

Does Healthy BMI Mean Healthy Lifestyle? A Cross-Sectional Analysis of Nutrition and Physical Activity in Normal Weight Adolescents Versus Overweight and Obese Adolescents

Background:

- In the setting of increasing rates of adolescent obesity, recent evidence suggests that adolescents fall far below federal recommendations for daily fruit and vegetable intake as well as daily aerobic exercise
- The primary care setting is one potential source of nutrition and exercise education
- The American Academy of Pediatrics' Committee on Nutrition 2003 policy statement recommends annual screening for obesity with body mass index measurements, routine promotion of physical activity, healthy nutrition behaviors, limitation of screen time to 2 hours or less per day, and physician monitoring of risk factor development for both obesity and for obesity-related comorbidities
- Despite these recommendations, the overall rate of counseling around nutrition and exercise for adolescents in the primary care setting is exceedingly low (18.1% and 22% respectively) and those who do receive counseling are more likely to be obese than normal weight
- Hence, the majority of efforts have tended to focus on secondary and tertiary prevention rather than primary prevention:
 - Implied underlying assumption:** adolescents with normal BMI engage in healthier eating and exercise behaviors in comparison to those who are overweight and obese.

Research Objective:

- To assess if adolescents with normal BMI engage in significantly healthier eating and exercise behaviors in comparison to those who are overweight and obese (null hypothesis)
- First study to our knowledge to attempt such a comparison; prior studies have only reported on overall diet and exercise patterns amongst adolescents collectively or amongst adolescents who are specifically overweight or obese

Methods:

- Study Design:** The data used for this study were obtained from the cross-sectional 2010 National Youth Physical Activity and Nutrition Study (NYPANS)
- Subjects:** Adolescents across all 50 states enrolled in grades 9-12 within US high schools (both public and private), Total n=11,429
- Exposure Variables:** 1) Normal Weight Status: Defined as BMI equal to 5th-85th percentile (n=6001); 2) Overweight or Obese Status: Defined as BMI ≥ 85th percentile (n=3767)
- Binary Outcome Variables:**
 - Exercise:
 - ≥ 5days/week of ≥ 60 minutes physical activity (vs < 5days/week)
 - ≥ 5days/week of ≥ 20 minutes aerobic physical activity (vs < 5days/week)
 - Diet:
 - Mean number of cups of X consumed per day (Possible values for X= fruits; vegetables)
 - Mean number of times X consumed in the past week (Possible Values for X = fruits; vegetables; fried potatoes; pizza; soda; other sugar-sweetened beverage)
- Statistical Analysis:** SPSS statistical software used to conduct chi square analyses and multiple logistic regressions. Regression analyses included adjustment for potential confounder variables of race, gender, and grade

Major Findings:

Table 1: Demographic characteristics of the study population

	BMI 5-85%		BMI >85%	
Demographic Category	n (% within demographic category)	(95% CI)	n (% within demographic category)	(95% CI)
Total (n=9768)	6001(62.3)	(59.9,64.7)	3767(37.7)	(39.4,40.1)
Gender				
Male	3147(63.7)	(60.8,66.6)	1822(36.3)	(33.4,39.2)
Female	2854(60.9)	(58.2,63.6)	1945(39.1)	(36.4,41.8)
Race				
White	2446(65)	(61.5, 68.5)	1311(35)	(31.5,38.5)
Black	1239(57.5)	(53.8, 61.2)	911(42.5)	(38.8,46.2)
Hispanic	1769(57.1)	(54.7,59.5)	1238(42.9)	(40.5,45.3)
Other*	457(64.4)	(60.3,68.9)	255(35.6)	(31.3,39.9)
High school Grade				
9 th	1549(59.2)	(55.3,63.1)	1018(40.8)	(36.9,44.7)
10 th	1526(63.8)	(59.5,68.1)	940(36.2)	(31.9,40.5)
11 th	1440(62.5)	(59.0,66.0)	935(37.5)	(34.0,41.0)
12 th	1468(62.3)	(57.8, 66.8)	866(35.7)	(31.2,40.2)

*Includes American Indian, Alaskan Native, Native Hawaiian or Other Pacific Islander

Table2: Physical Activity in Adolescents Across BMI status, Gender, Race, & High School Grade

Category	n (% within category)	p-value	Adjusted OR (95% CI)***
BMI Status			
Normal (5-85%)	2841(51.3)	<0.0001	1.342(1.149-1.568)
Overweight or Obese (>85%)**	1548(43.9)		

Gender			<0.0001	
	Male	2768(58.2)		2.274(1.928-2.682)
	Female**	1796(37.6)		
Race			<0.0001	
	White**	1970(51.6)		
	Black	916(43)		0.939(0.709-1.243)
	Hispanic	1282(42.7)		0.924(0.694-1.229)
	Other*	328(45)		1.325(1.004-1.749)
Grade			<0.0001	
	9 th	1300(54.5)		1.739(1.370-2.207)
	10 th	1169(49)		1.338(1.172-1.526)
	11 th	1080(45.5)		1.148(0.989-1.332)
	12 ^{th**}	998(41.8)		
			p-value	Adjusted OR (95% CI)***
	≥ 5 days/past week of			
	≥ 20 minutes of physical activity			
Category	n (% within category)			
BMI Status			<0.0001	
	Normal (5-85%)	2698(47.7)		1.298(1.098-1.535)
	Overweight or Obese (>85%)**	1470(40.8)		
Gender			<0.0001	
	Male	2662(54.7)		2.272(1.999-2.582)
	Female**	1658(34.4)		
Race			0.072	
	White**	1848(47.6)		
	Black	859(40.8)		0.994(0.753-1.285)
	Hispanic	1249 (41.9)		1.017(0.706-1.466)
	Other*	301(41.1)		1.277(1.044-1.562)
Grade			<0.0001	
	9 th	1223(49.8)		1.641(1.282-2.099)
	10 th	1122(47.2)		1.459(1.231-1.728)
	11 th	1024(41.9)		1.140(0.933-1.392)
	12 ^{th**}	933(38.6)		

*Includes American Indian, Alaskan Native, Native Hawaiian or Other Pacific Islander

**Denotes Reference Group in Odds Ratio Calculations

*** OR adjusted for race, gender, and grade

Table 3: Food Consumption Behavior in Normal Weight Versus Overweight and Obese Adolescents

Eating Behaviors	Overall Mean Estimate	Mean Estimate for Normal BMI (5-85%) Adolescents	Mean Estimate for Overweight and Obese Adolescents (BMI>85%)	Unadjusted p-value	p-value adjusted for race, gender, grade
Number of times fruit eaten during the past week	3.44	3.43	3.45	0.628	0.525
Number of times vegetables eaten during the past week	2.92	2.95	2.88	0.059	0.151
Number of cups of fruit eaten per day	3.33	3.35	3.3	0.323	0.349
Number of cups of vegetables eaten per day	2.91	2.93	2.87	0.107	0.324
Number of times French fries or fried potatoes eaten during the past week	2.23	2.27	2.16	0.002	<0.001
Number of times pizza eaten during the past week	2.02	2.05	1.96	<0.0001	<0.001
Number of times can, glass, or bottle of soda during drank during the past week	2.69	2.71	2.65	0.198	0.101
Number of times can, glass, or bottle of SSB* drank during the past week	2.39	2.39	2.39	0.943	0.878

*SSB = sugar sweetened beverage

Explanations for Findings:

- For normal weight adolescents, participating in a greater amount of physical activity requires a higher caloric intake in order to maintain their energy balances (though not in the form of energy-dense nutrition-poor foods as these results suggest)

And/Or..

- Normal weight adolescents interpret their healthy weight status as being immune to the impact of less nutritious food which is dangerous considering the long-term consequences that include adult obesity and related complications

Limitations:

- Cross-sectional data
- Absence of SES variable; since SES alludes to various economic and geographic determinants of access to and participation in healthy nutrition and physical activity, SES represents a possible confounder that could not be assessed
- Data was obtained via self-report which potentially makes it subject to recall bias and overestimation of healthy behaviors.

Next Steps:

- Overarching gap in nutritional knowledge and/or implementation of that knowledge for adolescents at large, regardless of weight status
- Address providers' barriers to diet and exercise counseling such as perceived lack of effectiveness with larger randomized studies on the impact of diet and exercise counseling on nutrition and physical activity behaviors, regardless of weight status