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Altering the school breakfast environment reduces barriers to school breakfast participation among diverse rural youth

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Abstract

Background—The purpose is to determine if altering school breakfast policies and the school breakfast environment will positively impact adolescent beliefs of the barriers and benefits of eating breakfast.

Methods—There were 904 adolescents from 16 rural high schools, Minnesota, in the BreakFAST Study who reported eating breakfast fewer than 4 times per week at baseline. Schools were randomized to intervention (N = 8 schools) or delayed intervention (N = 8) condition. The intervention lasted one school year. Students completed an online survey of beliefs of barriers and benefits to eating breakfast at baseline and follow-up. Summative scales were created. Bivariate and multivariate linear regression, accounting for clustering by school, was performed using SAS. Sex interaction was tested. Models tested the effect of the intervention on change in summative scales from baseline to follow-up.

Results—Participants were 54% female, 69.1% white, 36.6% eligible for free or reduced-price meals (FRM) and 13.1 % of families received public assistance. The change in reported barriers was significantly different in intervention versus control schools (Net difference = 1.0, $p = .03$). There was no intervention effect of perceived benefits.

Conclusions—A school based policy and environmental change intervention can successfully reduce perceived barriers to eating school breakfast.

Keywords

school policy; intervention; school breakfast; adolescent

School policies and practices are an important determinant of school breakfast consumption among adolescents. Schools can ‘opt in’ to the School Breakfast Program, administered by the Food and Nutrition Service, US Department of Agriculture (USDA), and receive cash subsidies from the USDA for each meal they serve.¹ While school breakfast must meet nutritional standards, the local school food authorities determine specific foods, how they are prepared and the school level policies around availability, ease of access and other breakfast promoting efforts.¹

Schools do not universally implement policies aimed at reducing barriers that are most commonly cited by adolescents and promoting positive beliefs about the benefits of breakfast. Adolescents consistently report not eating breakfast because they do not have time or desire to eat breakfast^{2,3} and that school breakfast food does not taste good.³ One effective strategy to address barriers such as not having time to eat breakfast is to provide grab-n-go breakfast option in the cafeteria and hallway.⁴ A strategy for those who are not hungry immediately is to offer second-chance breakfast.⁵ Yet, neither of these policies are widely implemented.⁶ In fact, the traditional model of eating breakfast in the cafeteria continues to be used by 91.3% of schools.⁷

Adolescents are also unaware or unconcerned about the potential benefits of eating breakfast. Adolescents who skip breakfast report fewer perceived benefits to eating breakfast than those who do not skip breakfast.³ And adolescents continue to skip breakfast as a means of losing weight despite robust evidence to the contrary.^{8,9} Despite these recurring messages from adolescents, school policies are not necessarily designed to alleviate such factors and rural schools lag behind urban schools in progressive policies. A large study of U.S. secondary schools found that schools in small towns or rural locations had significantly fewer healthy eating policies and practices than urban locations.^{10,11}

Breakfast consumption contributes to healthful life habits and positive adolescent outcomes, but nearly 25% of high school students do not eat breakfast.¹² As children transition into adolescents, regular breakfast consumption decreases, with more girls than boys reporting skipping breakfast.¹³⁻¹⁵ Eating breakfast is associated with a lower body mass index (BMI),¹⁶ improved cognitive function, attention and memory¹⁷ and improved math testing scores and attendance.¹⁸ Contrary to the perceptions of some adolescents aiming to lose weight, skipping breakfast is associated with higher BMI¹⁹ and poorer nutrient intake.²⁰ Unfortunately, the evidence to date is largely correlational,²¹ contradictory and with limited focus on adolescents.²²

The purpose of this paper is to provide experimental evidence on the ability to effectively alter adolescent beliefs of barriers to and benefits of breakfast consumption. Specifically, the adolescents in this group randomized trial are breakfast skippers, meaning they ate breakfast fewer than four times per week at baseline. Adolescents in this sample were from rural school districts, a unique feature as that is a commonly overlooked population. This paper

contributes to the literature and has implications for school policy as this analysis explores effective strategies to reduce barriers and increase perceptions of benefits of school breakfast in this particularly at-risk population.

Methods

Participants

The BreakFAST study is a group randomized trial aimed at increasing breakfast participation through policy and environmental-level school change. The conceptual paper can be found here.²³ Briefly, sixteen secondary schools in rural Minnesota were randomized to participate in the BreakFAST intervention or delayed intervention. The intervention consisted of a variety of school policy and environmental changes including offering 'grab and go' breakfast options, moving the breakfast foods out of the cafeteria and more convenient to students entering school, altering service times to include after the bell (second chance breakfast), allowing breakfast to be eaten in hallways and classrooms. and school-specific marketing campaigns aimed at education and social support around breakfast.²³

All 9th and 10th grade students (N = 5767) present on the day of screening were asked to complete a brief survey, reporting number of days per week the student eats breakfast and demographic characteristics. Students were eligible to be enrolled if they reported eating breakfast fewer than four times in a normal week (47% of the sample), scheduled to be in class when the school day began, skill in reading and writing English and access to a phone and the internet (N = 2512). Of the eligible students, between 50-75 students, depending on school size, were randomly selected and invited to participate in further data collection. Students of color were oversampled. Parent consent was passive, student assent was obtained at time of measurement. The final consented sample size at baseline was N = 904. The analytic sample size (answered the specific scale items at both baseline and follow-up) was 675, 678, and 691 for the scales about barriers, benefits, and beliefs, respectively.

Instrumentation

This analysis used the computer-based survey that enrolled students completed. Of the enrolled students, 92% completed baseline survey at baseline and 84% at follow-up.

Three scales were created to represent student beliefs about the benefits of breakfast, barriers to consuming breakfast and likelihood of eating breakfast if the student believed there would be positive outcomes. Details of the three scales can be found here.³ Breakfast beliefs were assessed by asking 4 questions using a 4-point Likert scale (disagree to agree) with questions such as "Eating breakfast helps me pay attention in class." Cronbach's alpha = 0.85. Breakfast barriers were assessed by asking nine questions about how strongly the student agreed with statements such as "I am too busy to eat school breakfast". Cronbach's alpha = 0.64. Finally, the benefits scale included seven questions on the likelihood that eating school breakfast would, for example, "improve math, reading and standardized test scores". Cronbach's alpha = 0.91.

Student identification numbers linked school level data to identify students who received free or reduced-price meals (FRM), which was used as a socioeconomic marker. Students reported their race, grade, and sex.

Data Analysis

Baseline characteristics were summarized and compared between conditions among enrolled students. The effect of intervention on change in barriers, benefits, and beliefs were examined using linear mixed models. The unadjusted models included random effect of school and fixed effect of intervention. The adjusted models included random effect of school and fixed effects of intervention, baseline age, sex, free and reduced priced meal eligibility, and race. Interaction between intervention and sex was tested, and was dropped from the model as it was not significant. Each scale was modeled independently. All analysis was performed using Statistical Analysis Software (version 9.3, SAS Institute Inc., Cary, NC). A two-sided p-value < .05 was considered statistically significant.

Results

Characteristics of the enrolled students at baseline can be found in Table 1. There were 904 enrolled students, 54% female, 69.1% white, 36.6% eligible for FRPL and 13.1 % of families received public assistance. The final analytic sample size was 675, 678, and 691 for barriers, benefits, and beliefs, respectively. Those lost to follow up were more likely to be nonwhite and were more likely to be eligible for FRM. Differences between those lost to follow up and not were not significant by age, sex, condition, school, and baseline scales.

The barriers scale was reverse coded so a higher score represents fewer barriers. At baseline, both the intervention and control conditions reported similar scale scores. At follow-up, the participants in the intervention schools reported fewer barriers (mean = 21.0, SD = 3.8) compared to participants in the control schools (mean = 20.0, SD = 3.6). The difference in the net change from baseline to follow-up between the intervention and control schools was statistically significant in unadjusted ($p = .03$) and adjusted models ($p = .03$). There was no statistical significance in the net change from baseline to follow-up between the intervention and control schools for the benefits or beliefs scale. Interaction between intervention and sex was examined, but it was not significant for any of the three outcomes, hence was dropped from the model.

Further descriptive analysis of item specific response patterns highlights the top barriers that influenced the change in the barriers scale pre- and post-intervention by condition. Table 3 shows that the top 5 barriers remained the same pre- and post-intervention by condition. However, the change in the proportion of the students who stated 'agree' or 'strongly agree' appeared to vary from pre- to post-intervention by condition. For example, there was an increase in both the proportion of students who stated 'agree' or 'strongly agree' for the item "It is easy for me to get school breakfast." Another example is for the item "School breakfast takes too much time." From pre- to post-intervention, the control group had an increase in the proportion of students who agreed with the statement that school breakfast takes too much time, but decreased among intervention participants.

Discussion

Altering the school policies and school environment around school breakfast is an effective way to reduce students' perceived barriers to eating breakfast in general, and school breakfast in particular. However, the intervention did not result in a significant change in adolescents' perceptions of the benefits of eating breakfast or their beliefs about how eating breakfast will impact their attention in class, energy level or weight control. This study strongly supports the use of policy and environmental change to address factors that may interfere with breakfast consumption among adolescents.

The barriers scale as described here,³ consisted of nine items that capture what the broader literature identifies as barriers to eating school breakfast. One important barrier for adolescents is time. Time includes a range of issues including taking the time to eat breakfast when the adolescent is not hungry or too busy, the adolescent prefers the extra sleep or the adolescent is unable to eat school breakfast due to a late arriving bus or ride.^{2,24-27} The BreakFAST intervention addressed the concerns around time by increasing the ease of access to breakfast and providing second breakfast offerings. Specifically, breakfast carts with 'grab-n-go' options were moved to entrances and hallways; breakfast was provided after the first class of the day for those who prefer to eat later in the morning and eating breakfast was allowed in most classrooms and all hallways in the school. Contrary to concerns, there was no additional burden of trash reported by school administration, which was consistent with pilot study data.²⁸

A second important barrier is the culture and climate related to breakfast consumption at school. This includes issues of students feeling comfortable eating in the classrooms, perceptions of affordability and taste. A marketing campaign was initiated along with policy and environmental changes to normalize the practice of eating breakfast. With more students eating breakfast, those who receive free or reduced cost meals and may have avoided school breakfast due to perceived stigma² are now among their peers eating breakfast. The marketing campaign also emphasized the 'grab-n-go' meals as delicious and good for health and learning. Taste-testing promotions gave students a chance to taste breakfast offerings, vote on likeability of specific offerings and influence the foods served to match their preferences. Thus, the climate and culture around breakfast shifted, addressing specifically the reported barrier that school breakfast food tastes bad.

According to change in item specific responses, the greatest difference between control and intervention conditions was in the areas of 'taste', students being 'too busy' to eat school breakfast and school breakfast taking too much time. The intervention encouraged taste tests of breakfast food items to improve the quality and taste, and identify favorite breakfast items. Another example of an intervention component that addressed item specific barriers was the grab and go breakfast while allowing eating in classrooms and hallways, making breakfast easier and less time consuming. Other top 5 barriers included the ease of which students accessed school breakfast and not feeling hungry in the morning, although these items had a smaller net difference in change over time. The examination of change in item specific barriers suggests the intervention elements contributed to the overall decrease in reported barriers to school breakfast consumption.

Student knowledge of the benefits of eating breakfast and the belief that eating breakfast would help in class, energy level and weight control did not change significantly between the two conditions. It is possible that policy and environmental level changes had a more immediate and stronger impact on reducing barriers whereas the benefits and beliefs require additional time and / or more intensive interventions focused on promoting breakfast nutrition and academic benefits. Investigation of individual items showed that both the adolescents in the intervention and control schools changed their belief that eating breakfast could control weight. As height and weight was collected on all students at school, the collection of this data may have drawn attention to the correlation between breakfast consumption and weight.

Limitations

There are a few limitations to note. Each school within the intervention arm was allowed to design its individual policy and environmental change initiatives provided it complied with the overarching aims. While this in fact is a strength of the intervention and makes the findings even more generalizable, schools that were less driven to innovate likely diminished the intervention effect. Another limitation is the students lost to follow up were different according to race/ethnicity and economic markers, representing a group at higher risk. Despite these limitations, the group randomized design of this intervention is very strong and provides compelling evidence that perception of barriers can be altered.

Conclusions

Improving access to and perceptions of school breakfast had an immediate and significant effect on the perceived barriers of this rural population of adolescent breakfast skippers. Preliminary results of the main intervention effects suggest that the intervention significantly increased school breakfast program participation (results forthcoming). Removing these perceived barriers, along with other intervention strategies, contributed to the preliminary results of a significant increase in students purchasing the school breakfast. Thus, it is proposed that this is an effective strategy for initiating healthy habits in adolescence, while increasing awareness and favorability of the school breakfast program.

Implications for School Health

Significant evidence demonstrates the importance of breakfast consumption on health and academic skills among adolescents. The results from this group randomized trial is directly transferable to school administrators who wish to increase breakfast participation. Common barriers to eating breakfast (eg, time, not being hungry) are reported across the country. Schools can implement grab-and-go breakfast options for students and second chance breakfast. Both of these initiatives require limited policy and environmental change. In addition, marketing strategies designed by students for students will support a positive climate around breakfast consumption, further reducing perceived barriers. School policy makers have a unique opportunity to increase breakfast consumption among students, with long term aims of improving health and academic outcomes.

Human Subjects Approval Statement

The University of Minnesota Institutional Review Board approved study procedures.

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Table 1
Baseline Characteristics among Cohort Students by Condition, BreakFAST study

	Overall N = 904	Intervention N = 463	Control N = 441	p value
Sex, Female, N (%)	491 (54.3)	254 (54.9)	237 (53.7)	.74
Race, N (%)				<.0001
White	597 (69.1)	283 (63.7)	314 (74.8)	
Native Hawaiian or other Pacific Islander	4 (0.5)	3 (0.7)	1 (0.2)	
American Indian or Alaska Native	23 (2.7)	21 (4.7)	2 (0.5)	
Asian	19 (2.2)	9 (2.0)	10 (2.4)	
Black or African American	39 (4.5)	23 (5.2)	16 (3.8)	
Mixed	182 (21.1)	105 (23.7)	77 (18.3)	
Ethnicity, Hispanic or Latino, N (%)	102 (11.3)	55 (11.9)	47 (10.7)	.55
Age, mean (SD)	15.2 (0.8)	15.2 (0.8)	15.1 (0.8)	.06
Eligible for Free/Reduced Price Meals, N (%)	322 (36.6)	167 (37.0)	155 (36.2)	.82

Table 2
Means (SD) of Secondary Outcomes Related to Barriers, Benefits, and Beliefs among Cohort Students by Condition, BreakFAST Study*

	Baseline mean(SD)	Follow-up mean(SD)	Change mean(SD)	Unadjusted *** p	Adjusted *** p
Barriers scale (Range 9-36)					
Intervention (N=346)	19.6 (3.9)	21.0 (3.8)	1.5 (4.0)	.03	.03
Control (N=329)	19.6 (3.3)	20.0 (3.6)	0.5 (4.0)		
Benefits scale (Range 7-28)					
Intervention (N=347)	19.6 (4.8)	19.3 (5.0)	-0.3 (5.2)	.70	.71
Control (N=331)	19.8 (5.1)	19.7 (5.2)	-0.1 (5.8)		
Beliefs scale (Range 4-14)					
Intervention (N=353)	10.4 (2.4)	10.5 (2.3)	0.1 (2.5)	.51	.41
Control (N=338)	10.5 (2.4)	10.4 (2.5)	-0.1 (2.6)		

* Analyses were limited to those completed survey items at both baseline and follow up.

*** p-values are comparing changes from pre- to post-intervention. Unadjusted models include random effect of school and fixed effect of intervention. Adjusted models include random effect of school and fixed effects of intervention, baseline age, sex, FRPL, and race.

Table 3
Change in Mean Percent of Students from Baseline to Follow-up and by Condition Who
Agreed or Strongly Agreed that the Perceived Barrier Interfered with Breakfast,
BreakFAST Study

Top 5 common barriers to breakfast consumption	Mean % change Control condition	Mean % change Intervention condition
It is easy for me to get school breakfast	↑ 3.95	↑ 5.49
I skip breakfast because I am not hungry in the morning	↓5.44	↓7.88
The breakfast food sold at my school tastes bad	↑6.08	↓13.79
I am too busy to eat school breakfast	↑2.43	↓7.22
School breakfast takes too much time	↑1.52	↓13.01