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Breakfast Quality Varies by Location among Low-Income Ethnically Diverse Children in Public Urban Schools

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Abstract

Objective: To evaluate breakfast location and children's food choices.

Methods: Cross-sectional analysis of 1,371 fourth- through sixth-grade students in 2013. Foods and beverages in 17 categories characterized breakfast choices: (1) 1 fruits or vegetables, (2) 1 foods high in saturated fats and added sugars (SFAS), and (3) meeting *School Breakfast Program* (SBP) requirements.

Results: Among breakfast eaters ($n = 1,133$; 82.6%), 46.0% ate at home, 13.1% ate at school, 41.0% ate at multiple locations; and 21.8% ate at a corner store. Those eating at school were more likely to consume 1 fruit or vegetable (odds ratio [OR] = 1.90; 95% confidence interval [CI], 1.26–2.87), less likely to eat 1 SFAS food (OR = 0.46; 95% CI, 0.22–0.94), and more likely to meet SBP requirements (OR = 2.47; 95% CI, 1.42–4.29). Those eating at corner stores ($n = 247$) were more likely to consume high-SFAS foods (63.9% vs 9.2%; $P < .001$).

Conclusions and Implications: Eating school breakfast increased the odds of consuming fruit, choosing lower SFAS, and meeting nutritional requirements of the SBP relative to other locations.

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CONFLICT OF INTEREST

GDF is an employee and shareholder of Weight Watchers International. The rest of the authors have not stated any conflicts of interest.

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Keywords

breakfast; children; eating patterns; school meals; corner stores

INTRODUCTION

Among US children aged 6–11 years, breakfast provides 18% to 19% of total daily energy intake but a relatively greater proportion of daily intake of several nutrients of public health concern among Americans,¹ including vitamin D (40% to 42%), calcium (26%), fiber (21%), and iron (32%).²

Breakfast consumption has been positively associated with academic outcomes.^{3–5} Conversely, 12% to 34% of US children report skipping breakfast, which has been associated with a 2–5 times lower likelihood of meeting recommended nutrient intakes,⁶ poorer memory,^{5,7} and a twofold increased risk of obesity.^{3,8–11} Thus, whether children eat breakfast is important.^{3,11–15} This study examined the extent to which the types of breakfast foods children consume are influenced by location.

School has become an increasingly important context for breakfast. The US *School Breakfast Program* (SBP) was permanently authorized in 1975 to provide nutritious breakfasts, targeting lower-income children.¹⁶ Currently, the SBP serves approximately 11.2 million children per day.¹⁷ Eating breakfast at school vs home is associated with higher daily intakes of some nutrients including energy, protein, and sodium.^{6,18} Alternatively, many youth report eating in the morning at corner stores,^{9,19–21} where food purchases tend to be rich in energy and low in nutrients.²¹ However, little is known about the influence of location on children's breakfast food choices.

The objective of this research was to evaluate children's breakfast food choices based on location(s) among low-income, urban, fourth- to sixth-grade youth. Specifically, the research team evaluated whether consumption of fruits and vegetables (FV) or foods high in saturated fats and added sugars (SFAS), as well as meeting nutritional (ie, meal component) requirements of the SBP at breakfast varied based on whether consumption occurred at school, home, and/or corner stores.²² Currently, a majority of school-aged children do not meet recommended guidelines for FV and exceed the 2015 Dietary Guidelines for Americans' SFAS recommendations.^{1,23} Understanding the role of location in the quality of children's breakfast choices may inform interventions to improve breakfast consumption among youth.

METHODS

Design

The researchers conducted a cross-sectional analysis using baseline data from a randomized control trial to promote school breakfast consumption. All participating schools had universal breakfast policies in which breakfast was available to all students free of charge before school in the cafeteria. Data were obtained in October through December, 2013. Students completed measures in the morning, after the cafeteria breakfast was offered and

before scheduled lunches. No schools offered snacks before lunch. Students completed surveys independently on electronic tablets. Trained research staff provided instructions and were available during survey administration to answer questions. The school district provided additional student sociodemographic data.

Participants and Setting

Participants were fourth- to sixth-grade students recruited from 16 kindergarten to eighth-grade Philadelphia public schools. Schools were eligible if they met the following inclusion criteria for the larger trial from which baseline data presented here were taken: (1) at least 50% of students qualified for free or reduced price lunch, (2) they did not have an existing classroom breakfast feeding program (or were willing to give up classroom breakfast feeding for the duration of the study), and (3) they received *Supplemental Nutrition Assistance Program–Education* nutrition programming. The student-level exclusion criterion was developmental or behavioral disorders affecting the ability to understand and/or complete the breakfast survey.

Schools were matched for school size, race/ethnicity composition, and food service type (full-service vs satellite cafeterias); 25 schools were invited to participate. Nine schools declined owing to an unwillingness to accept randomization. Eligible and participating schools were similar to other schools in the district with respect to percent minority, size, and percent qualifying for free and reduced lunch.²⁴ Mean $\pm$ SD percent eligibility for free or reduced-price meals from the *National School Lunch Program* for the 16 schools at the time of school recruitment (spring, 2013) was $89.7\% \pm 6.3\%$. The study was approved by and conducted in accordance with the ethical standards of the Office of Research and Evaluation at the School District of Philadelphia and the Institutional Review Board at Temple University.

Research staff visited each classroom to explain the study and distribute consent and assent forms. All fourth- through sixth-grade classrooms in the enrolled schools participated in the study. Among the 2,715 eligible students, active parental consent and child assent were obtained for 1,463 students (53.9%); consent rates did not differ by condition (intervention: 54.6%, control: 53.7%). Students did not receive compensation for participation; the 16 schools each received \$1,000 for participating. From the sample, 91 children were removed from analyses (42 transferred schools before data collection, 31 started the classroom breakfast portion of the intervention during the baseline period, 10 were in special education, 4 had incomplete height and weight measurements, 1 was chronically absent, and 1 had missing survey data). The final sample consisted of 1,371 children.

Measures and Data Collection Procedures

The school district provided children's race/ethnicity, sex, month and year of birth, and grade level. Children's race/ethnicity, as categorized by the school district based on parent report, was black, Hispanic, white, Asian, or other.

Children's self-reported breakfast intake on the day of the breakfast patterns survey was assessed using a questionnaire developed for ethnically diverse, low-income, school-aged children in New York City.^{9,20} Foods and beverages in 17 categories included typical

breakfast foods (eg, milk and eggs categories) from school menus used in Philadelphia^{9,21} and New York City,²⁰ as well as nontypical breakfast foods (eg, chips and candy categories). Children were first asked, *Did you eat/drink anything today?* Children who answered affirmatively marked foods and beverages consumed in 17 categories separately for each of 4 locations: home, corner store, school cafeteria, and other. Students were instructed to omit foods that had been acquired but not yet consumed. Foods were recorded as being consumed in the location where the food was acquired. Children who reported drinking only water were not counted as having consumed breakfast. On average, students took approximately 5–10 minutes to complete the survey.

Children's food choices at breakfast were characterized in several ways. Consumption of high-SFAS foods was characterized by intake of 1 foods in the following categories (yes/no): chips, candy, and sugar-sweetened beverages. Consumption of SFAS was evaluated with and without the categories of muffins, donuts, and pastries because low-saturated fat versions of these foods were served as part of the SBP at the time of the study. Consumption of FV was characterized by eating 1 foods in the following categories (yes/no): fruits, vegetables, and 100% fruit juice; consumption was evaluated with and without 100% fruit juice. Meeting nutritional requirements of the SBP was characterized by 1 of the following meal component combinations in accordance with 2014–2015 guidelines²²: (1) 1 FV, 1 grain, and 1 milk; (2) 1 FV and 2 grains; or (3) 1 FV, 1 grain, and 1 meat or meat alternative. Of the 17 food categories assessed, consumption of foods and drinks from the fruits, vegetables, and 100% fruit juice categories were counted as meeting the FV component. Consumption of foods from the 192 categories of cereal; bread; waffles, french toast, and pancakes; muffins, donuts, and pastries; and breakfast sandwiches were counted as meeting the grains component. Consumption of a breakfast sandwich, meat, eggs, or yogurt/cheese was counted as a component of the meat/meat alternatives. Breakfast was defined as any food or drink consumed between when participants woke up in the morning and when they filled out the survey. Number of breakfasts consumed was defined by number of locations at which children consumed food or drinks.

Data Analyses

The researchers used Stata/SE (Release 14, Stata Statistical Software, StataCorp LP, College Station, TX, 2015) for all statistical analyses. Descriptive statistics were generated for all relevant variables. Wald chi-square tests of independence were used to describe differences in child race/ethnicity, sex, and grade level by breakfast location. Logistic regression models and margins estimated at covariate means were used to predict probability of FV consumption, SFAS food consumption, and meeting SBP nutrition requirements by breakfast location(s), as well as comparisons of food and beverage categories across location combinations. Breakfast location variables were used to predict FV and SFAS outcomes. All models were adjusted for race/ethnicity, sex, and grade. $P < .05$ was considered to indicate statistical significance. All analyses used clustered sandwich estimators to adjust for within-school clustering.

RESULTS

Demographics

The sample was 51.3% female and 66.5% black. Students were divided approximately equally across the 3 target grades (fourth grade: 35.2%; fifth grade: 34.8%; sixth grade: 30.0%). Approximately 80% of students qualified for free or reduced-price meals, as defined by federal poverty guidelines (Table 1). Location of breakfast consumption did not differ by grade level but varied with sex (degrees of freedom = 5; $n = 1,133$; $P < .001$) and race/ethnicity (degrees of freedom = 5; $n = 1,133$; $P < .001$). Compared with boys, girls were more likely to eat at home only (49.1% vs 42.7%; $P < .05$) and home or a corner store (11.8% vs 6.4%; $P < .05$), and less likely to eat at school or home (17.7% vs 12.1%; $P < .05$). Black children (66.4% of the sample) were less likely to eat at home only (39.9% vs 58.0%; $P < .05$) and more likely to eat at school only (14.6% vs 10.0%; $P < .05$), home or a corner store (11.0% vs 5.5%; $P < .05$), school or home (15.3% vs 13.9%; $P < .05$), and other location combinations (14.0% vs 8.7%; $P < .05$), compared with non-black children.

Breakfast Locations

On the morning of data collection, almost 20% of children skipped breakfast (17.4%; $n = 238$), half ate breakfast in 1 location (51.8%; $n = 710$), and almost a third ate breakfast in multiple locations (30.9%; $n = 423$). Most children reported consuming a food or beverage at home (79.3%) and more than a third of children reported having a food or beverage at school (38.6%); 21.8% of children reported having a food or beverage at a corner store and 7.1% of children reported consuming a food or beverage obtained from another location such as a relative's home.

Among students who ate in multiple locations ($n = 423$), home or school (39.7%), home or a corner store (24.6%), and home or school or a corner store (12.8%) were the most frequent location combinations.

Associations of Type of Breakfast Location with Foods and Beverages Consumed

Table 2 lists associations among breakfast location and children's odds of consuming FV and SFAS, and meeting SBP requirements. Children who ate at school had higher odds of consuming FV than did children who did not eat at school (OR = 4.09; 95% CI, 2.66–6.28). Children had greater odds of consuming FV when they ate breakfast only at school (OR = 1.90; 95% CI, 1.26–2.87), at school or home (OR = 4.01; 95% CI, 2.69–5.99), at school or home or a corner store (OR = 4.42; 95% CI, 2.37–8.25), or at other location combinations (OR = 2.68; 95% CI, 1.91–3.74), compared with eating breakfast only at home. When juice was excluded from the FV analysis, children had lower odds of consuming FV when they ate at school only (OR = 0.46; 95% CI, 0.26–0.83) and greater odds of consuming FV when they ate at home or a corner store (OR = 1.78; 95% CI, 1.0–3.1, home or school or a corner store (OR = 3.1; 95% CI, 1.5–6.2), and school or home (OR = 1.7; 95% CI, 1.1–2.6) compared with children who ate breakfast only at home.

The odds of consuming high-SFAS foods were greater among children who reported eating at corner stores, compared with children who did not report eating at corner stores (OR =

18.81; 95% CI, 14.04–25.21). Compared with children who ate breakfast only at home, children who ate only at school had lower odds of consuming high-SFAS foods (OR = 0.46; 95% CI, 0.22–0.94) but higher odds when they ate at home or a corner store (OR = 19.05; 95% CI, 10.82–33.53), at school or home or a corner store (OR = 29.17; 95% CI, 18.70–45.5), at school or home (OR = 1.92; 95% CI, 1.02–3.61), and at other location combinations (OR = 16.54; 95% CI, 9.78–28.0). When muffins, donuts, and pastries were included in the SFAS analysis, children had higher odds of consuming SFAS when they ate at school only (OR = 4.17; 95% CI, 1.92–9.05) and other combinations involving school (data not shown), compared with children who ate only at home.

Overall, only 7.2% of children who ate breakfast consumed foods and beverages, including juice, that met the national SBP meal component requirements. Fourteen percent of children who ate exclusively at school met SBP requirements, compared with 6.1% of children who ate exclusively at home. Compared with children who ate breakfast only at home, children who ate exclusively at school had greater odds of meeting SBP requirements (OR = 2.47; 95% CI, 1.42–4.29). The number of breakfast locations reported was unassociated with the odds of meeting national SBP requirements.

Across all locations, the 5 most frequently consumed foods were milk (46.7%), cereal or oatmeal (37.7%), 100% fruit juice (30.2%), waffles, french toast, and pancakes (22.2%), and muffins, donuts, and pastries (21.5%) (Table 3). The percentage of children reporting consumption of cereal, oatmeal, eggs, meat, and whole FV was lower for those who ate exclusively at school vs exclusively at home. The percentage of children reporting consumption of 100% fruit juice and muffins, pastries, and doughnuts, however, was higher among eating those exclusively at school than those eating exclusively at home. The percentage of children reporting consumption of candy, chips, and SSB was higher among those who ate breakfast at a corner store in combination with other locations, compared with children who ate breakfast exclusively at home.

DISCUSSION

This research reveals that the type of breakfast foods consumed by urban school-aged youth differed by location. Consistent with previous studies,^{9,20,25} children ate breakfast in varied locations, with almost a third eating in multiple locations. School breakfast was positively associated with FV intake, which was primarily due to children's consumption of 100% fruit juice. This finding is notable because more than three quarters of US grade-schoolchildren do not meet national recommendations for FV intake.²⁶ Furthermore, children who ate exclusively at school were more likely to consume a breakfast that met meal component requirements of the SBP; however, this proportion (14%) was relatively small. Finally, children who ate breakfast only at school were less likely to consume SFAS foods than were children who ate only at home. Consumption of SFAS foods was most pronounced among children who ate at corner stores, which is important given the role of SFAS in weight management and chronic disease risk.¹ Taken collectively, these findings suggest that school breakfast may have some potential nutrition benefits for urban youth relative to eating breakfast at other locations.

The positive association of school breakfast with FV consumption is consistent with previous studies reporting that nutrient-dense foods such as cereal, milk, and FV, are among the breakfast foods most frequently consumed at school.^{9,27} In this study, the association was driven by children's consumption of 100% fruit juice, which was difficult to interpret. On the one hand, concerns regarding excessive juice consumption led to recommendations to limit 100% fruit juice to 8–12 oz daily among children aged 7–18 years.²⁸ On the other hand, 100% fruit juice represents only 28% to 33% of school-aged children's total daily fruit intake,²⁹ which is lower than recommended for many US children.³⁰ Furthermore, a recent meta-analysis of prospective studies showed no associations of 100% fruit juice consumption with changes in body mass index among children aged 7–18 years.³¹ In light of these observations, the current findings suggested that the provision of 100% fruit juice in the SBP makes beneficial contributions to fruit intake among school-aged youth. However, SBP guidelines consider 100% fruit juice to be an acceptable alternative to whole fruit. The extent to which the SBP can better promote whole FV intake is an important nutritional issue that merits additional consideration.

The SBP guidelines allow for processed as well as whole-grain foods and do not require consumption of protein-rich foods such as meat and eggs.²² Reflecting those guidelines, this study found that consumption of muffins, donuts, and pastries was higher at school and that of breakfast sandwiches, eggs, and meat was lower at school than home. These findings indicated that the nutritional quality of school breakfast may not be superior to that of other locations in all regards and highlights areas for potential improvements in SBP regulations and offerings. Similarly, although children who ate at school were more likely to meet nutritional requirements outlined in the SBP, the percentage of children who met these guidelines was low. This finding suggested that children eat fewer of the meal components (eg, 1 FV, 1 grain, and 1 milk) than are provided and underscored the need to understand better the institutional, operational, and behavioral factors that encourage healthy food choices at school.

Rates of skipping breakfast seen in this study were within the range of those seen in previous reports (12% to 34%).^{3,12} That fewer than half of children in this study ate school breakfast despite having a universal breakfast policy was also consistent with previous studies documenting underuse of the SBP.^{9,32,33} Universal breakfast policies do not appear to influence rates of breakfast skipping in elementary school.³² Furthermore, focus groups revealed that students and parents were wary of the SBP owing to the perceived low quality of foods served and social stigma.³³ Results from this and other studies suggested that novel strategies are needed to address stigma and facilitate access to SBP, such as classroom breakfast programs.^{9,20,33}

A number of limitations merit discussion. First, this research evaluated self-reported breakfast consumption on a single day; the extent to which these data reflect children's usual intake at breakfast is unknown. Previous research also demonstrated that school-aged children often underreport food intake.³⁴ This potential source of bias, however, was mitigated by the fact that children were surveyed shortly after breakfast and were asked only about single-meal. Second, information about portion sizes, the number of foods consumed within a given category, and nutrient content of foods was not assessed. Thus, these data

cannot be used to infer nutrient intake. Third, analysis of high-SFAS foods did not include muffins, donuts, and pastries because healthier, low-saturated fat versions that met SBP guidelines were frequently served at the time of the study. That children were more likely to consume SFAS at school when this category was included is consistent with this observation, but it makes those results more difficult to interpret. Fourth, although the Breakfast Patterns Survey scale was developed for urban school-aged children, its psychometric characteristics are not well described.^{9,20} Finally, the cross-sectional study design does not permit causal inference.

IMPLICATIONS FOR RESEARCH AND PRACTICE

This research revealed positive associations of school breakfast with the quality of children's breakfast choices. Eating school breakfast increased the odds of consuming fruit, lower-SFAS choices, and meeting nutritional requirements of the SBP relative to other locations. Eating school breakfast increased the odds of consuming FV and meeting nutritional requirements of the SBP regardless of whether children ate at other locations. The relatively low rates of SBP participation suggest a need for additional research to investigate innovative approaches for promoting school breakfast. In an attempt to increase school breakfast participation, innovative interventions to promote school breakfast, such as classroom breakfast and grab-n-go carts, have been implemented.^{33,35} Finally, more research is needed regarding the quality of foods parents serve children for breakfast at home, as well as the role of corner stores and other retail locations in shaping the quality of children's breakfast consumption patterns.^{19,21,36}

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Table 1.

Sample Characteristics of Fourth- Through Sixth-Grade Philadelphia Public School Students Participating in the School Breakfast Policy Initiative Study (n = 1,371)

Sample Characteristic	n	%
Sex		
Male	667	48.7
Female	704	51.3
Race/ethnicity		
Asian	85	6.2
Black	912	66.5
Hispanic	235	17.1
White	100	7.3
Multiple/other	39	2.8
Grade level		
Fourth grade	482	35.26
Fifth grade	477	34.8
Sixth grade	412	30.0
Age (mean $\pm$ SD)		10.80 $\pm$ 0.96
Free/reduced lunch from <i>National School Lunch Program</i> (yes)	1,082	78.9
Ate breakfast (yes)	1,133	82.6
Breakfast location combinations (n = 1,133)		
Home only	521	46
Home and school	168	14.8
School only	148	13.1
Home and corner store	104	9.2
Home, school, and corner store	54	4.8
Other combinations	138	12.2

Table 2.

Breakfast Choices by Location Among Fourth- to Sixth-Grade Philadelphia Public School Students (n = 1,133)

Outcome	Reference	Odds Ratio	Confidence Intervals (Odds, 95%)	P
Consuming 1 FV				
Any school	No school	4.09	2.66–6.28	< .001
School only	Home only	1.91	1.26–2.87	.002
Home/corner/school	Home only	4.42	2.37–8.25	< .001
School/home	Home only	4.01	2.70–6.0	< .001
Other location combinations	Home only	2.68	1.91–3.74	< .001
Consuming 1 high-saturated fats and added sugars food/beverage				
Any corner store	No corner store	18.81	14.04–25.21	< .001
School only	Home only	0.46	0.22–0.94	.03
Home/corner	Home only	19.05	10.82–33.53	< .001
Home/corner/school	Home only	29.17	18.70–45.50	< .001
School/home	Home only	1.92	1.02–3.61	.04
Other location combinations	Home only	16.54	9.78–28.0	< .001
Meeting <i>National School Breakfast Program</i>				
nutritional requirements (includes juice as FV) ^a				
School only	Home only	2.47	1.42–4.29	.001
Meeting <i>National School Breakfast Program</i>				
nutritional requirements (excludes juice as FV) ^a				
School only	Home only	0.34	0.10–1.13	.08

FV indicates fruits and vegetables.

Note: Logistic regression models and margins estimated at covariate means were used to predict probability of FV consumption, SFAS food consumption, and meeting SBP nutrition requirements by breakfast location(s). Breakfast location variables were used to predict FV and SFAS outcomes. All models adjusted for race/ethnicity, sex, and grade.

^aThree components defined per US Department of Agriculture regulations: (1) 1 FV, 1 grain, 1 milk; (2) 1 FV, 2 grains; or 3) 1 FV, 1 grain, 1 meat/alternative.

Table 3.
Self-reported Food and Beverage Category Consumption by Location Combinations^a

Category	Overall (n = 1,133)	Home Only (n = 521)	School Only (n = 148)	Home and Corner Store (n = 104)	Home, School, and Corner Store (n = 54)	Home and School (n = 168)	Other Location Combinations (n = 138)
Cereal, oatmeal	37.7	42.4	19.6**	43.6	44.5	43.8	24.8
Milk	46.7	39.4	47.5	49.2	68.3**	66.1**	39.3
Bread (bagel, toast, or roll)	15.0	13.7	4.8*	13.9	41.0***	20.2*	15.2
Breakfast sandwich	15.6	13.4	3.3**	27.1***	36.8***	18.2	17.2
Waffles, french toast, or pancakes	22.2	17.3	25.2	24.7	36.9**	32.7**	17.2
Muffin, donut, pastry, cake, or pie	21.5	7.0	36.1***	18.0**	62.4***	31.7***	34.2***
Chips (Doritos, potato chips, Cheetos, etc)	10.6	1.7	0.7	36.7***	50.5***	4.4	25.2***
Yogurt, cheese	16.1	13.9	10.6	14.5	37.0***	25.3	11.6
Eggs	18.4	18.3	1.3***	23.5	42.0***	26.3	14.3
Meat (bacon, ham, or sausage)	12.2	12.5	0.7**	22.8*	23.7*	11.0	12.8
Fruit (apple, pear, peaches, etc)	19.7	17.2	9.3*	26.2	37.1**	26.4*	20.2
Vegetable (lettuce, green beans, broccoli, etc)	4.3	4.0	0.6*	5.1	10.8*	6.1	4.2
100% fruit juice (Juicy Juice)	30.2	16.5	40.8***	22.5	55.8***	54.7***	37.0***
Soda, lemonade, Capri-Sun, Sunny-D, Hug, etc	10.8	4.2	0.7	28.2***	39.2***	8.1	24.5***
Candy	9.8	2.5	2.0	33.6***	38.8***	2.4	24.3***
Coffee, tea, iced tea (Arizona, Brisk, etc)	7.8	5.8	0.0	17.9***	29.7***	7.9	7.2
Other	11.4	8.8	13.0	12.9	16.8	11.0	17.5*

Adjusted predicted probabilities of sample reporting consumption in each location combination.

^aLogistic regressions were used to test differences in the predicted probability of children consuming food/beverage categories at home only vs other location combinations. Location combinations are mutually exclusive. Analyses were adjusted for covariates (sex, race/ethnicity, and grade level);

* $P < .05$;

** $P < .01$;

$P < .001$

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