Title

School Wellness Committees Are Associated With Lower Body Mass Index Z-Scores and Improved Dietary Intakes in US Children: The Healthy Communities Study

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Authors

Au, Lauren E
Crawford, Patricia B
Woodward-Lopez, Gail
et al.

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School wellness committees are associated with lower body mass index z-scores and improved dietary intakes in US children

Lauren E. Au, PhD, RD [Assistant Researcher],
Nutrition Policy Institute, Division of Agriculture and Natural Resources, University of California, 2115 Milvia Street, Suite 301, Berkeley, CA, 94704; (P) 510-642-1584; (F) 510-643-8197;leau@ucanr.edu

Patricia B. Crawford, DrPH, RD [Adjunct Professor, Sr. Research Director, Nutrition Specialist],
School of Public Health, University of California, Berkeley, Nutrition Policy Institute, Division of Agriculture and Natural Resources, University of California, 2115 Milvia Street, Suite 301, Berkeley, CA, 94704; (P) 510 642-3589; (F) 510-643-8197; crawford@berkeley.edu

Gail M. Woodward-Lopez, MPH, RD [Associate Director of Research],
Nutrition Policy Institute, Division of Agriculture and Natural Resources, University of California, 2115 Milvia Street, Suite 301, Berkeley, CA, 94704; (P) 510-888-9762; (F) 510-643-8197; gwlopez@ucanr.edu

Klara Gurzo, MA [Data Analyst],
Nutrition Policy Institute, Division of Agriculture and Natural Resources, University of California, 2115 Milvia Street, Suite 301, Berkeley, CA, 94704; (P) 510-643-6945; (F) 510-643-8197; kgurzo@ucanr.edu

Janice Kao, MPH [Academic Coordinator],
Nutrition Policy Institute, Division of Agriculture and Natural Resources, University of California, 2115 Milvia Street, Suite 301, Berkeley, CA, 94704; (P) 510.642.0278; (F) 510-643-8197; jankao@ucanr.edu

Karen L. Webb, PhD, MPH [Researcher], and
Nutrition Policy Institute, Division of Agriculture and Natural Resources, University of California, 2115 Milvia Street, Suite 301, Berkeley, CA, 94704, (P) 510 642-3589; (F) 510-643-8197; lkwebb@ucanr.edu

Lorrene D. Ritchie, PhD, RD [Director]
Nutrition Policy Institute, Division of Agriculture and Natural Resources, University of California, 2115 Milvia Street, Suite 301, Berkeley, CA, 94704, (P) 510 642-3589; (F) 510-643-8197; LRitchie@ucanr.edu

Abstract

Correspondence to: Lauren E. Au.

BACKGROUND: Our objective was to examine the association between school wellness committees and implementation of nutrition wellness policies and children's weight status and obesity-related dietary outcomes.

METHODS: A cross-sectional study was conducted of 4790 children ages 4-15 years recruited from 130 communities in the Healthy Communities Study. Multi-level statistical models assessed associations between school wellness policies and anthropometric (body mass index z-score) and nutrition measures, adjusting for child and community-level covariates.

RESULTS: Children had lower BMI z-scores (−0.11, 95%CI:−0.19,−0.03) and ate breakfast more frequently (0.14 days/week, 95%CI:0.02-0.25) if attending a school with a wellness committee that met once or more in the past year compared to attending a school with a wellness committee that did not meet/did not exist. Children had lower added sugar ($p < .0001$), lower energy-dense foods ($p = .0004$), lower sugar intake from SSBs ($p = .0002$), and lower dairy consumption ($p = .001$) if attending a school with similar or stronger implementation of the nutrition components of the school wellness policies compared to other schools in the district.

CONCLUSIONS: A more active wellness committee was associated with lower BMI z-scores in US schoolchildren. Active school engagement in wellness policy implementation appears to play a positive role in efforts to reduce childhood obesity.

Keywords

wellness policies; body mass index; children's diet; health outcomes; school health

Schools have the opportunity to make valuable contributions to both the prevention and the treatment of childhood obesity.[1,2] Children spend more time in school than any other environment except their home,[2] school policies are more permanent than public health programs,[3] and no other single institution outside the home has as much influence on children during their first 2 decades of life. Therefore, schools have an immense opportunity to promote children's health by creating an environment in which children eat nutritious foods and learn lifelong skills supporting healthy eating and active living.[1,5] Whereas schools alone cannot solve the childhood obesity epidemic, it is unlikely that childhood obesity rates can be reversed without involvement of strong school nutrition environments that support healthy eating.

In 2004, Congress passed the Child Nutrition and WIC Reauthorization Act, which required schools that participate in the National School Lunch and School Breakfast programs to establish school wellness policies.[6] Since passage of this legislation, school districts across the country have implemented policies including goals for nutrition education and physical activity, nutrition guidelines for all foods on school campuses during the school day; reimbursable school meal guidelines, and plans for measuring implementation of the policies.[7] In 2010, the Healthy Hunger Free Kids Act strengthened requirements for school wellness policies and put more emphasis on policy implementation.[8] School district wellness committee responsibilities were expanded to include greater oversight of policy implementation.[8] In addition, these committees provided a way to inform teachers, staff, students, and families about the work the school is doing to improve student health and academic success.[9]

Even though almost all states and districts have a wellness policy and a wellness committee at the school or district level, Chriqui et al[10] documented, in a study of over 3500 elementary schools, that there was substantial variability in the strength of those policies and in policy enforcement, meaning that any effect of wellness policies in schools must take into account the actual implementation of the policy. In a study by Gaines et al of Alabama schools, districts meeting federal requirements varied from 72% in specifying a responsible party for evaluation to 90% in stating physical activity goals.[11] Similarly, variations in compliance were seen with the highest compliance for physical activity (94%) and other school-based wellness activities (95%), and the lowest compliance with requirements regarding measurement of implementation (85%) in a national study by Moag-Stahlberg et al.[12] Because wellness committees are tasked with evaluating policy implementation, it is important to understand whether having an active school wellness committee is associated with improved obesity-related outcomes among students. To our knowledge, this is the first study to examine the association between school wellness committee activity, implementation of nutrition-related wellness policies, and weight and dietary outcomes in a diverse sample of elementary and middle schools nationwide.

METHODS

Design

In this cross-sectional study, data on the nutrition environment of schools, student dietary intakes and habits, and student anthropometrics were collected from 2013 through 2015. Parents provided written informed consent for their children's participation. A full description of the research protocol for the Healthy Communities Study is described in John et al.[13]

Participants

The Healthy Communities Study included a total of 5138 students ages 4-15 years from 423 elementary and middle schools in 130 communities across the US communities (defined as high school catchment areas). A complex sampling design was used to stratify by region of the US and community urbanicity, race/ethnicity, and income, as well as purposeful selections of communities known to be actively engaged in implementing programs and policies to address childhood obesity.[14] In each community up to 2 elementary and 2 middle schools were randomly selected for recruiting households. From each selected school, between 1 and 44 students were sampled with an average of 12 students per school. Child participants were selected from participating households who met the study's recruitment goals related to sex, age, and race/ethnicity.[13]

Instrumentation

Independent variables: school wellness committee and wellness policy implementation.—A survey completed online by a designated school staff member provided information about student enrollment and attendance, nutrition education, school wellness committee, implementation of wellness policies, and coordinator (existence and function) as described previously.[15] Survey questions were adapted from the School Nutrition Dietary Assessment (SNDA) III[16] and the School Health Policies and Practices

Study (SHHPS).[17] Questions on school wellness committees included: "How often did your school health or wellness council, committee, or team meet during the past 12 months?" (Answer options: Did not meet, 1-2 times, 3-4 times, 5-6 times, >6 times, or no school council); "For how many years has this school health or wellness council, committee, or team been meeting on a regular basis?" "How does this school compare to other schools of the same level [elementary/middle] in the district with regard to implementation of the nutrition components of the wellness policy?" (Answer options: Less fully implemented than most, about the same as most, more fully implemented than most, there are no other schools at our level in the district); and "Currently does someone in your district or school coordinate school health or wellness, for example, a school health coordinator, and if so, at what level do they provide this coordination?" (Answer options: no, yes at both the district and school levels, yes at the district level only, and yes at the school level only). Additionally, 3 questions were asked to identify the extent to which the nutrition-related school wellness policies were implemented at the school: "To what extent were reimbursable school meal goals implemented?" "To what extent were nutrition guidelines for all other foods implemented?" and "To what extent were nutrition guidelines for foods that are not sold, but offered such as classroom parties and social events implemented?" [Answer options: To a limited extent or not at all (<10% implemented), to some extent (10-50% implemented), to a large extent (51-90% implemented), and completely (>90% implemented)].

Dependent variables: anthropometrics.—Trained field staff measured height and weight of each child participant during in-home visits as described previously.[18] The anthropometric measurement protocol was adapted from the procedures used in the National Health and Nutrition Examination Survey (NHANES).[19] Body mass index z-scores (BMI z-scores) were calculated based on CDC age- and sex-specific growth charts.[20] Measurements were excluded in cases where either 2 measurements were more than 0.5 cm apart for height or 0.1 kg apart for weight. Measurements were also excluded when heights were less than 75 cm or greater than 250 cm or when weights were less than 10 kg or greater than 200 kg. A full description of the anthropometric procedures is described in Sroka et al.[18]

Dependent variables: dietary intakes and behavior.—Dietary intakes were estimated for the past 30 days using the NHANES Dietary Screener Questionnaire (DSQ) developed by the National Cancer Institute (NCI).[21] Trained research staff administered the questions during the in-home visit. The respondent was determined by the child's age as previously described.[15] NCI-generated scoring algorithms based on age- and sex-specific 24-hour dietary recall intake data from NHANES were calculated. Estimated quantities of the following food groups were calculated: fruits/vegetables/legumes without fried potatoes (cups/day), dairy (cups/day), total added sugar (tsp/day), sugar from sugar-sweetened beverages (tsp/day), whole grains (oz/day), and dietary fiber (g/day). The frequency of intake (times/day) of energy-dense foods of minimal nutritional value, including cookies, cakes, pies, donuts, sweets, fried potatoes, and chips/crackers, was also computed. The dietary behavior question included frequency of eating breakfast (days/week).[15]

Covariates.—The individual-level covariates included in the models were a varying combination of: age, sex, parental employment status, maximum biological mother employment, maximum biological father education, race/ethnicity, annual household income, and/or maximum parental education depending on the outcome variable of interest (BMI z-score or diet). Community-level covariates were calculated from the 2009-2013 American Community Survey.[14] The community-level covariates included a combination of: US region, urbanicity, proportion of population below the federal poverty level and/or unemployed, and/or whether a minority population tract (30% or more African American or Hispanic).

Data Analysis

To account for missing answers due to non-response, multiple imputation was computed 20 times using chained equations for the outcome variables and covariates, but not the predictor variable. Sociodemographic covariates selected for the models were based on the least absolute shrinkage and selection operator techniques (LASSO), which is a regression method that involves penalizing the absolute size of the regression coefficients.[22] This method was chosen because of the large number of sociodemographic covariates available in the data set and the highly correlated nature of those covariates. Multi-level statistical models were generated to relate school wellness committees and implementation of policies, adjusting for child and community-level covariates, and clustered by school and community levels. An interaction between the years the wellness committee had been in place with the frequency of wellness committee meetings was also examined. Because BMI z-scores are highly correlated year to year and children were not randomized, there was concern that children's BMI z-scores may differ by school wellness committees prior to their formation. Since mother's BMI is known to be correlated with children's early BMI z-scores, an additional analysis was conducted including mother's BMI. Analyses of child's recent BMI z-score in this sample, both adjusted and unadjusted for mother's BMI were compared. The analytical sample size included 4,790 students: 316 students were excluded from analysis because they were from schools where information about school wellness committees was not provided and 32 students were excluded because the schools they attended could not be identified. Data were analyzed using SAS version 9.4 (SAS Institute Inc. Cary, NC, 2013). A p-value of $<.05$ was considered statistically significant.

RESULTS

The sample was evenly distributed by sex (51% girls), close to 45% were Hispanic, 29% were non-Hispanic white, close to 19% were non-Hispanic black, and children were on average 9 years old (Table 1). More than half of the sample came from households with annual incomes of less than $35,000. At the community-level, there was a larger proportion of the sample from the South (41%) and from suburban areas (41%). Most of the children had at least one parent that was working full-time (71%) and at least one parent that had less than a bachelor's degree (69%). Children had an average BMI z-score of 0.69 and about 41% were overweight or obese. On average, children ate less than the recommended fruit and vegetable intake per day (2.5 cups/day) and consumed close to 20 tsp/day of added sugar, of which approximately 7 tsp/day came from sugar-sweetened beverages.

Students attending schools with wellness committees that met at least once in the past year compared to children in schools with wellness committees that did not meet or did not exist, had lower BMI z-scores (−0.1, 95% CI: −0.2, −0.03) and consumed breakfast more frequently (0.1 days/week, 95% CI: 0.02, 0.3) (Table 2). There were no significant relationships found between school wellness committee meetings and intake of fruit and vegetables, fiber, energy-dense foods, whole grains, or dairy.

When the school wellness committee categories were broken into 3 categories (did not meet/no council, met once, or met more than once), there was an overall association with sugar-sweetened beverages ($p < .05$) and total added sugar ($p = .01$), (data not shown). In pair-wise comparisons children attending schools with wellness committees that met more than once in the past year, compared to children attending schools with wellness committees that did not meet, had significantly lower sugar intake from sugar-sweetened beverages (−0.4 tsp/day, 95% CI: −0.8, −0.1) and total added sugar (−0.8 tsp/day, 95% CI: −1.4, −0.2), but this was not seen for school committees that met only once (data not shown).

Children had lower total added sugar ($p < .0001$), lower energy-dense foods ($p = .0004$), lower sugar intake from SSBs ($p = .0002$), and lower dairy consumption ($p = .001$) if attending a school with similar or stronger implementation of the nutrition components of the school wellness policies compared to other schools in the district (Table 3). In pair-wise comparisons, when comparing stronger to less fully implemented schools, children had lower intakes of total added sugar (−3.8 tsp/day, 95% CI: −5.4, −2.2), energy-dense foods (−0.7 times/day, 95% CI: −1.1, −0.3), sugar from SSBs (−1.9 tsp/day, 95% CI: −2.9, −1.0), and dairy (−0.2 cup/day, 95% CI: −0.4, −0.04) (Table 3).

For the questions regarding extent to which various wellness policies were implemented at the school, only a few associations were found. There was an association between the extent to which the wellness policies were implemented and intake of fruit and vegetables ($p = .03$); and a relationship between nutrition guidelines for classroom parties and frequency of breakfast ($p < .05$), (data not shown). There were no associations found between the existence of a wellness coordinator and outcomes of interest. No interaction was found between years the wellness committee had been in place and the frequency of meetings of the wellness committee or the outcomes of interest. Finally, the addition of maternal BMI did not confound the association of children's BMI and school wellness committees.

DISCUSSION

This cross-sectional study of nearly 5000 children from a diverse sample of more than 420 US schools compared the student anthropometric and dietary outcomes with school wellness committee activity and implementation of nutrition-related wellness policies. Wellness committees evaluate and modify school-wide policies and programs to improve the health and well-being of students, yet the way in which they work varies greatly. This study found that schools that had active wellness committees, even those meeting as little as one time per year, had children with significantly lower BMI z-scores than children in schools that did not have wellness committees or committees that did not meet. The significant difference in BMI-z (ß = 0.11), although modest, is important given that this study took place in primarily

low-income and racially diverse communities across the US which tend to have higher child overweight/obesity rates.[23]

The effect size of this difference can be best understood through an example. For a 9-year-old girl in this study, the median BMI was 18.4 kg/m^2, which corresponds to 79.4 percentile based on the US Centers for Disease Control and Prevention growth charts.[20] The average difference in BMI between children in schools with active wellness committees compared to non-active committees was about 0.35 kg/m^2. For girls, shifting the population from BMI 18.4 to 18.1 corresponds to a shift of about 0.1 z-scores or 3 percentiles. These results are promising as similar effect sizes were observed in one of the largest community-based obesity interventions that showed reductions of −0.10 BMI z-score among children in the first year and −0.06 BMI z-score in the second year following the intervention compared to control groups.[24,25] Further, an average difference of BMI z-scores of 0.09 was reported in a meta-analysis of community intervention trials with children.[26] The association found in this study suggests that an active wellness committee at school may positively influence children's health-promoting dietary behaviors and weight status.

To our knowledge this is the first study to examine the association of school wellness committee activities and implementation of wellness policies with obesity-related dietary intakes; however, our findings are consistent with other studies that indicate that wellness policies, most likely instituted and enforced by wellness committees, have improved school offerings of healthy items and/or reduced consumption of high-fat, high-sugar foods, sugar sweetened beverages, and high-fat milks.[10,27–33] These changes may play a role in reducing obesity. While there was no effect modification seen with the number of years a wellness committee had been in place, there was an association between having a more active committee and weight status, indicating that committees meeting more frequently may have more influence on the overall healthfulness of a school environment.

Whereas there were multiple associations found between obesity-related diet outcomes and the implementation of the nutrition wellness policies compared to other schools, there were very few significant associations found when the questions were asked about the school's specific wellness policies. The discrepancy between these findings may be due to the different wording of the questions. The questions asking about extent to which the nutrition-related school wellness policies were implemented at the school did not assess the strength of the policy. For example, a school with a strict policy may not be implementing it very well, but still could be doing more than a school with a very lax policy that is fully implemented. Future studies should design questions to assess both the implementation and strength of school policies and programs.

Unlike most other studies assessing the school environment, strengths of our study included measured height and weight.[16,17] Further, many of the previous studies examining wellness policies looked at environmental dietary changes at the school-level,[10,34] while this study measured individual dietary outcomes. Our study also had some limitations. Because of the observational design, causality cannot be inferred and our analysis does not allow examination of changes to wellness policies over time. Although children were interviewed, all nutrition measures were based on self-report which is subject to recall error and reporting

bias. However, weight and height were measured by trained field staff using quality control procedures,[18] and provide a more objective, longer-term outcome measure. While this study included a diverse sample of US elementary and middle schools, results may not be generalizable to other schools or children. Finally, even though children spend a significant portion of their days and consume close to half of their calories at school,[35] school-level policies may not impact intakes at home unless parent components are included, which could not be assessed in this analysis.

Future research is needed to identify the critical differences in the environments with more active school wellness committees. There is increasing evidence showing that school-based policies regarding foods and beverages are related to improved dietary intake and weight status, though most studies, including this one, were cross-sectional.[36–38] This study points to the need for more research understanding the effects of wellness policies on children's health.

IMPLICATIONS FOR SCHOOL HEALTH

Our data, from over 420 schools, demonstrate the positive relationship between school wellness committee activity and student nutrition and body mass index. This paper suggests that guidance provided by wellness committee policies and practices can have lasting effects on children's health throughout their school careers. While we did not study ways to encourage school wellness committees, we feel that it would be appropriate for schools to consider ways to encourage them. Some ways for schools to encourage school wellness policies might include the following:

- Publicize the importance of school wellness committees via materials distributed to the school community, including both staff and parents.
- Establish guidelines for regular wellness committee meetings at the school site, to be held at least annually and, preferably, with greater frequency.
- Possibly encourage the PTA, PTO, or a school champion in health issues to take leadership on developing or re-invigorating a school wellness committee.
- Communicate wellness committee activities/recommendations to students, staff, and parent organizations.

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Human Subjects Approval Statement

The study was approved by the US Office of Management and Budget and the Battelle Memorial Institute Institutional Review Board (#0588-FG006608) and was overseen by an NIH-appointed Observational Study Monitoring Board.

Table 1.

Characteristics of Children and Communities in the Healthy Communities Study in Schools that Answered Question about the School Wellness Committee (N = 4790)

Student level characteristics	**Mean (SD)**
Body mass index (BMI) (N = 4594)[1]	20.06 (5.39)
Body mass index z-score (BMIz) (N = 4594)[1]	0.69 (1.20)
Child age (N = 4790), years	9.29 (2.66)
	N (%)[7]
Overweight/obese (N = 4594)[1,2]	1,880 (40.92%)
Girl (N = 4790)	2,434 (50.81%)
Child race/ethnicity (N = 4636)[3]	
Hispanic or Latino Non-Hispanic White Non-Hispanic Black Non-Hispanic multi-racial Non-Hispanic Other	2,099 (45.28%) 1,332 (28.73%) 861 (18.57%) 176 (3.80%) 145 (3.13%)
Family Income (N = 4390)	
Less than $20,000 $20,000 – 35,000 $35,000 – 50,000 $50,000 – 75,000 $75,000 – 100,000 Greater than $100,000	1,193 (27.18%) 1,045 (23.80%) 568 (12.94%) 481 (10.96%) 351 (8.00%) 752 (17.13%)
Maximum parental education from both biological mother/father (N=4,630)[4]	
Less than high school High school diploma or equivalent Some college or associate degree Bachelor degree Graduate degree	1,079 (23.30%) 942 (20.35%) 1,161 (25.07%) 692 (14.95%) 756 (16.33%)
Maximum employment status of biological mother/father (N=4,471)[5]	
Working full-time for pay now Working part-time for pay now Unemployed Other	3,188 (71.30%) 475 (10.62%) 258 (5.77%) 550 (12.30%)
Dietary outcomes	**Mean (SD) or N (%)**
Fruit/Vegetable/Legume Intake, (cup/day) (N = 4694)	2.49 (0.93)
Fiber Intake (g/day) (N = 4640)	15.47 (3.91)
Total Added Sugar Intake (tsp/day) (N = 4705)	19.04 (7.73)
Energy-dense foods of minimal nutritional value (times/day) (N = 4753)	1.95 (1.85)
Whole grains (oz/day) (N = 4729)	0.71 (0.44)
Dairy (cup/d) (N = 4730)	2.50 (0.76)
Sugar from sugar-sweetened beverages (tsp/d) (N = 4733)	7.04 (4.81)
Breakfast (days/week) (N = 4744)[6]	6.14 (1.76)
Community level characteristics	**N (%)**
US region (N = 4790)	
Midwest	935 (19.52%)

Student level characteristics	**Mean (SD)**
Northeast South West	770 (16.08%) 1,974 (41.21%) 1,111 (23.19%)
Minority classification (N = 4790)	
Black Hispanic Other	1,010 (21.09%) 1,930 (40.29%) 1,850 (38.62%)
Urbanicity (N = 4790)	
Rural Suburban Urban	1,070 (22.34%) 1,952 (40.75%) 1,768 (36.91%)
	Mean (SD)
Percent of population aged 5 to 14 that is Black in community catchment area[8] (N = 4790)	20.05% (23.56%)
Percent of population aged 5 to 14 that is Hispanic in community catchment area[8] (N = 4790)	35.05% (30.04%)
Unemployment rate for population in labor force 16 years and over in community catchment area (N = 4790)	8.76% (3.39%)
Percent of population with poverty status in community catchment area (N = 4790)	20.79% (10.52%)

[1] Mean BMI is calculated by excluding observations with measurement issues.

[2] Overweight/obese includes 85th percentile or greater.

[3] Child race and origin: Other includes American Indian/Alaska Native, Native Hawaiian/Pacific Islander, Asian.

[4] Maximum for biological parents; graduate includes masters, professional, doctorate degree.

[5] Maximum for biological parent employment: unemployed includes only temporarily laid off, on sick leave or maternity leave, looking for work, unemployed; other includes disabled, keeping house, retired, student, other.

[6] Reported frequency in last week.

[7] Percents may not add up to 100% because of rounding.

[8] Community catchment area represents the approximate catchment area of the high school.

Table 2.

Association of Children's Weight Status, Dietary Outcomes, and School Wellness Committees in the Healthy Communities Study[1]

	Coefficient	Standard Error	95% Confidence Interval		p-value
BMIz (N=4,790)[2]					
Did not meet or no council (N=2,358)	Ref	-	-	-	-
Met once or more (N=2,432)	−0.11	0.04	−0.19	−0.03	.005
Fruit/Vegetable/Legume Intake, (cup/day)[2]					
Did not meet or no council	Ref	-	-	-	-
Met once or more	0.04	0.03	−0.02	0.1	.21
Fiber Intake (g/day)[2]					
Did not meet or no council	Ref	-	-	-	-
Met once or more	0.09	0.13	−0.17	0.35	.48
Total Added Sugar Intake (tsp/day)[2]					
Did not meet or no council	Ref	-	-	-	-
Met once or more	−0.37	0.27	−0.89	0.15	.17
Energy-dense foods of minimal nutritional value (times/day)[2]					
Did not meet or no council	Ref	-	-	-	-
Met once or more	−0.005	0.06	−0.13	0.12	.94
Whole grains (oz/day)[2]					
Did not meet or no council	Ref	-	-	-	-
Met once or more	−0.003	0.01	−0.03	0.03	.85
Dairy (cup/d)[2]					
Did not meet or no council	Ref	-	-	-	-
Met once or more	−0.03	0.03	−0.08	0.02	.27
Sugar from sugar-sweetened beverages (tsp/d)[2]					
Did not meet or no council	Ref	-	-	-	-
Met once or more	−0.29	0.16	−0.6	0.02	.06
Breakfast (days/week)[2]					
Did not meet or no council	Ref	-	-	-	-
Met once or more	0.14	0.06	0.02	0.25	.02

[1]Multilevel model adjusted for age (as polynomial with degrees as follows: 0 for regularly consumed lower fat milk; 1 for fruit and vegetables; 2 for dairy, whole grains, fiber, ate breakfast; 3 for sugar from sugar-sweetened beverages; 4 for total added sugar, energy-dense foods of minimal nutritional value) (diet only), sex (diet only), maximum father education (BMI only), maximum maternal employment (BMI only) maximum parental education (diet only), maximum parental employment (diet only), race/ethnicity, annual household income.

[2]Sample size is N=4,790: did not meet or no council (N=2,358), met once or more (N=2,432).

The community-level covariates included: US region, minority, urbanicity (diet only), proportion of population below the federal poverty level and/or unemployed (diet only), and whether a minority population tract (30% or more African American or Hispanic) (diet only). Standard errors are clustered at community and school level

Table 3.

Association of Children's Weight Status, Dietary Outcomes, and Implementation of Nutrition Components of School Wellness Policies in the Healthy Communities Study[1]

	Coefficient	Standard Error	95% Confidence Interval		p-value for comparison to reference category	Global p-value for categorical predictor
BMIz (N=4,578)[2]						
Less fully implemented (N=135)	Ref	-	-	-	-	.71
About the same (N=3,977)	−0.09	0.11	−0.31	0.13	.42	
More fully implemented (N=466)	−0.09	0.13	−0.33	0.16	.49	
Fruit/Vegetable/Legume Intake, (cup/day)[2]						
Less fully implemented	Ref	-	-	-	-	.75
About the same	0.05	0.09	−0.13	0.23	.57	
More fully implemented	0.03	0.1	−0.17	0.23	.8	
Fiber Intake (g/day)[2]						
Less fully implemented	Ref	-	-	-	-	.84
About the same	−0.17	0.37	−0.9	0.55	.64	
More fully implemented	−0.24	0.42	−1.06	0.58	.57	
Total Added Sugar Intake (tsp/day)[2]						
Less fully implemented	Ref	-	-	-	-	.00001
About the same	−3.28	0.74	−4.72	−1.84	<.0001	
More fully implemented	−3.77	0.82	−5.38	−2.16	<.0001	
Energy-dense foods of minimal nutritional value (times/day)[2]						
Less fully implemented	Ref	-	-	-	-	.0004
About the same	−0.69	0.18	−1.04	−0.35	<.0001	
More fully implemented	−0.67	0.2	−1.05	−0.28	.0007	
Whole grains (oz/day)[2]						
Less fully implemented	Ref	-	-	-	-	.7
About the same	−0.01	0.04	−0.09	0.07	.74	
More fully implemented	0.004	0.05	−0.08	0.09	.93	
Dairy (cup/d)[2]						
Less fully implemented	Ref	-	-	-	-	.001
About the same	−0.25	0.07	−0.38	−0.11	.0004	
More fully implemented	−0.19	0.08	−0.35	−0.04	.01	
Sugar from sugar-sweetened beverages (tsp/d)[2]						
Less fully implemented	Ref	-	-	-	-	.0002
About the same	−1.67	0.43	−2.51	−0.82	.0001	

More fully implemented	−1.92	0.48	−2.87	−0.97	<.0001	
Breakfast (days/week)[2]						
Less fully implemented	Ref	-	-	-	-	.12
About the same	0.32	0.17	−0.002	0.65	.05	
More fully implemented	0.37	0.19	0.009	0.74	.04	

[1]Multilevel model adjusted for age (as polynomial with degrees as follows: 0 for regularly consumed lower fat milk; 1 for fruit and vegetables; 2 for dairy, whole grains, fiber, ate breakfast; 3 for sugar from sugar-sweetened beverages; 4 for total added sugar, energy-dense foods of minimal nutritional value) (diet only), sex (diet only), maximum father education (BMI only), maximum maternal employment (BMI only) parental employment status (diet only), maximum parental education (diet only), race/ethnicity, annual household income.

[2]Sample size is N=4,578: less fully implemented (N=135), about the same (N=3,977), and more fully implemented (N=466).

The community-level covariates included: US region, minority, urbanicity (diet only), proportion of population below the federal poverty level and/or unemployed (diet only), and whether a minority population tract (30% or more African American or Hispanic) (diet only). Standard errors are clustered at community and school level.