

The Relationship Between Middle-School Children's Body Mass Index,

School Lunch Participation and Consumption

BACKGROUND

- One in five US school-aged children is obese.¹
- The National School Lunch program accounts for about 1/3 of total daily calories for children.²
- Previous research on obesity and school-lunch consumption has not included middle school,³⁻⁵ an important time to establish lifestyle habits that persist into adulthood.

OBJECTIVE

To explore the relationship between school-lunch participation and consumption with child body mass index (BMI).

METHODS

- Secondary analysis of data from middle-school students in Birmingham, AL.
- Child weight and height were measured to calculate BMI and categorized based on BMI-for-age percentiles.⁶
- School lunch participation was categorized as usual participant (UP, 3~5 days/ week) & non-usual participants (UNP, 0~2 days/ week)
- At pre- and post-lunch, researchers weighed and photographed school-lunch trays for 5 consecutive weekdays to capture amounts in grams.
 - "Offer-versus-serve" was available so students could refuse some meal components.

Pre-lunch weighing



Post-lunch weighing



Free and Reduced Lunch Eligibility Percentages
County A: 33-94% (5 schools)
County B: 58-92% (4 schools)
County C: 15-73% (3 schools)
County D: 54% (1 school)
County E: 95% (1 school)
County F: 7% (1 school)

RESULTS

Table 1. Characteristics of participants (n=288)

Characteristic	Category	Value
Child sex	Male	133 (46.2%)
	Female	155 (53.8%)
Child age	12.1 ±0.4 (range: 11.1-13.7) years	
Child race/ethnicity	White	104 (36.1%)
	African American	134 (46.5%)
	Hispanic/Latino	27 (9.4%)
	Other	15 (5.2%)
BMI Category ⁶	Underweight (<5 th percentile)	5 (1.7%)
	Healthy Weight (≤5 th percentiles <85 th)	131 (45.7%)
	Overweight (≥85 th percentiles <95 th)	55 (19.2%)
	Obese (≥95 th percentile)	96 (33.4%)
Family income (\$/year)	<20,000	22.9%
	20,000~40,000	22.9%
	40,000~60,000	14.7%
	60,000-90,000	13.9%
	>90,000	25.7%

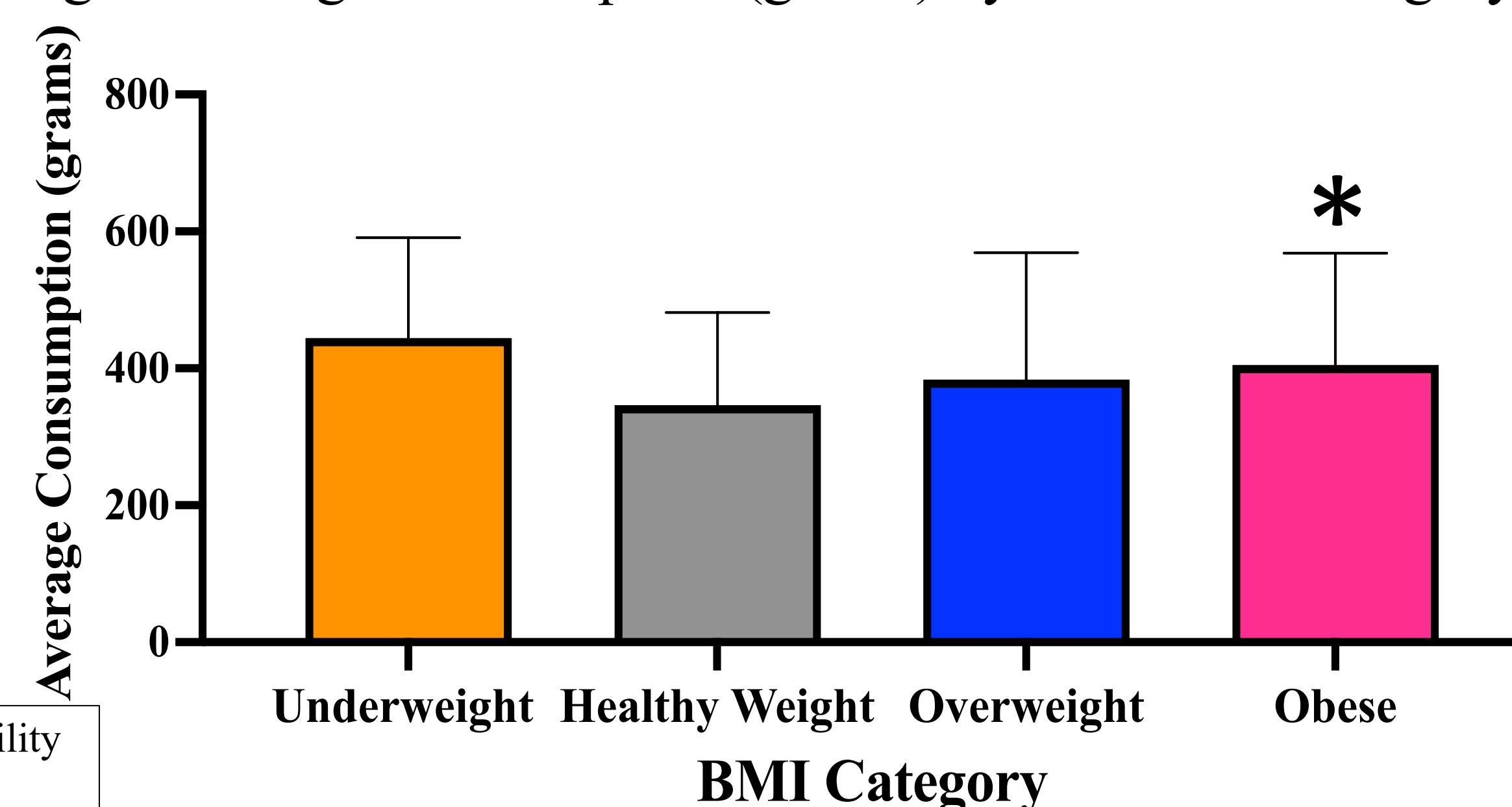
Table 2. Mixed-effects regression results with BMI as the dependent variable

Variable	β	P-value	Reference Group	
Average Consumption (grams)	1.82	0.0001*		
School Lunch Participation (Non-usual participation)	0.35	0.74	Usual Participation	
Age	-0.41	0.37		
Gender (Male)	0.0004	0.99	Female	
Child Race/ethnicity	African American	1.05	0.36	White
	Hispanic/Latino	2.76	0.11	
	Others	2.37	0.22	
Family Income (\$/year)	<20,000	2.16	0.12	>90,000
	20,000~40,000	3.76	0.01	
	40,000~60,000	1.12	0.45	
	60,000-90,000	1.49	0.32	

Note: Average Consumption (grams)=average of pre-weight – post-weight

- Mixed-effects regression explored BMI with school lunch participation and average consumption of school lunch as independent variables using standardized analysis. Age, gender, race/ethnicity, family income as fixed effects and school site as a random effect. (*p-value<0.001)

Fig. 1 Average Consumption (grams) by child BMI category



- Bars show Mean ± SD of average consumption of school lunch in grams. ANOVA with multiple comparisons using healthy weight group as reference. (*p-value<0.05)

CONCLUSIONS

- School-lunch consumption was positively related with BMI and obesity risk among middle school children. More grams of lunch were consumed as BMI increased.
- Future analyses will assess association of energy intake and food groups at school lunch with BMI and BMI category.

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