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Post Healthy Hunger-Free Kids Act adherence to select school nutrition standards, by region and poverty level: The Healthy Communities Study

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Abstract

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Author contributions: LA developed study question. LA, KG, and LN conducted data analysis. LA wrote first draft with contributions from LN, WG, and MT. GWL led the instrument and protocol development, data collection, and quality assurance with contributions from JK. All authors reviewed and commented on subsequent drafts of the manuscript.

Objective: The study determined the extent to which schools adhered to select nutrition and wellness provisions of the 2010 Healthy, Hunger-Free Kids Act (HHFKA) and examined differences by U.S. region and school poverty level.

Design: Comparison of cross-sectional observational data from the Healthy Communities Study (2013-2015) by region and school poverty level.

Participants: 401 U.S. elementary and middle schools.

Main outcome measures: Adherence with federal nutrition standards for meals and competitive foods; extent of implementation of select aspects of school wellness policies.

Analysis: Descriptive statistics and multivariate regression were used. Differences were examined by school poverty level and region, adjusting for other school and community-level covariates.

Results: Most schools reported meeting reimbursable school meal nutrition standards (74%), with more schools in the West meeting standards (82%) than the Midwest (64%). Most grains offered at lunch were whole grain-rich (82%), and the majority of competitive foods complied with standards (78%) before they were required. Most schools had a wellness coordinator (80%). Lowest levels of adherence were reported for guidelines for classroom/school events foods. No differences were observed by school poverty level.

Conclusions and Implications: Findings suggest that HHFKA provisions were feasible across a wide variety of schools and schools successfully implemented reimbursable school meal nutrition standards, regardless of school poverty level.

Keywords

school nutrition; whole grains; competitive foods; Healthy Hunger-Free Kids Act

INTRODUCTION

Schools have a critical opportunity to promote children's long-term health by creating an environment in which students can eat nutritious foods and develop lifelong habits for healthy eating.^{1,2} Children spend a significant portion of their days and consume close to half of their calories at school,³ and no other institution has as much continuous contact with children. With close to 30 million children participating in the National School Lunch Program (NSLP) each school day in 2018,⁴ improving school nutrition environments has the potential for considerable population-wide impact on the diets and health of U.S. children.^{5,6}

The Healthy, Hunger-Free Kids Act of 2010 (HHFKA) introduced substantial changes to the school nutrition environment, and implementation of new provisions was phased in over several years. Beginning in school year (SY) 2012-2013, schools were required to meet updated nutrition standards for reimbursable school meals, including increased availability of whole grain-rich items (i.e., at least half of the grains offered during the week must be whole grain-rich), fruit, and vegetables, and limits on total calories and sodium.⁷ The following year, SY 2013-2014, schools were required to make free, drinking water available to students during meals where meals are served.⁸ By the start of SY 2014-2015, all foods

sold to students on campus during the school day outside of the reimbursable school meals programs, otherwise known as competitive foods (i.e., foods sold à la carte or in school stores or vending machines), had to meet new nutrition standards, also known as Smart Snacks in Schools, to ensure healthier snack and entree options.^{8,9} In SY 2017-2018, several school wellness policy requirements were strengthened, including the establishment of a wellness committee and a wellness coordinator and identification of standards for classroom/event foods.¹⁰ The School Nutrition and Meal Cost Study, a nationally representative study of more than 1,200 schools in 2015, showed that the updated school meal nutrition standards have had a positive and significant influence on the nutritional quality of school meals.¹¹ Other evaluations of children's diets after implementation of the HHSFKA have shown that the changes in requirements were associated with improved nutritional quality of foods selected by students, greater consumption of fruit and vegetables at lunch, and higher overall student diet quality.¹¹⁻¹⁵ For example, in a study of 160 students in 12 middle and high schools from Massachusetts, students consumed 22 fewer grams of total sugar per day after HHSFKA implementation.¹⁶ Competitive food and beverage standards have also been associated with healthier foods being available in schools and improved dietary intakes in children.¹⁷⁻¹⁹

While the HHSFKA introduced important regulations to improve school nutrition environments, research is limited on how schools nationally are implementing these changes after implementation of provisions began in 2012-2013, and whether regional and socioeconomic differences in adherence exist. This is crucial because there are disparities in obesity such that children from low-income families have a higher prevalence.²⁰ Given the role of schools in influencing children's dietary behavior, differences in school nutrition environments could maintain, exacerbate, or help to ameliorate existing disparities in childhood obesity. Additionally, understanding the landscape of school nutrition environments throughout the U.S. can help prioritize which sub-groups or practices need the most focus.

One study conducted prior to the HHSFKA found that public elementary schools in the Pacific West and West South-Central Census divisions had healthier overall school food environments, based on assessment of their competitive food policies, school meals, and other food-related practices.²¹ Another study, conducted in 2014-2015 after the HHSFKA, examined school district wellness policies and found that policies for competitive foods and marketing of foods in schools were significantly less comprehensive and weaker in the Northeast compared to the West, but these findings were limited to only the presence of written policies and did not assess adherence at the school level.²²

The objectives of this study were (1) to determine the extent to which schools adhered to select nutrition and wellness provisions of the HHSFKA and (2) to examine differences by schools with varying levels of students eligible for free or reduced-price meals (i.e., school poverty level) and by region of the U.S. It was hypothesized that the majority of schools would adhere to provisions addressed by the HHSFKA, such as reimbursable school meal standards and competitive foods. It was also hypothesized that adherence to HHSFKA provisions would vary by school poverty level and region.

METHODS

Study Population

Data on the school nutrition environment were collected between 2013-2015 in a cross-sectional sample of 401 public schools in the 130 communities (defined as a high school catchment area) participating in the national Healthy Communities Study (HCS), with the majority of data collection occurring in 2013 and 2014.²³ The parent study's aim was to understand how community programs and policies relate to children's diet, physical activity, and weight outcomes.²⁴ Hispanic/Latino, African American, and low-income communities were oversampled.²⁵ Two elementary and two middle schools were randomly selected within each community. High schools were not included because the focus of the HCS was on obesity prevention for younger children. The Batelle Institutional Review Board approved the study protocol. Consent information was included and obtained in the surveys completed by school personnel.

Measures

School Nutrition Environment.—As described by Ritchie et al,²⁶ three complementary instruments, adapted from School Nutrition Dietary Assessment III²⁷ and the School Health Policies and Practices Study,²⁸ were used to assess the school nutrition environment.

Information was collected by observing school lunch foods and competitive foods offered during one school lunch period using a checklist. Data collectors were trained and certified by experienced researchers prior to data collection.²⁶ Training included topics such as how to identify whole grain-rich products (i.e., foods containing at least 51% whole grains) on packaging and ingredient lists, and to ask a food service staff member for packaging if further clarification was needed. Schools knew that they were going to be observed, but scheduling for the schools was often finalized at the last minute. School menus were generally planned weeks or months in advance and at the district level, so it is unlikely schools would serve a specific menu item because school staff knew they would be observed. Data regarding the school lunch and competitive foods offered during lunch time took approximately half an hour to collect.

Information about school foodservice that could not be observed, including meal program eligibility and student participation, school participation in selected state and federal nutrition programs, and adherence of district food-related school wellness policies, was collected by survey. The survey was completed online by the foodservice director or other designee at the selected school.

Information about student enrollment and attendance and school wellness committee existence, personnel, and function was collected by a survey completed by the school staff person designated by the school principal to serve as the study liaison.

The observations and surveys provided information pertaining to the following HHS/OPD provisions available: reimbursable school meal nutrition standards; nutrition guidelines for competitive foods; wellness committee; wellness coordinator; adherence to guidelines for

classroom/event foods; plain, free drinking water availability where school foods are served; competitive foods compliance; and whole grains (Table 1).

Community and school characteristics.—Socioeconomic characteristics were examined at the community and school levels. Community-level variables included U.S. Census region, urbanicity, and minority population census tract status (30% or more African American or Hispanic), all calculated from the 2009-2013 American Community Survey.²⁵ U.S. Census regions were defined by state as follows: Northeast (CT, MA, ME, NH, NJ, NY, PA, RI, VT); Midwest (IA, IL, IN, KS, MI, MO, MN, ND, NE, OH, SD, WI); South (AR, DE, DC, AL, FL, GA, KY, LA, MD, MS, NC, OK, TN, TX, SC, VA, WV); and West (AK, CO, AZ, CA, HI, ID, MT, NM, NV, OR, UT, WA, WY). Urbanicity classification (rural, urban, or suburban) was determined by the Rural-Urban Commuting Area (RUCA) system, which was developed by the U.S. Departments of Agriculture and Health and Human Services.²⁹

School-level data collected from the surveys included: school type (elementary, middle, K-8), percent of students eligible for free or reduced-price meals (FRPM), average student enrollment, student average daily attendance, School Breakfast Program (SBP) participation, and NSLP participation. School poverty level was determined by the percent of students eligible for FRPM. The categories were defined as low-mid (< 50% FRPM), mid-high (>50% to < 75% FRPM), and high (>75% FRPM), based on the National Center for Education Statistics definitions.³⁰

Statistical Analysis

The analytical sample included 401 schools (unit of analysis): 212 elementary, 143 middle, and 46 combination (kindergarten through grade 8). Thirty-seven schools were excluded from analysis because information on percentage of students eligible for FRPM could not be determined. In combination schools, elementary and middle schools are under a single site but may not have shared food facilities. For combination schools that did not share food facilities, means of school-specific variables were calculated from the respective elementary and middle schools to create 1 set of values for each site.

Descriptive statistics (frequencies, % or means, SD) were used to characterize the sample and describe differences by school poverty level and region. This study included data collected from two levels: the school and community level, with schools nested within communities. Therefore, the statistical models applied depended on the level of the predictor variables. For analyses comparing regions of the U.S., multivariate regression models were generated to relate region with adherence to HHFKA provisions, adjusting for school and other community-level covariates. Standard errors in these analyses were not clustered because region was measured at the community level; therefore, these variables are not nested within a higher level. Since school poverty was measured at the school level and schools were nested within communities, adjustment was made for clustering at the community level in the models assessing school poverty. Depending on the predictor variable, covariates included in these models were a varying combination of school-level covariates (FRPM eligibility as a continuous variable or school poverty as a categorical

variable, enrollment, attendance, breakfast participation, and lunch participation), and community-level covariates (urbanicity, U.S. region, and minority classification). Regression equations are as follows, with separate models fit for multiple different HHFKA-related outcomes: where i = community, j = school, and k = outcome of interest.

School poverty:

$$Y_{ijk} = \beta_0 + \beta_1(\text{school poverty})_{ij} + \beta_2(\text{enrollment})_{ij} + \beta_3(\text{attendance})_{ij} + \beta_4(\text{breakfast participation})_{ij} + \beta_5(\text{lunch participation})_{ij} + \beta_6(\text{urbanicity})_i + \beta_7(\text{region})_i + \beta_8(\text{minority classification})_i + \delta_i(\text{clustering at community level}) + \epsilon_{ij}$$

Region:

$$Y_{ijk} = \beta_0 + \beta_1(\text{region})_i + \beta_2(\text{FRPM})_{ij} + \beta_3(\text{enrollment})_{ij} + \beta_4(\text{attendance})_{ij} + \beta_5(\text{urbanicity})_i + \beta_6(\text{minority classification})_i + \epsilon_{ij}$$

This study assumes that δ_i follows a normal distribution with mean zero and variance σ_δ^2 , and ϵ_{ij} follows a normal distribution with mean zero and variance σ^2 .

Overall group $P < .05$ was considered statistically significant. A Bonferroni approach was used to compare within-group differences by school poverty level and region. At a 5% procedure-wise error rate, statistical significance for each individual test was defined as $P < .02$ ($P = .05/3$) for school poverty or $P < .01$ ($P = .05/6$) for region. Data were analyzed using SAS (version 9.4, SAS Institute, Inc, Cary, NC, 2013).

RESULTS

In this sample of 401 schools, the mean student enrollment was 624 students with an average daily attendance of 94% (Table 2). Most students were eligible for FRPM (72%), and schools had an average daily NSLP participation rate of 66% of total students. About three-quarters of schools were located in suburban (40%) or urban (37%) communities, and about one-quarter were located in rural areas (23%). School and community characteristics differed by school poverty level, with student enrollment and average attendance decreasing with higher poverty level ($P=0.04$, $P=0.04$, respectively), and percent of students approved for FRPM meals, SBP participation, and NSLP participation increasing with higher poverty level (all $P<0.001$, respectively). Urbanicity ($P<0.001$) and minority classification ($P<0.001$) of the community also differed by school poverty level. Regional differences existed among school-level characteristics, with highest student enrollment in the West ($P=0.009$) and highest average daily attendance in the West ($P=0.02$). Regional differences were also seen for community-level characteristics, including urbanicity ($P<0.001$) and minority classification ($P<0.001$).

With regard to assessment of adherence to the HHFKA, most schools reported meeting reimbursable school meal standards (74%) with significant variation across regions ($P=0.02$) (Table 3). More schools in the West reported meeting the reimbursable meal standards (82%) compared to the Midwest (64%). Fifty-four percent of schools reported full adherence

with nutrition guidelines for competitive foods. Only half (49%) had a wellness committee that met at least once a year, with schools in the South having more frequent wellness committee meetings than schools in the West and Midwest ($P<0.0125$). Most schools (80%) reported having a wellness coordinator and 26% reported full adherence to guidelines for foods in classrooms or events, with schools in the South and Northeast having greater adherence than schools in the West or Midwest ($P<0.0125$). Most schools offered plain, free drinking water where school meals were served (82%). Most schools offered competitive foods (87%), and most (78%) of competitive foods offered adhered to the HHFKA standards. Significantly more schools in the Midwest (84%) served compliant competitive foods compared to schools in the Northeast (68%) ($P=0.03$). Most grains that were part of the school lunch were whole grain-rich (82%), with more whole grain-rich items served in the West compared to the South ($P<0.0125$). No differences in adherence of HHFKA provisions were observed by school poverty level.

DISCUSSION

This observational study of elementary and middle schools in diverse communities examined HHFKA adherence and examined differences in adherence by school poverty level and region. Generally, most schools were adhering to HHFKA standards, such as those for reimbursable meals, competitive foods, and drinking water access. Importantly, no significant differences were observed in adherence to any of the HHFKA standards examined by school poverty level. These results suggest that even schools serving more economically vulnerable students were able to provide an improved nutrition environment as required by federal policy. This is important since research has shown that school nutrition policies can help instill healthy eating habits by shifting food consumption away from foods high in added sugar, refined grains, and sodium.^{16,18,19} These policies can also help students meet water recommendations and shift beverage consumption away from sugary drinks.^{32,33} Supporting all U.S. children to develop healthy eating habits can help to reverse the epidemics of obesity and chronic disease, and schools have been identified as key environments to foster these improvements.¹

Because schools were not required to update certain aspects of local school wellness policies (including establishment of a school wellness committee, a wellness coordinator, and guidelines for foods at classroom parties/events) until SY 2017–2018, it is likely that not all school improvements that schools would make in response to HHFKA were captured in the timeframe of this study (2013–2015). Prior public health research has identified regional differences in dietary intake,^{34,35} as well as risk for cardiovascular disease^{36,37} and generally finds higher risk in the South. Given the evidence that healthier school nutrition environments are associated with healthier dietary intakes^{5,6}, it is encouraging that schools in the South, which includes states with the highest childhood obesity rates,³⁸ were already taking action to provide a healthy school nutrition environment, in anticipation of the regulatory mandate. Given that lower income children tend to have higher obesity, it is also encouraging that schools with a higher percentage of students qualifying for FRPM were not less adherent with HHFKA standards than schools with students from higher income households.²⁰

Even though the 2015–2020 Dietary Guidelines for Americans recommend making half of all grains consumed whole grains, adherence to the provision in HHFKA that would have required all grains served to be whole grain-rich stalled in 2014 to allow school foodservice programs and food manufacturers time to find and produce more whole grain-rich products.³⁹ More recently, USDA finalized a rule mandating that only half of all grains served in school meals need to be whole grain-rich, starting in SY 2019–2020, citing challenges experienced by schools.⁴⁰ This action is not supported by this study's findings that the majority of schools were already successfully adhering to the whole grain-rich provision.

This study had some limitations. Because of the observational, cross-sectional design, the study was unable to conclude whether the HHFKA was responsible for improved characteristics of the nutrition environment. Data for this study were collected in 2013–2015, directly after the earliest HHFKA-related policies were required, namely school meal nutrition standards that went into effect starting SY 2012–2013. Even though most of the study data were collected before the competitive food standards went into effect in SY 2014–2015, the majority of schools were already in compliance with these new standards. Additionally, several measures of adherence to policies regulated by the HHFKA were self-reported by school staff, and thus subject to social desirability bias. However, this would not be expected to affect the examination of differences by school poverty level or region and these findings were also confirmed by direct observations in the lunchroom. For example, observations confirmed that 78% of competitive foods available were compliant and 82% of grains served at lunch met the requirements for whole-grain rich foods. It should be noted, however, that observations of competitive foods and other aspects of school lunch were made on a single day which may not be representative of usual school practices. While this study included a large, diverse sample of U.S. elementary and middle schools, results may not be generalizable to other schools because the sample was not nationally representative. Further, because this study oversampled schools serving larger populations of ethnically diverse and low-income households, a higher number of children qualified for free or reduced-price lunch (72%) compared to the national average, which was 52% in school years 2013–2015.⁴¹

Strengths of this study include the large, diverse sample of elementary and middle schools and inclusion of a variety of measures related to the HHFKA. Another strength includes collecting information about foods and beverages served at school lunch and competitive foods by direct observation by trained researchers compared to previous studies that relied solely on self-report by foodservice personnel or other school staff less familiar with foodservice practices. Future studies should examine the effects of HHFKA in high schools, where competitive foods are most frequently found.

IMPLICATIONS FOR RESEARCH AND PRACTICE

This study's findings suggest that many schools were complying with HHFKA provisions before and/or shortly after they were required to put them into effect. No differences in HHFKA compliance were observed by school poverty level, though significant variations existed by region. While it is encouraging to see that schools across the school poverty spectrum were equally able to implement improvements to school meals, it is critical to

understand the regional differences both for practice and policy. Future improvements to school meal policy should address potential geographic variation in policy adherence and implement any needed region-specific, targeted efforts to support schools in meeting regulations. Future studies at the federal, state, and local level should also assess the resources and skills that are needed to help struggling schools comply with regulations.

Providing healthy school food environments is critical to children's health and development. Most schools reported successfully providing healthy food environments consistent with HHFKA provisions, suggesting adherence to the provisions is feasible across schools with varying school and community characteristics. Federal nutrition policies appear to be an effective mechanism for influencing school food environments.

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Table 1.

Healthy Hunger-Free Kids Act (HHFKA) provisions assessed in the Healthy Communities Study

Variable	Effective date	Instrument	Measurement
HHFKA provision			
1. Reimbursable school meal nutrition standards	July 2012 ^a	Food service manager survey	Original question: "To what extent have each of the following components (reimbursable school meal goals) of the local wellness policy been implemented at this school and for how many years have they been in place?" 1=To a limited extent or not at all (<10% implemented), 2=To some extent (10-50% implemented), 3=To a large extent (51-90% implemented), 4=Completely (>90% implemented) Coded: Yes/no completely implemented reimbursable school meal nutrition standards
2. Nutrition guidelines for competitive foods	July 2014 ^a	Food service manager survey	Original question: "To what extent have each of the following components (nutrition guidelines for all other foods sold such as a la carte, school store, vending, etc.) of the local wellness policy been implemented at this school and for how many years have they been in place?" 1=To a limited extent or not at all (<10% implemented), 2=To some extent (10-50% implemented), 3=To a large extent (51-90% implemented), 4=Completely (>90% implemented) Coded: Yes/no completely implemented nutrition guidelines for competitive foods
3. Wellness committee	June 2017	School liaison survey	Original question: "How often did your school health or wellness council, committee, or team meet during the past 12 months?" Coded: Yes/no wellness committee met once or more in past year
4. Wellness coordinator	June 2017	School liaison survey	Original question: "Currently, does someone in your district or school coordinate school health or wellness, for example, a school health coordinator?" Coded: Yes/no wellness coordinator
5. Guidelines for classroom/event foods	June 2017	Food service manager survey	Original question: "To what extent have each of the following components (nutrition guidelines for foods that are not sold, but offered, such as at classroom parties and social events) of the local wellness policy been implemented at this school and for how many years have they been in place?" 1=To a limited extent or not at all (<10% implemented), 2=To some extent (10-50% implemented), 3=To a large extent (51-90% implemented), 4=Completely (>90% implemented) Coded: Yes/no completely implemented classroom nutrition guidelines
6. Plain, free drinking water	August 2013	Lunchroom observation	Water available free of charge in the dining room or serving areas from water fountain, pitcher, bottles, dispenser or other sources. Coded: Yes/no any water free of charge available
7. Proportion of competitive foods compliant in schools that served competitive foods	July 2014	Lunchroom observation	Of schools that serve competitive foods, the proportion of food items (e.g., burritos, chicken burgers, chicken pieces, hamburgers, hot dogs, meat and potato, meat and rice, nachos, pasta, pizza, quesadilla, sandwiches, crackers, desserts, muffins, pastries, cookies) compliant with competitive food guidelines divided by all types of items offered in competitive food venues as a la carte food venue, vending machine or other.
8. Proportion whole grain-rich	Original rule: Half of all grains, whole grain-rich July 2012 All grains, whole grain-rich July 2014 Revised rule: Half of all grains, whole grain-rich July 2019	Lunchroom observation	The proportion of whole grain-rich products (e.g., bread, pasta or tortillas, brown rice, corn tortillas) among all grain products served as part of the reimbursable meal. Coded: Proportion whole grain-rich, continuous variable

^aEffective date refers to the implementation date of associated federal nutrition standards because components of local wellness policies regarding foods sold in schools (reimbursable school meals and competitive foods) must be consistent with federal nutrition standards.^{7,8,9}

Table 2.

Characteristics of elementary and middle schools participating in the Healthy Communities Study by school poverty level and region (N=401)

	School Poverty Level ^{a, b}				Region					
	All schools (N=401) ^a	Low-Mid (n=81)	Mid-High (n=106)	High (n=214)	P	West (n=90)	South (n=179)	Midwest (n=67)	Northeast (n=65)	P
n (%) or Mean (SD)										
School grade-level type (N=401)										
Elementary	212 (52.9%)	40 (49.4%)	49 (46.2%)	123 (57.5%)	0.14	49 (54.4%)	99 (55.3%)	35 (52.2%)	29 (44.6%)	0.07
Middle	143 (35.7%)	35 (43.2%)	42 (39.6%)	66 (30.8%)		30 (33.3%)	66 (36.9%)	26 (38.8%)	21 (32.3%)	
K-8	46 (11.5%)	6 (7.4%)	15 (14.2%)	25 (11.7%)		11 (12.2%)	14 (7.8%)	6 (9.0%)	15 (23.1%)	
Mean (SD) student enrollment (n=374)	624 (278)	696 (292)	609 (299)	604 (258)	0.04	667 (233)	647 (303)	526 (232)	602 (285)	0.009
Mean (%) average daily attendance (n=362)	93.8 (6.1)	95.5 (2.4)	93.6 (9.9)	93.3 (4.4)	0.04	94.6 (3.8)	94.3 (4.0)	93.5 (3.4)	91.7 (12.4)	0.02
Mean (%) students approved for free or reduced-price meals in the previous school year (N=401)^b										
Free or reduced-price meals	71.8 (24.2)	33.0 (14.1)	64.0 (6.7)	90.3 (7.4)	<0.001	68.7 (24.5)	71.9 (23.2)	75.2 (26.7)	72.3 (23.7)	0.41
Mean (%) students participating in school meals										
School breakfast (n=392)	35.8 (24.2)	14.1 (14.9)	27.1 (14.3)	48.2 (23.3)	<0.001	34.1 (39.9)	42.2 (29.3)	35.2 (24.2)	31.9 (22.7)	0.05
School lunch (n=384)	66.3 (18.0)	47.0 (15.6)	63.1 (12.9)	75.2 (14.4)	<0.001	71.1 (84.3)	69.9 (21.4)	70.4 (38.5)	66.3 (21.0)	0.93
Urbanicity (n=401)										
Rural	93 (23.2%)	23 (28.4%)	24 (22.6%)	46 (21.5%)	<0.001	15 (16.7%)	58 (32.4%)	11 (16.4%)	9 (13.9%)	<0.001
Suburban	160 (39.9%)	25 (30.9%)	61 (57.6%)	74 (34.6%)		25 (27.8%)	73 (40.8%)	30 (44.8%)	32 (49.2%)	
Urban	148 (36.9%)	33 (40.7%)	21 (19.8%)	94 (43.9%)		50 (55.6%)	48 (26.8%)	26 (38.8%)	24 (36.9%)	
Minority Classification (N=401)										
African American	102 (25.4%)	3 (3.7%)	26 (24.5%)	73 (34.1%)	<0.001	4 (4.4%)	61 (34.1%)	25 (37.3%)	12 (18.5%)	<0.001
Hispanic	129 (32.2%)	16 (19.8%)	26 (24.5%)	87 (40.7%)		43 (47.8%)	53 (29.6%)	12 (17.9%)	21 (32.3%)	
Other	170 (42.4%)	62 (76.5%)	54 (50.9%)	54 (25.2%)		43 (47.8%)	65 (36.3%)	30 (44.8%)	32 (49.2%)	

^aN may differ due to nonresponse.

^bSchool poverty level was determined by the percent of students eligible for free or reduced-price meals. The categories were defined as follows: low-mid (50%), mid-high (>50% to 75%), high (>75%).

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Table 3.

Percentage of schools in the Healthy Communities Study meeting Healthy Hunger-Free Kids Act (HHFKA) provisions by school poverty level and region (N=401)

HHFKA provision	School Poverty Level ^a					Region				
	All schools (N=401) ^a	Low-Mid (n=81)	Mid High (n=106)	High (n=214)	P ^b	West (n=90)	South (n=179)	Midwest (n=67)	Northeast (n=65)	P ^c
	n (%)									
1. Reimbursable school meal nutrition standards (% implemented completely) (n=394)	290 (73.6%)	50 (62.5%)	74 (71.2%)	166 (79.1%)	0.60	74 (82.2%) ^x	129 (75.0%) ^{x,y}	43 (64.2%) ^y	44 (67.7%) ^{x,y}	0.02
2. Nutrition guidelines for competitive foods (% implemented completely) (n=389)	208 (53.5%)	43 (53.8%)	57 (54.8%)	108 (52.7%)	0.79	37 (41.1%)	106 (62.4%)	32 (47.8%)	33 (53.2%)	0.08
3. Wellness committee (% meeting once or more/year) (n=368)	179 (48.6%)	38 (53.5%)	47 (49.5%)	94 (46.5%)	0.97	25 (31.3%) ^z	101 (61.2%) ^x	27 (42.9%) ^{y,z}	26 (43.3%) ^{x,y,z}	<0.001
4. Wellness coordinator (% yes) (n=364)	292 (80.2%)	58 (82.9%)	76 (80.9%)	158 (79.0%)	0.92	60 (74.1%)	137 (84.6%)	51 (81.0%)	44 (75.9%)	0.06
5. Guidelines for classroom/ event foods (% implemented completely) (n=386)	100 (25.9%)	21 (26.3%)	24 (23.1%)	55 (27.2%)	0.45	10 (11.1%) ^y	60 (35.7%) ^x	4 (6.0%) ^y	26 (42.6%) ^x	<0.001
6. Plain, free drinking water (% yes)(n=389)	317 (81.5%)	61 (76.3%)	85 (83.3%)	171 (82.6%)	0.24	72 (81.8%)	142 (82.6%)	59 (88.1%)	44 (71.0%)	0.04
	Mean % (SD)									
7. Proportion of competitive foods compliant in schools that served competitive foods (mean %, SD) (n=338)	77.6% (22.9)	77.8% (21.9)	77.2% (22.3)	77.8% (23.6)	0.56	80.0% (22.8) ^{x,y}	77.7% (21.1) ^{x,y}	82.7% (22.9) ^x	68.0% (25.8) ^y	0.03
8. Proportion whole grain-rich (mean %, SD) (n=385)	81.8% (31.7)	79.6% (34.4)	82.2% (32.0)	82.4% (30.6)	0.94	88.5% (27.2) ^y	77.2% (34.5) ^x	87.7% (26.0) ^{x,y}	78.5% (33.1) ^{x,y}	0.03

^aSchool poverty level was determined by the percent of students eligible for free or reduced-price meals. The categories are defined as low-mid (< 50%), mid-high (>50% to 75%), high (>75%).

^bMultivariate regression adjusted for the following covariates: school enrollment, attendance, breakfast participation, lunch participation, urbanicity, region, minority classification. Standard errors were clustered at the community level.

^cMultivariate regression adjusted for the following covariates: school-level (free or reduced-price meals, enrollment, attendance), and community-level (urbanicity, minority classification). Different superscripts (^{X,Y,Z}) indicate statistical differences between groups using a post-hoc Bonferroni-Holm multiple comparison test.

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