CDC), 34.9% of all Mississippians are classified as obese; the single highest obesity rate in the nation.^{3,4} Obesity is caused by various factors including unhealthy eating⁵ and inactivity behaviors⁶; these behaviors can be influenced by characteristics of the environment (e.g., aesthetics of a neighborhood, grocery store access).^{7,8, 9}

Laws, regulations, and guidelines as public health policy can profoundly impact health behavior and status.¹⁰ Numerous policy interventions have been identified as effective in promoting physical activity, healthy eating, and obesity prevention.^{11–22} In addition to nationally implemented policies, mounting evidence shows that implementation at the local level is critical to achieving changes in risk factors and health outcomes.^{10,23–25} A 2009 IOM report describes the importance of local government action in obesity prevention and lays out policy recommendations likely to directly affect children.²⁴

When making decisions about supporting an issue, policymakers often prioritize constituents' needs or opinions above other factors.²⁶ Further, the IOM report, *Preventing Childhood Obesity: Health in the Balance*²⁷, emphasized that policy changes occur more quickly "when there is strong social consensus behind them."^{28,29} It is therefore important to provide timely data showing public support of evidence-based approaches. Obtaining information on public health topics, however, requires a large and diverse sample of respondents to provide such information. Most public health data collection assesses factors such as health status, socioeconomic, and demographic data, but misses the information that may be of particular importance to influence policymaker priorities. There is a lack of public opinion data, particularly at the state and local levels, to help local-level decision makers tailor policies that would most efficiently and effectively impact obesity rates. The lack of data available to advocates also hampers efforts to communicate constituent concerns to policymakers. Peer reviewed studies reporting on such perceptions are needed to help shape such communication efforts. Putting these studies through peer review and making them available in the scientific literature (not just the popular press literature) enhances the opportunity for researchers and policymakers to make use of these findings. This work aims to fill that gap by reporting the opinions of a random sample of residents from 10 counties in Mississippi.

Methods

The overall goal of this study was to determine the public support for policies related to nutrition and physical activity through administration of a phone survey in 10 counties in Mississippi. The study protocol has been reviewed and approved by the Washington University Institutional Review Board.

Survey methods

Telephone interviews with adult respondents were conducted using a random sample of 75% landline and 25% cell-phone numbers from residents living in the following 10 counties in Mississippi: Holmes, Humphreys, Jefferson, Tunica, Wilkinson, Harrison, Hancock, Rankin, Tishomingo, and Prentiss. The first 5 counties represent those with the highest adult obesity prevalence in the state and the last 5 counties represent those with the lowest adult obesity prevalence based on *County Health Rankings*. The *County Health Rankings* are published on-line at www.countyhealthrankings.org by the University of Wisconsin Population Health Institute and the Robert Wood Johnson Foundation (RWJF). The Rankings assess the overall health of nearly every county in all 50 states, using a standard way to measure how healthy people are and how long they live.³⁰ At the time the study was designed, these rankings were based on CDC data from 2006–2008.³¹ The data were collected from May through September 2011 by the Survey Research Laboratory, Social Science Research Center at Mississippi State University. The household telephone numbers were selected using random-digit-dialing (RDD) sampling procedures. The sample included households with unlisted numbers. Quotas for the total number of completed surveys to be obtained from each county were pre-determined according to county population size. Within-household random sampling was conducted by asking to speak with a household member who is at least 18 years of age and ... [randomly] ... “will be having the next birthday” [or] ... “has had the last birthday”. Telephone numbers were dialed a maximum of eight times before being retired. Calls were placed throughout Mondays-Fridays from 5pm–9pm, Saturdays from 10am–6pm, and Sundays from 1pm–9pm, without randomization for when the calls were placed. A total of 81,000 telephone numbers were purchased; 36,182 were never used and 21,138 were not home or were not working phone numbers. Of the remaining 24,480 numbers (which includes answering machines and busy signals as well as ineligibilities and refusals) 2,800 individuals responded (response rate 11%).

Questionnaire items

A series of 10 questions used a four-point scale to assess how strongly respondents would “favor or oppose” new laws or policies (referred to as: ‘healthy eating and activity policies’). An additional 4 questions asked whether respondents would support the use of local government funds to build and maintain 1) walking trails, 2) swimming pools, 3) recreation centers, and 4) bicycle paths (referred to as: “local funding”). The instrument is available for download as supplementary material.

Statistical analysis

Support for each policy was examined on a univariate basis, then stratified by a number of demographic characteristics (i.e. age, race, marital status, education, income, presence of

children in the home, gender, high/low obesity county, BMI). The Mantel-Haenszel chi-square values across levels of these characteristics were determined. Summary scores were computed by summing the responses to these questions for a possible score of 10 to 40 for support of healthy eating and activity policies (where 10 is strongly supporting each policy and 40 is strongly opposing all) and 4 to 8 for local funding policies (where 4 is answering 'yes' to each policy and 8 is answering 'no' to all). These scores were dichotomized to distinguish those supporting and those opposing policies (10–24 versus 25–40 for healthy eating and activity policies and 4–5 versus 6–8 for local funding policies). Logistic regression models were used to explore the association between supporting/opposing the policies and demographic characteristics (i.e. gender, race/ethnicity, age, income, presence of children in the home, level of obesity in the county, individual weight status, and education). These models were run a second time with adjustment for all other demographic characteristics.

Results

The final sample contained 2,800 individuals, roughly half (1,401) of whom were from the five counties with the lowest obesity rates in Mississippi. The sample was 71% female (2,000). Fifty-one percent of the sample (1,432) was white, 45% (1,263) were Black or African American, and nearly 4% (105) were some other race. Additional demographic characteristics of the sample can be found in Table 1, with additional demographic information on supplemental Table 1.

Among the total sample, support for healthy eating and activity policies was highest for: *Requiring at least 30 minutes of physical activity or physical education classes every day for children in kindergarten through 12th grade* (93%) and lowest for: *Taxing soda and soft drinks and using the money for public education campaigns to fight obesity in children* (65%). Support for local funding policies was highest for *Recreation centers* (86%) and lowest for *Swimming pools* (74%) (Table 2).

The levels of support for each policy, stratified by race, obesity level of the county, and gender, are shown in Table 2. Support for nearly every policy was greater among African Americans, females, and those living in counties with higher levels of obesity. In general, the trends across BMI, education, income, and age were not linear (data not shown), in that support did not increase or decrease consistently across categories.

For the sum of all 10 healthy eating and activity policies, summary scores ranged from 10 to 40, with a mean of 17.1 (SD=6.0) and for local funding the sum of the four items ranged from 4 to 8, with a mean of 4.7 (SD=1.3). Females were significantly more likely than males to support both types of policies (OR= 1.69, 95% CI: 1.28–2.24 and OR=1.30, 95% CI: 1.06–1.60) (Table 3). When this model was adjusted for all demographic factors listed in the methods, the association was no longer significant for the healthy eating and activity policies (adjusted OR=1.42, 95% CI: 0.98–2.06) but remained borderline significant for the local funding policies (adjusted OR=1.39, 95% CI: 1.04–1.85). Compared to Caucasians, Blacks/African Americans were significantly more likely to support both healthy eating and activity policies (adjusted OR=4.18, 95% CI: 2.48–7.05) and local funding policies (adjusted

OR=2.84, 95% CI: 1.95–4.15). Age was associated with support for local funding for all age categories compared to those 65 years and over, but this was significant after adjustment only for the age groups 25–34yrs; 35–44yrs; and 45–54yrs.

Those earning less than \$15,000 were more likely to support both types of policies than those earning at least \$75,000. However, the only association that was significant before and after adjustment was between those earning \$15,000-\$24,999 and those earning at least \$75,000 for supporting the healthy eating and activity policies (adjusted OR=2.32, 95% CI: 1.19–4.52).

Before, but not after, adjustment, respondents living in the 5 counties with the highest levels of obesity were significantly more likely to support both types of policies than those in the counties with the lowest obesity prevalence. Respondents with at least one child in the home were significantly more likely to support policies related to local funding (OR=1.94, 95% CI: 1.53–2.44). Similarly, obese individuals were more likely to support policies related to local funding than those with a normal BMI between 18.5–24.9 kg/m². Neither of these associations was significant after adjustment. Only those in the lowest education category (less than high school) were significantly more likely than those with at least a college education to support healthy eating and activity policies; this association was no longer significant after adjustment.

Discussion

Findings from this study indicate support among Mississippi residents for policies aimed at promoting healthy eating and activity in their communities, particularly among those living in counties with the highest levels of obesity. Other large-scale polls^{32–35} have shown similar levels of support. In late 2010, the California Endowment funded a poll of 1,005 registered voters³⁴ and found that levels of support for banning advertising were similar in Mississippi and California (66% and 64%, respectively).³⁴ Public use of school facilities when school is not in session had 88% support in California³⁴ and 80% support in Mississippi. On the other hand, Mississippi residents had higher support for banning the sale of soda in school (70% strongly or somewhat supported) than those in New York State (59% support)³² (April 2010 Quinnipiac University RDD survey of 1,381 New York State registered voters). Similarly, 65% of Mississippi respondents expressed support for taxing soda and soft drinks to fund public education campaigns for childhood obesity while only 56% of respondents in the California survey supported this policy.^{34,35} A slightly different version of this question (where the use of tax funds was not specified) was asked in a December 2009 Columbia Broadcasting System (CBS) poll,³³ which included a RDD sample of 1,048 adults nationwide; only 38% favored the policy. Finally, in the Quinnipiac University poll,³² which suggested the money raised from such taxes would be used to fund health care only, 48% supported the policy.

Support among Mississippians has remained relatively constant for some policies since a 2006 poll by the Mississippi Center for Health Policy.³⁵ For example, support for requiring schools to send annual BMI scorecards to parents was 68% in 2011 and 66% in 2006; this was much higher than the national level of support (51%), at the time (2006). A 2006 survey

found that support for eliminating vending machines in elementary schools was slightly greater in Mississippi³⁵ (78.5%) than the rest of the nation at that time (71%); in this 2011 survey, 74% of Mississippians supported the policy.

It is often difficult for researchers to conduct polls assessing policy perceptions due to financial and methodological constraints. Funding and research study timelines are often out of synch with the need for information about timely issues.³⁶ The surveys mentioned above were not published as part of the scientific literature. In the case of these surveys, dissemination through popular, rather than scientific press, allows practitioners and policymakers the opportunity to use the knowledge gleaned from these investigations in a more timely fashion. While inclusion in the popular press is important, publication of these findings in the scientific literature aids in their use by researchers and policymakers. This type of publication allows for peer-review, which adds credibility, and allows them to be searchable in databases such as Pubmed.

Many of the trends across demographic characteristics seen in the Mississippi population were also seen in similar surveys conducted elsewhere. In Mississippi, support for taxing soda and soft drinks had greater support among African Americans (76%) than Caucasians or any other race (55% and 61%, respectively). Similarly, in California,³⁴ the highest support was among African Americans and Latino/Hispanics (70% and 72%, respectively) compared to 50% and 53% for Caucasian non-Hispanics and Asian-American/others.

Findings from this Mississippi study have a number of research and policy implications. This study identified several characteristics as being related to policy support. Future research efforts should investigate the use of such components to target social marketing campaigns, such as those aimed at building support for policy change. A recent IOM report, *Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation*,³⁷ recommends social marketing as a method of changing public opinion. An essential piece of this method, is that these campaigns be highly targeted (in terms of audience and behavior).³⁸

In addition to the research implications, this study has the potential to inform policy. Policymakers rely heavily on constituent needs and opinions in making crucial policy decisions.²⁶ Practitioners can use this information to tailor communication about public health interventions, including policy approaches. Local health leaders can determine priorities for education and awareness. In addition, this information, showing clear support for policies encouraging healthy eating and physical activity, can be powerful in the hands of advocates working with policymakers to achieve change.²⁶

An important use for these findings is to provide those looking to achieve policy change with information regarding population subgroups most likely to support (and those most likely to oppose) policy changes related to healthy eating and physical activity. This study found that African Americans and females were more likely to support healthy eating and activity policies and local funding policies. Similarly, those in younger age groups were more likely to support local funding than those in the oldest age group. These are individuals

who may need to be specifically targeted, perhaps with different messages, in order to change their perception.

Study limitations include a cross-sectional design, which limits causal inferences. Secondly, though the study was designed to be representative of the counties sampled (the five with the highest and five with the lowest obesity levels in Mississippi), it is not representative of state or national samples, which may limit generalizability. The response rate for the sample was low, however the individuals were sampled for variability (by selecting those in the counties with the highest and lowest levels of obesity), and the aim was not to try to estimate area-wide prevalence. Third, related to sampling, we had a low response rate and though an attempt was used to survey by cell-phone as well as landline, there may have been bias in those choosing to participate in the survey.

These results paint a picture of the perceptions of residents concerning public health policies related to healthy eating and physical activity. Though patterns were found by demographics such as race and gender, overall support was quite high for all policies. In practice, individuals and groups that support such policies should be recruited as advocates. Those opposing the policies may be targeted with messages aimed at reducing their resistance. These findings can help move public opinion, a key driver of policy change.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Demographic characteristics of the sample by obesity level of the county of residence in a 2011 Mississippi telephone survey

Table 1

Variable	Categories	Total			High Obesity County		Low Obesity County	
		Frequency	Percent	Frequency	Percent	Frequency	Percent	
Race	Caucasian	1432	51.1	340	24.3	1092	77.9	
	African American	1263	45.1	1019	72.8	244	17.4	
	Other	105	3.7	40	2.9	65	4.6	
Marital Status	Married	1311	46.8	522	37.3	789	56.3	
	Unmarried couple	42	1.5	20	1.4	22	1.6	
	Divorced	292	10.4	161	11.5	131	9.3	
	Widowed	446	15.9	225	16.1	221	15.8	
	Separated	73	2.6	46	3.3	27	1.9	
	Single	606	21.6	403	28.8	203	14.5	
	Refused	30	1.1	22	1.6	8	0.6	
Education	<High school	422	15.3	271	19.7	151	10.9	
	High school or GED	898	32.5	490	35.6	408	29.5	
	Some College/Tech	693	25.1	314	22.8	379	27.4	
	College+	747	27.1	301	21.9	446	32.2	
Missing = 40								
Annual Household Income	<\$15,000	576	32.7	401	45.3	175	19.9	
	\$15-\$24,999	336	19.1	187	21.1	149	17.0	
	\$25-\$34,999	168	9.5	77	8.7	91	10.4	
	\$35-\$49,999	234	13.3	81	9.1	153	17.4	
	\$50-\$74,999	202	11.5	80	9.0	122	13.9	
Missing = 1038	\$75,000+	246	14.0	59	6.7	187	21.3	
# Child in home	0 Child	1897	68.3	899	65.0	998	71.7	
	1+ Child	879	31.7	485	35.0	394	28.3	
Missing = 24								
County Obesity	High	1399	50.0	-	-	-	-	
	Low	1401	50.0	-	-	-	-	

Variable	Categories	Total		High Obesity County		Low Obesity County	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
Gender	Male	800	28.6	357	25.5	443	31.6
	Female	2000	71.4	1042	74.5	958	68.4
Age	18–24yrs	182	6.6	101	7.3	81	5.9
	25–34yrs	265	9.6	149	10.8	116	8.4
	35–44yrs	322	11.7	164	11.8	158	11.5
	45–54yrs	512	18.4	278	20.1	234	17.0
	55–64yrs	608	22.0	308	22.2	300	21.8
Missing = 39	65+yrs	872	31.6	384	27.7	488	35.4
BMI (kg/m ²)	Underweight (18.5)	63	2.2	31	2.2	32	2.28
	Normal (18.5–24.9)	762	27.2	303	21.7	459	32.8
	Overweight (25–24.9)	839	30.0	421	30.1	418	29.8
	Obese (30)	1136	40.6	644	46.0	492	35.1
Fruit/Veg Intake	< 5 servings/day	2490	90.3	1253	91.0	1237	89.6
Missing = 43	5+ servings/day	267	9.7	124	9.0	143	10.4

Note: data were collected cross-sectionally

Percent of Mississippians strongly or somewhat supporting each policy by race, county obesity, and gender in a 2011 Mississippi telephone survey

Table 2

Policy	Race					County Obesity			Gender		
	Total	Caucasian	African American	Other	p	High	Low	p	Male	Female	P
Req 30 min PA k-12	92.8	90.9	95.1	92.5	<01	94.2	91.5	0.0062	88.7	94.5	<01
Health in curric	91.3	89	93.7	92.2	<01	92.8	89.7	0.0046	87.3	92.8	<01
Healthy school lunch	88.2	85.9	91.0	85.2	<01	90	86.5	0.0048	84.8	89.6	<01
Elem no vend	74.1	73.6	74.7	72.3	0.78	72.6	75.5	0.0931	69.5	75.9	<01
Ban SSB in school	70.1	67.4	73.2	69.4	0.01	71	69.1	0.2977	66.3	71.6	<01
Req BMI card	68.0	59.8	77.9	60	<01	75	61.1	<0001	65.9	68.8	0.16
Prohib adv in schools	66.2	65.9	67.2	58.1	0.22	66.9	65.6	0.4908	62.9	67.5	0.02
Tax soda to fight ob	90.6	85.9	95.9	90.8	<01	92.5	88.8	0.0012	87.5	91.9	<01
Funding for rec and PA	80.3	74.7	87	72.9	<01	81.1	79.6	0.3344	80.7	80.2	0.78
School gyms open	64.7	54.8	76.3	60.7	<01	72.4	57.2	<0001	59.4	66.8	<01
Walking trails	85.7	79.1	93.8	74.4	<01	88.5	82.9	<0001	84.3	86.3	0.18
Swimming pools	82.8	77.7	88.9	77.4	<01	84.1	81.4	0.0642	80	83.9	0.02
Recreation centers	82.3	77.6	87.6	82.1	<01	82.9	81.7	0.4106	80.1	83.2	0.05
Bicycle paths	74.5	66.5	83.5	72.9	<01	77.8	71.2	0.0001	73.6	74.9	0.50

* Would you favor or oppose a new law: Requiring at least 30 minutes of physical activity or physical education classes every day for children in kindergarten through 12th grade.

† For each one, please tell me whether you would favor or oppose it: Taxing soda and soft drinks and using the money for public education campaigns to fight obesity in children.

‡ Do you think local government funds should be spent to build and maintain places in your community where people can exercise, such as: Walking trails

Note: data were collected cross-sectionally

Odds of supporting PA and healthy eating policies by demographic characteristics in a 2011 Mississippi telephone survey

Table 3

Variables	Categories	Crude OR (95% CI)			Adjusted* OR (95% CI)		
		New Laws†	Local Funding‡	New Laws†	Local Funding‡	Local Funding‡	
Gender	Male	1.00	1.00	1.00	1.00	1.00	
	Female	1.69 (1.28–2.24)	1.30 (1.06–1.60)	1.42 (0.98–2.06)	1.39 (1.04–1.85)		
Race	Caucasian	1.00	1.00	1.00	1.00	1.00	
	African American	3.29 (2.41–4.49)	2.66 (2.14–3.30)	4.18 (2.48–7.05)	2.84 (1.95–4.15)		
	Other	1.36 (0.66–2.79)	1.11 (0.66–1.87)	2.44 (0.73–8.16)	0.84 (0.39–1.84)		
Age	18–24yrs	1.21 (0.68–2.16)	2.66 (1.67–4.24)	0.96 (0.41–2.27)	1.54 (0.78–3.05)		
	25–34yrs	1.56 (0.91–2.66)	3.32 (2.17–5.06)	1.22 (0.58–2.56)	2.97 (1.51–5.84)		
	35–44yrs	1.42 (0.88–2.29)	3.76 (2.48–5.69)	1.28 (0.64–2.55)	2.18 (1.22–3.88)		
	45–54yrs	1.25 (0.84–1.86)	2.11 (1.58–2.82)	1.38 (0.78–2.42)	1.63 (1.07–2.48)		
	55–64yrs	1.13 (0.77–1.64)	1.61 (1.24–2.08)	1.07 (0.66–1.75)	1.05 (0.74–1.49)		
	65+yrs	1.00	1.00	1.00	1.00		
Annual Household Income	<\$15,000	2.78 (1.69–4.58)	1.57 (1.05–2.37)	1.48 (0.80–2.71)	1.34 (0.82–2.21)		
	\$15–\$24,999	3.42 (1.84–6.35)	1.50 (0.95–2.36)	2.32 (1.19–4.52)	1.46 (0.89–2.39)		
	\$25–\$34,999	1.66 (0.87–3.16)	1.36 (0.79–2.32)	1.30 (0.65–2.60)	1.46 (0.83–2.60)		
	\$35–\$49,999	1.63 (0.93–2.86)	1.07 (0.67–1.71)	1.53 (0.85–2.75)	1.13 (0.70–1.84)		
	\$50–\$74,999	1.43 (0.81–2.55)	1.20 (0.73–1.97)	1.37 (0.76–2.48)	1.25 (0.75–2.09)		
	\$75,000+	1.00	1.00	1.00	1.00		
# Child in home	0 Child	1.00	1.00	1.00	1.00		
	1+ Child	1.18 (0.89–1.58)	1.94 (1.53–2.44)	0.90 (0.58–1.39)	1.23 (0.86–1.75)		
County Obesity	High	1.94 (1.47–2.57)	1.31 (1.08–1.60)	1.14 (0.73–1.77)	0.83 (0.60–1.15)		
	Low	1.00	1.00	1.00	1.00		
Education	<High school	1.79 (1.08–2.97)	1.11 (0.80–1.54)	1.31 (0.64–2.71)	0.91 (0.54–1.52)		
	High school or GED	1.11 (0.79–1.56)	1.07 (0.83–1.38)	0.93 (0.57–1.53)	0.72 (0.48–1.06)		

Variables	Categories	Crude OR (95% CI)			Adjusted* OR (95% CI)		
		New Laws [†]	Local Funding [‡]	New Laws [†]	New Laws [†]	Local Funding [‡]	Local Funding [‡]
	Some College/Tech	1.04 (0.73–1.49)	0.89 (0.68–1.16)	0.92 (0.58–1.46)	0.77 (0.52–1.13)	1.00	1.00
	College+	1.00	1.00	1.00	1.00	1.00	1.00
BMI (kg/m ²)	Underweight (18.5)	1.47 (0.44–4.95)	0.86 (0.45–1.65)	0.73 (0.20–2.67)	1.97 (0.57–6.73)	1.00	1.00
	Normal (18.5–24.9)	1.00	1.00	1.00	1.00	1.00	1.00
	Overweight (25–24.9)	0.89 (0.63–1.24)	0.88 (0.68–1.12)	0.79 (0.50–1.24)	0.85 (0.60–1.21)	1.00	1.00
	Obese (30)	1.39 (0.99–1.96)	1.33 (1.04–1.71)	1.24 (0.79–1.96)	1.30 (0.91–1.84)	1.00	1.00

* Adjusted for all other variables;

[†] Would you favor or oppose a new law: Requiring...(some of 10 questions);

[‡] Do you think local government funds should be spent to build...(some of 4 questions); data were collected cross-sectionally