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Barriers, benefits and behaviors related to breakfast consumption among rural adolescents

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Abstract

Background—We sought to determine if perceived barriers, benefits, and modifiable behaviors support or interfere with breakfast consumption in a racially and economically diverse rural high school population.

Methods—The participants were 832 Minnesota adolescents from 16 rural high schools. We used baseline data from a group randomized trial aimed at increasing school breakfast participation through policy and environmental-level school changes. Students completed an online survey asking about demographics, breakfast eating behaviors, and the barriers and benefits of eating as it relates to school performance. Bivariate and multivariate logistic regression, accounting for clustering by school, was performed using SAS. Each scale was modeled independently.

Results—Participants were 9th and 10th grade students, 36% free/reduced price lunch (FRL), 30% non-white and 55% female. Breakfast skippers compared to non-breakfast skippers reported fewer school related benefits and beliefs and more barriers to eating breakfast ($p < .01$). Adjusted models revealed students reported more positive beliefs (OR= 0.78, 95%CI=0.73-0.83), more

benefits (OR=0.95, 95% CI=0.93-0.97) and fewer barriers (OR=0.85, 95% CI=0.82-0.87) and were less likely to skip breakfast.

Conclusions—Future intervention research should focus on alleviating barriers and enhancing education around the school related benefits of eating breakfast.

Keywords

adolescent; school breakfast; barriers; rural

High school students in the United States (US) are frequent breakfast skippers, contributing to suboptimal health and academic outcomes. Nearly 25% of high school students do not eat any breakfast and this has increased over time¹. Breakfast skipping behavior varies by student demographic characteristics²⁻⁴. Data from the National Health and Nutrition Examination Study (2001-2002) show that breakfast eating prevalence is highest among 2-5 year-olds (95%) dropping to 70% among 12-19 year-olds. Girls are more likely to skip breakfast than boys, reporting that skipping breakfast will allow them to lose weight.⁵⁻⁷

There is growing evidence to suggest that eating breakfast has positive health- and school-related outcomes for children and adolescents. Breakfast consumption is associated with improved cognitive function, attention, and memory,⁸ improved math testing scores and attendance⁹, and lower body mass index (BMI).¹⁰ Conversely, breakfast skipping is associated with higher BMI¹¹ and poorer nutrient intake.¹² There are some known reasons why adolescents skip breakfast. Adolescent girls report that they skip breakfast to control their weight.^{13,14} Adolescents also report skipping breakfast because they do not feel hungry in the morning or they do not have enough time to eat breakfast.¹⁵ Other reasons for breakfast skipping are not well understood, particularly those that are modifiable.

There are several weaknesses in the scientific literature on the causes and consequences of breakfast skipping behavior. First, the strength of the evidence linking weight status to breakfast skipping has been historically weak, predominantly descriptive studies, hence showing correlation but not causation.¹⁶ Studies to date linking breakfast consumption with health and academic achievement are weighted towards younger students, with less information available on adolescents in general and more specifically their perception or knowledge of the potential benefits of breakfast consumption and reducing modifiable barriers.¹⁷ Finally, the literature is sparse on breakfast consumption patterns and rationale among diverse adolescents from rural areas. These gaps limit the efficacy of current research for rural adolescents and subsequently may reduce the purported benefits of breakfast consumption as research is translated to school policy and practice. Increasing the frequency of breakfast consumption may require a multipronged approach from individual awareness to policy and environmental change.

Therefore, the purpose of this study is to provide baseline analysis, as part of a larger group randomized trial, of the association between adolescent perceived barriers and benefits of eating breakfast and skipping breakfast behavior among a racially and economically diverse rural high school population. A secondary question was if the relationship differed by sex or by weight status of the student. The literature suggests the motivations for skipping breakfast

vary between boys and girls, with the expectation that skipping breakfast will result in weight loss. This analysis will provide data on a little known population and geography. Researchers will be able to use the results of this analysis to target messaging in conjunction with school environmental changes to reduce barriers to breakfast consumption.

Methods

Participants

This analysis uses baseline data from the BreakFAST Study, a group randomized trial aimed at increasing school breakfast participation through policy and environmental-level school changes. Sixteen secondary schools in rural Minnesota were recruited to participate. Schools were randomly assigned to intervention or control conditions. All students in the 9th and 10th grade in all 16 schools present on the day of data collection (N = 5767) were asked to complete a brief screening survey. The screening survey asked student to report sex, number of days per week the student eats breakfast, student grade, if he/she is scheduled to be in class when the school day begins, skill in reading and writing English and home access to a phone and the internet. Students were eligible to enroll in the BreakFAST study if they were in 9th or 10th grade, spoke and wrote English well, had access to a phone at home, was typically in school at the beginning of the day and ate breakfast 3 days per week (N = 2512).

Of the eligible students, between 50-75 students, depending on school size, were randomly selected from each school and invited to participate in longitudinal data collection. Minority students were oversampled. Parent consent was passive and student assent was obtained at time of measurement. The final consented sample size was 904. The analytic sample for this analysis included 16 schools with 832 students because 70 students did not complete baseline survey and another 2 students did not answer the question that the outcome variable was derived from.

Instrumentation

Enrolled students completed a computer-based survey, had their height and weight measured, and completed 24-hour dietary recall. The school also provided administrative data for each student in the cohort. For this analysis, survey and anthropometric data was used. Of the enrolled students, 92% completed baseline survey.

Student height and weight were measured by trained staff at school according to established protocols, available upon request. Two staff members were present, one to measure, and one to record and verify. Height was measured in centimeters using a portable stadiometer (Infant/Child/Adult wooden ShorrBoard, Weigh and Measure, LLC (formerly Shorr Productions) Olney, Maryland) to the nearest 0.1 cm. Students were asked to remove their shoes and stand erect, head level, with their heels touching the back of the stadiometer. Height was measured twice for every student and in the event that the 2 measures differed by more than .5 centimeters, a third measurement was taken. The 2 measures within 0.5 cm were averaged. Weight was assessed using a portable scale (TBF-300) [Tanita/TBF-300/ Tanita Corporation of America, Inc. in Arlington Heights IL]. Students removed their shoes

and anything from their pockets. Students were asked to stand quietly with their arms at their sides. Each weight measurement was taken twice, and in the event that the percent body fat differed by more than 2 percentage points, a third measurement was taken. The 2 measures within 2 percentage points were averaged. BMI percentile was calculated from the height and weight data using the Centers for Disease Control and Prevention Growth Charts¹⁸ Students with BMI percentile 85% or higher were classified as overweight or obese.

The student survey was completed online at home or at school in the computer lab. The outcome variable was derived from the question, "During a normal school week, how many days per week do you skip breakfast?" The variable was dichotomized by students who reported skipping breakfast 0-2 days ('non-breakfast skippers') per week compared to 3 or more days per week ('breakfast skippers').

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. Responses for questions were in the form a Likert response, ranging from 1 (most negative category) to 4 (most positive category). Individual variables were reverse coded as necessary. Scales were calculated by summing item responses.

Breakfast beliefs were assessed using 4 questions. Students asked to report how strongly they disagree or agree (Likert scale 1-4) to the following statements: (1) Eating breakfast helps me pay attention in class; (2) I have more energy when I eat breakfast; (3) If I miss breakfast, I feel more tired in the morning; and (4) Eating breakfast helps me control my weight. Cronbach's alpha for the scale was 0.85.

Breakfast barriers were assessed by asking how strongly the student agreed with the following statements: (1) I plan to eat school breakfast most days; (2) I am too busy to eat school breakfast; (3) School breakfast costs too much; (4) Eating breakfast takes too much time; (5) The breakfast food sold at my school tastes bad; (6) It is easy for me to get school breakfast; (7) The bus arrives too late for me to get the school breakfast; (8) I am not comfortable eating in my classroom; (9) I skip breakfast because it might cause me to gain weight; and (10) I skip breakfast because I am not hungry in the morning. Cronbach's alpha for this scale was 0.62.

Students were asked what the likelihood that eating school breakfast would (1) improve math, reading and standardized test scores; (2) getting along better with your peers; (3) reducing your absences and tardiness; (4) improving your memory, attention span and problem-solving ability; (5) getting important nutrients, vitamins and minerals; (6) establishing healthy habits; and (7) maintain or reach a healthy weight. Cronbach's alpha for this scale was 0.91.

School level data were linked by student identification numbers for students who received free or reduced cost lunch (FRL), which was used as a socioeconomic marker. Students reported their race, grade and sex. Weight status and sex were independently assessed as effect modifiers and if not statistically significant ($p < .05$), were treated as a confounder.

Data Analysis

Bivariate analysis (chi-square tests and 2-sample t tests) and multivariate logistic regression, accounting for clustering by school, was performed. The unadjusted logistic regression models included random effect of school. The test for interaction by sex and by weight was done using unadjusted models. The adjusted logistic regression models included random effect of school and fixed effects of sex, grade, race, FRL, and weight status if the test for interaction was not statistically significant. Each scale was modeled independently. All analysis was performed using Statistical Analysis Software (version 9.3, SAS Institute Inc., Cary, NC). A 2-tailed p-value < .05 was considered statistically significant.

Results

Data were available on 832 students. The participants were 9th and 10th grade students from 16 rural Minnesota schools, 55% female, 36% receiving FRL and racially diverse (30% non-white). Thirty-six percent of the students were classified as overweight or obese. Bivariate analysis revealed no statistical differences in sociodemographic characteristics and breakfast skipping (breakfast <3 days per week). Individual scale items and scales are shown in Table 1. There is a consistent pattern of statistical difference between breakfast skippers and non-breakfast skippers across most individual items. Subsequently, the scales also revealed statistical differences. Breakfast skippers compared to non-breakfast skippers reported fewer school related benefits and beliefs and more barriers to eating breakfast ($p < .01$, Table 1).

Student sex and weight status were independently assessed as effect modifiers of the relationship between beliefs, barriers and benefits scales and breakfast skipping. Neither sex nor weight status was a statistically significant effect modifier. Therefore, sex and weight status were included as potential confounders in subsequent models.

Beliefs, barriers and benefits scales were each assessed individually (not mutually adjusted). Adjusted models including random effects of school and fixed effects of sex, race, grade, FRL and weight status. The adjusted model revealed students who reported more positive beliefs (OR=0.78, 95% CI=0.73-0.83), more benefits (OR=0.95, 95% CI=0.93-0.97) and less barriers (OR=0.85, 95% CI=0.82-0.87) were less likely to be breakfast skippers (Table 2).

Discussion

Breakfast consumption patterns, or breakfast skipping, among rural adolescents may in fact have a complex underlying cause. According to the findings from this analysis, rural adolescents who skip breakfast 3 or more days per week report more barriers to eating school breakfast and are less likely to report the potential positive benefits of consuming breakfast on their academic, social and overall health status compared to students who skip breakfast 0-2 times per week.

The barriers to breakfast consumption reported here are consistent with what is observed in the literature to date. Girls skip breakfast as a strategy to lose weight.¹³ Yet, breakfast skipping is not an effective strategy for losing weight. Meal skipping often results in higher caloric intake later in the day, preventing weight loss and even weight gain. In obese adult

breakfast-skippers, simply adding breakfast to their daily routine resulted in lowered dietary fat intake and reduced impulse eating.¹⁹ A similar pattern is seen in adolescents. Adolescents who skip breakfast tend to eat more snacks between meals, have lower micronutrient content and consume more alcohol and sucrose compared to those who eat breakfast regularly.²⁰ A second common reason for not eating breakfast supported in our results is that adolescents are not hungry in the morning or do not have enough time to eat breakfast.¹⁵ Sleep is a priority for this age group. According to the National Sleep Foundation, adolescents need 8-10 hours per sleep each night, but only 15% report sleeping 8-1/2 hours on school nights.²¹ Although in a slightly younger age category, experimental evidence showed that less sleep resulted in higher food intake compared to more sleep.²² Rural students also may face longer commute time to school in the morning adding additional time constraints. In our sample, 62% reported getting to school by car. Twenty-three percent agreed that their bus arrives too late to get the school breakfast.

Other perceived barriers to breakfast consumption included cost, food quality and stigma. The School Nutrition Association reported the most common way in which school breakfast programs have been altered to address barriers is to provide grab-n-go breakfast option,²³ but it is not yet widely implemented.²⁴ Not all students who qualify for free or reduced cost meals receive them. In the current sample, approximately one-third of the students receive free or reduced cost meals. It is not known how many of the students qualify and do not receive, but data on rural areas show higher rates of poverty and school meal eligibility.²⁵ Normalizing school breakfast by making it a school wide offering helps reduce stigma, particularly in low-income schools.

Reddan, Wahlstrom, and Reicks assessed child (4th-, 5th- and 6th-grade students) perceived benefits and barriers to eating breakfast in schools that offered universal school breakfast compared to schools that did not.¹⁵ The pilot intervention was parents and teachers encouraging the children to eat school breakfast and education about the positive effects of eating breakfast. The children in the schools with universal school breakfast reported more positive benefits of eating breakfast, including reporting having more energy and being better able to pay attention in class. These children also reported higher weekly breakfast consumption. We saw a similar pattern in the present study. Adolescents who ate breakfast more frequently reported higher positive beliefs, including paying attention in class and more energy. Although correlational, the evidence appears consistent through middle and high school that those who eat breakfast more frequently report higher benefits of breakfast consumption.

Students in the present study were also asked about the likelihood that eating school breakfast would improve academic skills (eg, test scores, memory), improve social interaction (eg, get along better with peers) and overall health (eg, achieve adequate nutrients, reach a healthy weight). Again, adolescents who ate breakfast more frequently reported a higher likelihood that eating breakfast would have more positive school, social and health outcomes. This is particularly noteworthy given the study sample. One-third of the students participating are low-income, one-third are racial/ethnic minorities and all are from rural communities. Each of these categories (low-income, racial/ethnic minority, rural) is associated with lower academic achievement and poorer health outcomes compared to the

dominant population. There is an important opportunity to determine, through experimental studies, whether increasing the co-occurrence of breakfast consumption by way of reducing barriers and increasing knowledge of potential benefits of breakfast consumption will in actuality improve school, social and health outcomes.

Limitations

Surprisingly, there was no interaction by sex or by weight category. It is possible that the use of scales, in particular the barriers scale with a Cronbach's alpha of 0.62, had too much internal variability to detect the expected differences by males and females. Other limitations are that the data are cross-sectional. However, these data represent baseline associations as part of a larger group randomized trial aimed at reducing environmental barriers and increasing student positive perceptions of eating breakfast. Future analysis will help ascertain the validity of our conclusions once the longitudinal and experimental data are available. Finally, breakfast skipping behavior was self-reported and based on a typical week. It is possible that student under or overestimate breakfast consumption patterns, particularly among those who do not routinely eat or not eat breakfast daily. There may also be weekly or seasonal variation. It is not expected that there is any systematic bias in breakfast consumption reporting between school or the treatment arms.

Conclusions

In conclusion, there is a dearth of research on rural adolescents. The results from this paper indicate a need to address barriers and misaligned perceptions of the relationship between school breakfast consumption and school, social and health outcomes. Much of the data to date is observational, as is the current study. A carefully done intervention study is necessary to ascertain if observed associations to date are in fact mutable and achieve the expected school, social and health benefits for students. There is a unique opportunity to address one factor – breakfast consumption – that will simultaneously improve life changes for low-income, racial/ethnic minority and rural adolescents. Access to the School Breakfast Program has been a neglected area of research. The BreakFast study was designed for this purpose specifically and these baseline findings support the need for testing interventions aimed at increasing school breakfast participation.

Implications for School Health

Compelling evidence suggests that breakfast consumption, particularly participation in the school breakfast program, has positive effects on both health and academic achievement. This cross sectional analysis, baseline data of a group randomized trial to increase breakfast participation through policy and environmental change, support the need to address real and perceived barriers to breakfast consumption as well as emphasize benefits to adolescents. It is clear from these results that children who skip breakfast also report that school breakfast is not easy to obtain, their bus arrives late which prohibits breakfast consumption, and school breakfast does not taste good. Contrarily, students who eat breakfast regularly report more positive social, academic and positive health outcomes. These results provide an important opportunity for school to alter actual and perceived factors that limit school

breakfast consumption, particularly in student populations at greater risk for health and academic challenges.

Human Subjects Approval Statement

The University of Minnesota Institutional Review Board approved study procedures.

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Table 1
Study Sample Description and Bivariate Comparison of Sample Characteristics, Beliefs, Benefits and Barriers With Breakfast Skipping Behavior among Rural Adolescents. The BreakFAST Study. 2013-14

	Skip breakfast			p value
	Overall (N = 832)	0-2 days (N = 420)	3 days or more (N = 412)	
SES, N (column %)				
free/reduced	302 (36%)	155 (37%)	147 (36%)	.73
full priced	529 (64%)	265 (63%)	264 (64%)	
Race, N (column %)				
white	558 (70%)	277 (69%)	281 (71%)	.60
nonwhite	236 (30%)	122 (31%)	114 (29%)	
Grade, N (column %)				
9	407 (49%)	215 (51%)	192 (47%)	.19
10	425 (51%)	205 (49%)	220 (53%)	
Sex, N (column %)				
female	458 (55%)	233 (55%)	225 (55%)	.80
male	374 (45%)	187 (45%)	187 (45%)	
Weight categories, N (column %)				
underweight	22 (3%)	13 (3%)	9 (2%)	.10
normal	508 (62%)	269 (65%)	239 (58%)	
overweight/obese	296 (36%)	135 (32%)	161 (39%)	
Weight categories, N (column %)				
underweight/normal	530 (64%)	282 (68%)	248 (61%)	.04
overweight/obese	296 (36%)	135 (32%)	161 (39%)	
breakfast beliefs scale				
N	808	407	401	<.0001
Mean (SD)	10.4 (2.5)	11.1 (2.3)	9.7 (2.4)	
Median	11	11	10	
Range	4 – 16	4 – 16	4 – 16	
breakfast barriers scale				
N	797	400	396	<.0001
Mean (SD)	19.6 (3.7)	20.6 (3.5)	18.6 (3.6)	
Median	20	21	19	
Range	9 – 30	10 – 30	9 – 29	
breakfast benefits scale				
N	801	403	397	.0002

	Skip breakfast			
	Overall (N = 832)	0-2 days (N = 420)	3 days or more (N = 412)	p value
Mean (SD)	19.5 (5.0)	20.2 (4.8)	18.9 (5.0)	
Median	20	21	19	
Range	7 – 28	7 – 28	7 – 28	

Belief Scale Items		Overall	Skip breakfast 0-2 days	Skip breakfast 3 days or more	p value
Eating breakfast helps me pay attention in class	Strongly Disagree	46 (5.7%)	12 (2.9%)	34 (8.5%)	<.001
	Disagree	254 (31.4%)	88 (21.6%)	166 (41.4%)	
	Agree	415 (51.4%)	238 (58.5%)	177 (44.1%)	
	Strongly agree	93 (11.5%)	69 (17.0%)	24 (6.0%)	
I have more energy when I eat breakfast	Strongly Disagree	35 (4.3%)	11 (2.7%)	24 (6.0%)	<.001
	Disagree	198 (24.5%)	60 (14.7%)	138 (34.4%)	
	Agree	451 (55.8%)	248 (60.9%)	203 (50.6%)	
	Strongly agree	124 (15.3%)	88 (21.6%)	36 (9.0%)	
If I miss breakfast, I feel more tired in the morning	Strongly Disagree	50 (6.2%)	20 (4.9%)	30 (7.5%)	<.001
	Disagree	308 (38.1%)	111 (27.3%)	197 (49.1%)	
	Agree	352 (43.6%)	213 (52.3%)	139 (34.7%)	
	Strongly agree	98 (12.1%)	63 (15.5%)	35 (8.7%)	
Eating breakfast helps me control my weight	Strongly Disagree	94 (11.6%)	35 (8.6%)	59 (14.7%)	0.001
	Disagree	431 (53.3%)	205 (50.4%)	226 (56.4%)	
	Agree	250 (30.9%)	146 (35.9%)	104 (25.9%)	
	Strongly agree	33 (4.1%)	21 (5.2%)	12 (3.0%)	

Barriers Scale Items		Overall	Skip breakfast 0-2 days	Skip breakfast 3 days or more	p value
I am too busy to eat school breakfast	Strongly Disagree	100 (12.6%)	51 (12.8%)	49 (12.4%)	<.001
	Disagree	338 (42.5%)	211 (52.8%)	127 (32.1%)	
	Agree	261 (32.8%)	112 (28.0%)	149 (37.6%)	
	Strongly agree	97 (12.2%)	26 (6.5%)	71 (17.9%)	
School breakfast costs too much	Strongly Disagree	156 (19.6%)	71 (17.8%)	85 (21.5%)	.208
	Disagree	436 (54.8%)	234 (58.5%)	202 (51.0%)	
	Agree	152 (19.1%)	71 (17.8%)	81 (20.5%)	
	Strongly agree	52 (6.5%)	24 (6.0%)	28 (7.1%)	
Eating school breakfast takes too much time	Strongly Disagree	101 (12.7%)	57 (14.3%)	44 (11.1%)	<.001
	Disagree	381 (47.9%)	220 (55.0%)	161 (40.7%)	
	Agree	261 (32.8%)	107 (26.8%)	154 (38.9%)	
	Strongly agree	53 (6.7%)	16 (4.0%)	37 (9.3%)	
The breakfast food sold at my school tastes bad	Strongly Disagree	43 (5.4%)	20 (5.0%)	23 (5.8%)	.005
	Disagree	353 (44.3%)	200 (50.0%)	153 (38.6%)	
	Agree	273 (34.3%)	130 (32.5%)	143 (36.1%)	

Barriers Scale Items		Overall	Skip breakfast 0-2 days	Skip breakfast 3 days or more	p value
	Strongly agree	127 (16.0%)	50 (12.5%)	77 (19.4%)	
It is easy for me to get school breakfast	Strongly Disagree	51 (6.4%)	17 (4.3%)	34 (8.6%)	.001
	Disagree	187 (23.5%)	84 (21.0%)	103 (26.0%)	
	Agree	477 (59.9%)	246 (61.5%)	231 (58.3%)	
	Strongly agree	81 (10.2%)	53 (13.3%)	28 (7.1%)	
The bus arrives too late for me to get the school breakfast	Strongly Disagree	192 (24.1%)	95 (23.8%)	97 (24.5%)	.009
	Disagree	425 (53.4%)	233 (58.3%)	192 (48.5%)	
	Agree	128 (16.1%)	49 (12.3%)	79 (19.9%)	
	Strongly agree	51 (6.4%)	23 (5.8%)	28 (7.1%)	
I am not comfortable eating in my classroom	Strongly Disagree	166 (20.9%)	81 (20.3%)	85 (21.5%)	.420
	Disagree	420 (52.8%)	222 (55.5%)	198 (50.0%)	
	Agree	167 (21.0%)	76 (19.0%)	91 (23.0%)	
	Strongly agree	43 (5.4%)	21 (5.3%)	22 (5.6%)	
I skip breakfast because it might cause me to gain weight	Strongly Disagree	264 (33.2%)	139 (34.8%)	125 (31.6%)	<.001
	Disagree	409 (51.4%)	222 (55.5%)	187 (47.2%)	
	Agree	83 (10.4%)	27 (6.8%)	56 (14.1%)	
	Strongly agree	40 (5.0%)	12 (3.0%)	28 (7.1%)	
I skip breakfast because I am not hungry in the morning	Strongly Disagree	89 (11.2%)	68 (17.0%)	21 (5.3%)	<.001
	Disagree	262 (32.9%)	181 (45.3%)	81 (20.5%)	
	Agree	323 (40.6%)	124 (31.0%)	199 (50.3%)	
	Strongly agree	122 (15.3%)	27 (6.8%)	95 (24.0%)	

Benefit Scale Items		Overall	Skip breakfast 0-2 days	Skip breakfast 3 days or more	p value
...improving your math, reading and standardized test scores	Very likely	130 (16.3%)	73 (18.1%)	57 (14.4%)	.516
	Somewhat likely	448 (56.0%)	223 (55.3%)	225 (56.7%)	
	Somewhat unlikely	147 (18.4%)	70 (17.4%)	77 (19.4%)	
	Not at all likely	75 (9.4%)	37 (9.2%)	38 (9.6%)	
...getting along better with your peers	Very likely	125 (15.6%)	74 (18.4%)	51 (12.8%)	.001
	Somewhat likely	340 (42.5%)	188 (46.7%)	152 (38.3%)	
	Somewhat unlikely	221 (27.6%)	93 (23.1%)	128 (32.2%)	
	Not at all likely	114 (14.3%)	48 (11.9%)	66 (16.6%)	
...reducing your absences and tardiness	Very likely	96 (12.0%)	59 (14.6%)	37 (9.3%)	.010
	Somewhat likely	231 (28.9%)	125 (31.0%)	106 (26.7%)	
	Somewhat unlikely	253 (31.6%)	125 (31.0%)	128 (32.2%)	
	Not at all likely	220 (27.5%)	94 (23.3%)	126 (31.7%)	
...improving your memory, attention span and problem-solving ability	Very likely	169 (21.1%)	98 (24.3%)	71 (17.9%)	.006
	Somewhat likely	412 (51.5%)	212 (52.6%)	200 (50.4%)	
	Somewhat unlikely	139 (17.4%)	53 (13.2%)	86 (21.7%)	
	Not at all likely	80 (10.0%)	40 (9.9%)	40 (10.1%)	
...getting important nutrients, vitamins and minerals	Very likely	312 (39.0%)	168 (41.7%)	144 (36.3%)	.038

Benefit Scale Items		Overall	Skip breakfast 0-2 days	Skip breakfast 3 days or more	p value
	Somewhat likely	364 (45.5%)	187 (46.4%)	177 (44.6%)	
	Somewhat unlikely	76 (9.5%)	29 (7.2%)	47 (11.8%)	
	Not at all likely	48 (6.0%)	19 (4.7%)	29 (7.3%)	
...maintaining or reaching a healthy weight	Very likely	194 (24.3%)	109 (27.0%)	85 (21.4%)	.001
	Somewhat likely	374 (46.8%)	198 (49.1%)	176 (44.3%)	
	Somewhat unlikely	156 (19.5%)	72 (17.9%)	84 (21.2%)	
	Not at all likely	76 (9.5%)	24 (6.0%)	52 (13.1%)	
...establishing healthy habits	Very likely	245 (30.6%)	139 (34.5%)	106 (26.7%)	.004
	Somewhat likely	369 (46.1%)	191 (47.4%)	178 (44.8%)	
	Somewhat unlikely	126 (15.8%)	50 (12.4%)	76 (19.1%)	
	Not at all likely	60 (7.5%)	23 (5.7%)	37 (9.3%)	

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Table 2
Logistic Regression Analysis of the Association between Beliefs, Benefits and Barriers
Related to School Breakfast Consumption and Breakfast Skipping Behavior among Rural
Adolescents. The BreakFAST Study. 2013-14

	Unadjusted models*		Adjusted models**	
	OR (95% CI)	P value	OR (95% CI)	P value
breakfast beliefs scale	0.78 (0.74, 0.83)	<.0001	0.78 (0.73, 0.83)	<.0001
breakfast barriers scale	0.86 (0.82, 0.89)	<.0001	0.85 (0.82, 0.87)	<.0001
breakfast benefits scale	0.95 (0.93, 0.97)	<.0001	0.95 (0.93, 0.97)	<.0001

* Unadjusted models include random effect of school.

** Adjusted models include random effect of school and fixed effects of sex, race, grade, frl, and weight categories (2 categories).