Chapter 2

Rural Disparities in the Distribution of Policies that Support Healthy Eating in U.S. Secondary Schools

By Dr. Susie Nanney

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Chapter 2
Summary: Dr. Susie Nanney

Dr. Susie Nanney will present on the role that schools can play in promoting access to healthy food for students, especially in rural communities. Her research has focused on how school breakfast, vending and after-school snacks may be associated with student health outcomes such as dietary intake and weight, as well as academic performance. Specifically, her talk will highlight how rural schools in America lag in promoting healthy eating and offer evidence-informed strategies to address this gap.

Why focus efforts on rural communities?
Students in rural schools are more likely to attend small schools, live in poverty, be food insecure, be eligible for free or reduced lunch, and come to school unprepared to learn. Very little research has been done on how to improve the school food environment in small town and rural school environments even though these environments are lagging behind urban and suburban schools.

What are the promising healthy eating practices for rural schools?
School Breakfast Program (SBP). Breakfast intake is associated with improved behavior, test outcomes and attendance among youths. Teens experiencing hunger are more likely to have been suspended from school and have difficulty getting along with others. SBP eaters weigh less and have healthier eating habits. Dr. Nanney's research with rural Minnesota high schools has shown:

- Increased participation in the SBP among low-income students, girls, and minority students
- Slowed weight gain among high school students eating the SBP
- Better grades among SBP eaters

School Healthy Eating Policies. A study conducted by Dr. Nanney of 28 U.S. states, including Kentucky, representing 6,732 secondary schools identified that schools in small town and rural locations had significantly fewer healthy eating policies and practices. Specifically, rural schools were:

- More likely to allow marketing of junk foods and soda and sports drinks
- Less likely to promote healthy eating (e.g., provide nutrition information to students and parents, price healthy foods lower, taste test)
- Less likely to have fruits and/or vegetables at school celebrations
- Less likely to have fruits and/or vegetables in vending machines
- Less likely to limit package serving sizes

What are some evidence-informed actions?

- Increase participation in the School Breakfast Program to improve youth health and academics
- Promote family and community involvement in school eating (and activity) policy development to increase access to healthy foods in schools
- Encourage farm-to-school programs to improve access to local foods and support local economies

In summary, Dr. Nanney will highlight the evidence-based opportunities to promote healthy eating in rural school settings.

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Rural Disparities in the Distribution of Policies that Support Healthy Eating in US Secondary Schools

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ABSTRACT

The distribution of food and nutrition policies and practices from 28 US states representing 6,732 secondary schools was evaluated using data from the 2008 School Health Profiles principal survey. School policies and practices evaluated were: availability of low-nutrient, energy-dense (LNED) snacks/drinks; use of healthy eating strategies; banning food marketing; availability of fruits and vegetables; and food package sizes. For each school, school-level demographic characteristics (percentage of students enrolled in free/reduced-price meals, minority enrollment, and geographic location) were also evaluated. Schools in small town/rural locations had significantly fewer policies that support healthy eating strategies and ban food marketing, and were less likely to serve fruits and vegetables at school celebrations, have fruits and vegetables available in vending or school stores, and limit serving-size packages. Schools serving the highest percentage of minority students consistently reported the same or better school food environments. However, schools serving the highest percentage of low-income students had varied results: vending and LNED vending policies were consistently better and fruit and vegetable availability–related policies were consistently worse. Disparities in the distribution of policies and practices that promote healthy school food environments seem most pronounced in small town/rural schools. The data also support the need for continued reinforcement and the potential for expansion of these efforts in urban and suburban areas and schools with highest minority enrollment.
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THE CHILD NUTRITION AND WIC REAUTHORIZATION Act of 2004 (CNRA 2004), a major federal legislative milestone to address childhood obesity, included a mandate to school districts participating in the school meal program to establish and implement policies addressing nutrition at school by the start of the 2006-2007 school year. Evaluating the effectiveness of these school nutrition policies is a nationwide priority.[1] Research suggests that school food environments, especially competitive foods, contribute excess energy to children's diets.[2,3] Estimates show that low-nutrient, energy-dense (LNED) competitive foods provide 171 kcal/day to the diets of middle school students and 219 kcal/day to high school students.[4] Although evidence of the impact on student body mass index remains mixed,[5] a few studies suggest inverse associations between youth overweight and school food environments when mandated by states[6] and whether strong district wellness policies[7] and local school policies and practices are in place.[8,9]

Monitoring the distribution of school food policies and practices and evaluating effectiveness through a health disparities lens is important.[10] Minority and low-socioeconomic groups are disproportionately affected by excess weight at all ages.[11] Obesity rates among rural youth are as much as 50% higher compared with their urban counterparts.[12-14] Although recent (2001-2008) evidence suggests a leveling off of obesity prevalence among white students, it also points to a worsening disparity among nonwhite students, especially for severe obesity.[15] Descriptive evaluations considering school obesity prevention policies and disparities have identified differences by geographic region of the country (eg, southern states)[16] and across schools by poverty status and geographic location (eg, schools in rural communities).[17,18] Two evaluation studies report more favorable behavioral outcomes for minority students with stronger state mandates for competitive foods in schools.[19,20] Evidence-based recommendations directed at competitive foods that aim to reverse the obesity trajectory include: (a) establishing nutrition standards for competitive foods available at school,[21] (b) incorporating collaborative strategies to encourage healthy eating at school,[22] and (c) banning advertising and marketing of LNED foods to youth in schools.[21,23] The extent that the adoption of these recommendations is evenly distributed across US schools is not known. The goal of this study was to compare the distribution of food and nutrition–related policies and practices across US middle and junior/senior high schools (6th to 12th grade) by geographic location, minority enrollment, and free/reduced-price school meal enrollment after implementation of the 2004 CNRA in 2006. This inquiry is especially relevant as schools prepare to respond to the Healthy, Hunger-Free Kids Act of 2010, which focuses on competitive foods sold at school with a rolling implementation timeline beginning 2012-2020.[24]

METHODS

Dependent Variables and Source

The dependent variables for this cross-sectional study were school-level food and nutrition–related policy and practice questions collected as part of the 2008 School Health Profiles Principal Survey (Profiles), a surveillance tool sponsored by the Centers for Disease Control and Prevention (CDC), which has good validity and reliability.[25] Profiles include a biennial survey of public school principals of middle and junior/senior high schools collected by state education and health agencies. School response rates for individual states for 2008 ranged from 70% to 93%.[26] Most states give the CDC permission to share their de-identified dataset. For this study, states were individually contacted and asked to share their school *identified* data sets for the purpose of linking the school-level demographic data (geographic location, minority enrollment, free/reduced-priced meal enrollment).

Data Collection

An e-mail letter of invitation was sent to all 50 states' Profiles coordinators from the principal investigator explaining the study purpose and requesting access to their existing 2008 school-level policy data. A signed data use agreement detailing data confidentiality was also included. State Profiles administrators (ie, Department of Education, Department of Health) had varying comfort levels with data-sharing, ranging from accepting the terms of agreement, to requiring additional paperwork, to engaging in an iterative process with the project data manager that accomplished the data linking without divulging school identifying data. Total contacts (ie, emails, phone calls) to state agencies to share and transfer their states' Profiles data ranged from 1 to 35 with an average of 10. Fifty-six percent of states (n=28) contacted agreed to share their datasets. A map of the participating states is available at the project website (http://z.umn.edu/schoolnutrition). Seven states did not respond to multiple requests to participate (14%); eight refused to participate (16%), citing change in leadership, concerns that sharing the identified datasets violated agreements with participating schools, or inability to locate data due to staff turnover and loss of positions. Seven states (14%) sent de-identified data, which could not be used.

State nonresponse bias was assessed using publicly available state-level policy and practice data from the nonparticipating states. The absolute differences between participating and nonparticipating states in the median weighted percentage of schools reporting each nutrition policy item were less than 5% for all but two items. The two items were "allowed students to purchase non-fried vegetables" (20% vs 28%) and "collected suggestions on food preferences" (45% vs 55%). Altogether, these results suggest similar nutrition policy implementation for participating and nonparticipating states.

Scale Development

Food and nutrition–related policy and practice items from the Profiles principal survey were identified and grouped to represent three domains: availability of LNED snacks and drinks, engaging in healthy eating strategies, and marketing of LNED snacks and drinks. Four other policy and practice items were evaluated individually.

Availability of LNED snacks and drinks. Ten items were identified and included whether the following were available for purchase in vending machines or school stores (VMSS): chocolate candy, candy, salty snacks not low in fat, cookies, cakes, crackers not low in fat, ice cream not low in fat, 2% or whole milk, frozen water ices or slushes that do not contain juice, soda pop or fruit drinks that are not 100% juice, sport drinks, and caffeinated foods or beverages. Responses were coded as yes=1, no=0. The summated scale score represented the total number of LNED snacks and drinks available for purchase. Cronbach's α for this scale was .80. Schools without VMSS were excluded from this analysis.

Healthy eating strategies. Five items were identified and included whether the following strategies were used: strategic pricing of healthy snacks and drinks lower in cost and/or LNED snacks and drinks higher in cost, suggestions collected from students and families, calorie information provided to students/families, student taste-testing of new products, and student visits to the cafeteria for learning. Responses were coded as yes=1, no=0. The summated scale score represented the total number of implemented healthy eating strategies. Cronbach's α for this scale was .61.

Marketing of LNED snacks and drinks. Four items were identified and included whether the school prohibits advertisements for candy, fast food, or soft drinks in (1) school building (yes/no), (2) on school grounds (yes/no), (3) on school buses (yes/no), (4) in school publications (yes/no). Responses were coded as yes=1, no=0. The summated scale score represented the total number of banned marketing practices. Cronbach's α for this scale was .89.

Other policy/practice items not included in the scales. Four additional items were examined separately: fruits and/or vegetables available at school celebrations (almost always or always, rarely, or never), any VMSS availability (yes or no), fruits and/or vegetables available for purchase from VMSS (yes or no), and limited package/serving size of items sold in VMSS (yes or no).

Independent Variables and Sources

The independent variables for this study were school-level demographic variables: geographic location (town/rural, urban, suburban), percentage minority enrollment (ie, defined as racial and ethnic minorities), and free/reduced-price school meal enrollment. The source of the independent variables was the National Center for Education Statistics Public Elementary/Secondary School Universe Survey (NCES), which is publicly available and updated annually.[27]

Twelve NCES-defined geographic designations were combined into three locations for easiest interpretation: city (n=1,232 schools, 18.3%), suburban (n=1,467, 21.8%), and town/rural (n=4,033, 59.9%). The number of minority students for each school was calculated by subtracting the number of white non-Hispanic students enrolled from the total student enrollment and then dividing by the total student enrollment to calculate percentage minority enrollment. Similarly, the number of students enrolled in the free/reduced-price meal program was divided by the total student enrollment to calculate percent free/reduced-price meal enrollment.

These variables were categorized using approximate quartile cutpoints rounded to the nearest percentile divisible by five. The lack of significant differences in policy prevalence between the middle two quartiles resulted in the decision to combine these quartiles into one medium level category while preserving categories for the upper and lower approximate quartiles of schools. Minority percent enrollment data was available for 6,696 schools and was categorized as follows: <5% (low) (n=1,180 schools, 17.6%), 5% to <50% (medium) (n=3,802, 56.8%), and 50% or more (high) minority enrollment (n=1,714, 25.6%). Free/reduced-price meal enrollment data was available for 6,421 schools and categorized as follows: <20% (low) (n=1,533 schools, 23.9%), 20% to <60% (medium) (n=3,501, 54.5%), and 60% or more (high) free/reduced-priced meal enrollment (n=1,387, 21.6%). The relationship between minority enrollment percentile and free/reduced-price percentile was examined to confirm that these two variables were not surrogates for each other. The correlation coefficient was 0.55, indicating that the two variables contribute unique school-level demographic information.

Analysis

Cronbach's α was used to assess internal reliability of summated scale variables. Correlation analysis was used to examine the linear relationship between minority enrollment percentile and free/reduced-price meal enrollment percentile. Multiple logistic regression models were used to estimate adjusted odds ratios for individual nutrition policy and practice items by location, minority enrollment category, and free/reduced-price meal enrollment category. Generalized linear models were used to evaluate location, minority enrollment category, and free/reduced-price meal enrollment category differences in adjusted mean scores for the nutrition policy and practice scales. Significant factors in each model were further evaluated to identify levels of school characteristics with significant differences. The Bonferroni method was used to adjust significance levels for these multiple comparisons (α of .017 for means, α of .008 for odds ratios). Model estimates and standard errors were used to construct 95% CIs for the adjusted means for each level of the school characteristic and adjusted odds ratios for school characteristic levels relative to the reference level.

RESULTS AND DISCUSSION

A total of 6,732 schools from 28 states were included in the analysis. A table detailing the distribution of each policy and practice item by each demographic characteristic is available from the project website (http://z.umn.edu/schoolnutrition). Table 1 identifies the mean score (95% CI) for each scale by school location and demographic category adjusted for the other school characteristic variables. For the *Availability of LNED Snacks and Drinks Policy Scale,* a lower score was the better result. The adjusted mean number of LNED snacks or drinks available for purchase from VMSS was significantly less (ie, better) for schools with the highest free/reduced-price meal enrollment than for schools with low or medium enrollment and was also significantly less for schools with medium enrollment than for schools with low enrollment. Studies show that restricting the availability of LNED foods in schools while increasing the availability of healthful foods might be an effective strategy for promoting more healthful choices among students at school.[4,28]

For the *Healthy Eating Strategies Policy Scale*, a higher score was the better result. The adjusted mean number of healthy eating strategies implemented was significantly higher (ie, better) in urban and suburban schools than in town/rural schools. This finding is important because studies show that youth are sensitive to food pricing[29] and respond positively to taste testing healthy foods.[30]

For the *Marketing of LNED Snacks and Drinks Policy Scale*, a higher score was the better result. The adjusted mean number of locations in which advertisement for candy, fast food, or soft drinks was banned was significantly higher (ie, better) in urban and suburban schools than in town/rural schools; and significantly higher in schools with high minority enrollment than in schools with low or medium minority enrollment. An increasing number of studies demonstrate direct causal effects of exposure to food advertising on young people's weight and higher rates of obesity.[31]

Table 2 identifies the individual policy and practice items by school location and demographic category adjusted for the other school characteristic variables. The likelihood of fruits and/or vegetables almost always or always being available at school celebrations was significantly higher at suburban schools than at town/rural schools, significantly lower at schools with low and medium minority enrollment than at schools with highest minority enrollment, and significantly higher at schools with lowest free/reduced-price meal enrollment than at schools with highest free/reduced-price meal enrollment.

The likelihood of having no vending or school store availability of foods was significantly lower in schools with low and medium minority enrollment than in schools with the highest minority enrollment, and was significantly lower at schools with low and medium free/reduced-price meal enrollment than at schools with the highest free/reduced-price meal enrollment.

The likelihood of fruits and/or vegetables being available for purchase from vending machines or school stores was significantly higher in urban and suburban schools than in town/rural schools, was significantly lower at schools with low and medium minority enrollment than at schools with highest minority enrollment, and was significantly higher at schools with low and medium free/reduced-price meal enrollment than at schools with highest free/reduced-price meal enrollment.

The likelihood of limited package or serving sizes of foods sold in school stores or vending was significantly higher in urban and suburban schools than in town/rural schools. Studies have identified an impact upon student dietary intake when portion sizes were limited in schools.[32,33]

Strengths and Limitations

To our knowledge, this is the first study to compare a multistate sample of food and nutrition–related policies and practices across categories of place, ethnicity, and socioeconomic status after the implementation of the 2004 CNRA in 2006. The state response rate is a limitation. However, the authors made a reasonable attempt to determine whether bias exists. The school food and nutrition–related policies and practices evaluated were limited to those previously collected by states. No new data were collected.

Table 1. Adjusted mean scale scores of policies and practices by school demographic characteristics for a sample of US secondary schools[a]

Policy Domains	Sample Mean±SD[b]	Sample (Min, Max)	Location			Minority Enrollment			Free/Reduced-Price Meal Enrollment		
			Urban	Suburban	Town/Rural	Low (<5%)	Medium (5% to <50%)	High (≥50%)	Low (<20%)	Medium (20% to <60%)	High (≥60%)
Availability of LNED[cd] Snacks and Drinks Lower score better	4.42±2.82	(0, 10)	4.28 (4.06, 4.51)	4.39 (4.19, 4.59)	4.20 (4.06, 4.34)	4.26 (4.01, 4.51)	4.48 (4.33, 4.63)	4.13 (3.89, 4.38)	5.02** (4.76, 5.28)	4.29** (4.15, 4.43)	3.57 (3.33, 3.81)
Healthy Eating Strategies[c] Higher score better	1.42±1.32	(0, 5)	1.53 (1.44, 1.61)	1.51 (1.43, 1.58)	1.36** (1.31, 1.41)	1.46 (1.37, 1.55)	1.52 (1.47, 1.57)	1.41 (1.34, 1.48)	1.54 (1.46, 1.61)	1.44 (1.39, 1.49)	1.42 (1.33, 1.50)
Marketing of LNED Snacks and Drinks[c] Higher score better	2.60±1.64	(0, 4)	2.75 (2.65, 2.85)	2.79 (2.70, 2.88)	2.48** (2.42, 2.54)	2.47** (2.36, 2.58)	2.69* (2.63, 2.76)	2.85 (2.77, 2.94)	2.71 (2.61, 2.80)	2.60 (2.53, 2.67)	2.71 (2.61, 2.82)

[a]N=2008 School Health Profiles data representing 6,732 schools from 28 states.

[b]SD=standard deviation.

[c]Mean scores (95% confidence intervals), adjusted for other school-level characteristics, are reported for each scale.

[d]LNED=low-nutrient, energy-dense. Includes chocolate candy, candy, salty snacks not low in fat, cookies, cakes, crackers not low in fat, ice-cream not low in fat, 2% or whole milk, water ices that do not contain juice, soda pop or fruit drinks that are not 100% juice, sport drinks, and caffeinated foods or beverages available for purchase in school vending machines or stores. The adjusted mean scores for the availability of LNED snacks and drinks scale are also adjusted for a significant interaction between minority enrollment and free/reduced-price meal eligibility.

*Significantly worse scores than one or more location, minority enrollment, or free/reduced-price meal enrollment categories, adjusted for multiple comparisons from 0 at the 0.01 level.

**Significantly worse scores than one or more location, minority enrollment, or free/reduced-price meal enrollment categories, adjusted for multiple comparisons from 0 at the 0.001 level.

Table 2. Adjusted odds ratio[a] for each policy and practice by demographic characteristic for a sample of US secondary schools[b]

	Location			Minority Enrollment			Free/Reduced-Price Meal Enrollment		
Individual Policy items	Urban	Suburban	Town/ Rural	Low (<5%)	Medium (5% to <50%)	High (≥50%)	Low (<20%)	Medium (20% to <60%)	High (≥60%)
Fruits and/or vegetables available at school celebrations[c]	1.17 (1.003, 1.36)	1.24* (1.08, 1.42)	ref[e]	0.60* (0.49, 0.72)	0.67* (0.58, 0.78)	ref	1.32* (1.10, 1.59)	1.14 (0.98, 1.32)	ref
No VMSS[d] availability of foods	1.09 (0.93, 1.28)	0.94 (0.81, 1.10)	ref	0.66* (0.54, 0.81)	0.64* (0.55, 0.75)	ref	0.60* (0.49, 0.72)	0.62* (0.54, 0.73)	ref
Fruits and/or vegetables are available for purchase from VMSS	1.48* (1.25, 1.76)	1.67* (1.43, 1.95)	ref	0.70* (0.57, 0.88)	0.78* (0.66, 0.93)	ref	2.26* (1.83, 2.79)	1.52* (1.27, 1.82)	ref
Limited package serving size of items sold in VMSS[f]	1.43* (1.19, 1.72)	1.64* (1.39, 1.93)	ref	0.79 (0.63, 0.98)	0.87 (0.72, 1.04)	ref	0.95 (0.77, 1.18)	1.03 (0.86, 1.23)	ref

[a]Odds ratio and (95% confidence intervals), adjusted for other school-level characteristics for each nutrition policy item.
[b]N=2008 School Health Profiles data representing 6,732 schools from 28 states.
[c]Includes responses "almost always or always".
[d]VMSS=vending machines or school stores.
[e]ref=reference group.
[f]For example: Does this school limit the package or serving size of any individual food and beverage items sold in vending machines or at the school store?
*Odds ratios significantly different from the reference group after adjusting for multiple comparisons at the 0.008 level.

The most pronounced disparity in the distribution of policies and practices that support healthy school food environments seems to exist among schools located in town and rural communities. These findings are troubling given the health and weight disparities that already exist among these communities. Living in rural areas is a risk factor for children being overweight or obese.[12] Explanations for this geographic difference supported by the literature include: smaller school size and therefore fewer resources, less availability of healthy foods, and higher cost of high-quality produce. A study of 14 rural Kansas high schools reported that smaller foodservice programs had fewer financial resources, fewer total products, and lower product volume, resulting in fewer fruit and vegetable options.[13] Several studies have found that the availability and cost of healthy foods, especially high-quality produce, are most problematic in small town and rural settings.[34-36]

Schools serving the highest percentage of minority students consistently reported the same or better school food environments. However, schools serving the highest percentage of low-income students had varied results; vending and LNED vending policies were consistently better and fruit and vegetable availability related policies were consistently worse. A national multistate, multischool study investigating the school food environment reported better food and nutrition–related policies and practices among both lower income and higher minority enrollment schools.[37] However, this investigation occurred before the 2006 implementation of the 2004 CNRA. Another contradictory study involving a state examination of wellness policy language identified stronger policy language in the schools with the highest percentage of free/reduced-price meal enrollment.[17] One plausible explanation for the counterintuitive findings is that schools serving high-needs areas have been targeted for supportive programming: coordinated school health, fresh fruit and vegetable programs, and summer foodservice programs.[25,38,39] At the time of the current data collection, however, school-based fresh fruit and vegetable programs primarily targeted elementary schools and were in the piloting phase with limited reach. Continued monitoring of food policies and practices in secondary schools for geographic, income, and racial disparities is justified.

CONCLUSIONS

Students attending schools in small town and rural areas have significantly less exposure to healthy eating policies and practices and significantly more exposure to LNED marketing at school than students attending urban and suburban schools. Students attending city and suburban schools and schools with the highest minority enrollment seem to be attending schools with better food environments, although the overall scale scores were low, indicating room for improvement. Findings from this study uniquely add to the literature in two ways. First, the evaluation period captures 2 years after the implementation of the mandatory school district wellness policies. Second, the assessments of policies and practices include those with a substantial evidence base not previously examined (eg, food marketing, promotional strategies). This post-CNRA implementation study strengthens the need for small town and rural focused policy supports, especially as next steps (the Healthy, Hunger-Free Kids Act of 2010) are implemented. The data also support the need for continued reinforcement and the potential for expansion of these efforts in urban and suburban areas and schools with the highest minority enrollment. Lastly, future research should examine the impact of these school food policy environments on student diet, weight, health, and academic outcomes. Especially important are evaluations by student sex, race/ethnicity, and income categories.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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