



Published in final edited form as:

Clin Pediatr (Phila). 2015 June ; 54(7): 693–696. doi:10.1177/0009922815574080.

Emotional Health Predicts Changes in Body Mass Index (BMI-z) Among Black and Latino Youth

Maryam M. Jernigan, PhD¹, Lisa Rosenthal, PhD², Amy Carroll-Scott, PhD, MPH^{3,4}, Susan M. Peters, APRN, MPH³, Catherine McCaslin, PhD⁵, and Jeanette R. Ickovics, PhD³

¹Yale School of Medicine, New Haven, CT, USA

²Pace University, New York, NY, USA

³Yale School of Public Health, New Haven, CT, USA

⁴Drexel School of Public Health, Philadelphia, PA, USA

⁵New Haven Public Schools, New Haven, CT, USA

Introduction

Childhood obesity is a complex and multifaceted health problem linked to elevated risk for chronic diseases, such as diabetes, cancer, hypertension, and cardiovascular disease.^{1,2}

Although research has increased dramatically in the past 2 decades, questions regarding factors driving overweight and obesity remain, particularly among youth of color who experience disproportionate rates of obesity and comorbid health conditions.³ Adolescence is a critical period in the developmental trajectory,⁴ in part because overweight and obese adolescents are more likely to remain overweight and/or obese in adulthood.³

Overweight and obesity have been associated with adverse symptoms and intra- and interpersonal psychological, social, and emotional issues that continue into adulthood, including depression and anxiety, social withdrawal, feeling worthless, lower self-esteem, and behavioral problems.^{5–7} Poor mental health may lead to increases in weight due to fluctuations in appetite, obesogenic behaviors (eg, overeating) to cope with negative mood, sedentary behavior, and increased isolation.⁸ Chronic stress or experiences of discrimination may also influence physiology and behaviors that affect weight gain.⁹ On the other hand,

Corresponding Author: Maryam M. Jernigan, Department of Psychiatry, Yale University School of Medicine, 301 Cedar St, 2nd Floor, New Haven, CT 06520, USA. maryam.jernigan@yale.edu.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author Contributions

MMJ conducted statistical analyses and literature searches, wrote the first draft of the manuscript, and incorporated all revisions from co-authors into the final version of the manuscript. LR conducted statistical analyses and contributed to interpretation of results. ACS contributed to analytic plan and interpretation of results. SMP served as the Director of school initiatives for the research team, contributed to the study design, and served as a liaison to the school-based study sites. CMC served as the Director the Dept. of Research, Assessment, and Student Information for the school district where the study was conducted. She contributed study measurement, data collection, and served as a liaison for study sites. JRI is Principal Investigator and was responsible for study conceptualization, design, funding, and oversight. All authors provided feedback on multiple versions of the manuscript and contributed to and have approved the final version of the manuscript.

increased body mass index (BMI) could result in adverse emotional outcomes over time due to weight-based stigma, bullying, or poor self-esteem.^{5,6}

The few longitudinal studies that have examined the association between emotional health and physical health outcomes have primarily taken a narrow focus of mental health symptoms (e.g., only examining depression)¹⁰ or behavioral concerns (e.g., conduct).¹¹ Physical outcomes, including BMI, were often collected by self-report¹² and/or retrospectively.¹³ Furthermore, they have been limited to predominantly White samples of older adolescents or adults.^{12,13}

Persistent racial and ethnic disparities in overweight and obesity further complicate research as well as clinical prevention and intervention efforts. Black and Latino youth experience disproportionate levels of overweight and obesity beginning as early as preschool and are more likely to remain obese as adults compared with Whites.¹⁴ Blacks and Latinos also are at disproportionate risk for multiple negative health conditions associated with overweight and obesity, such as diabetes.^{14,15} Reasons for such disparities remain poorly understood and understudied.

Although emotional health has been associated with weight in both adults and youth,¹⁶ prior research has been limited to cross-sectional studies.¹⁷ Longitudinal, prospective designs are critical to explicate the association between emotional health and BMI among Black and Latino youth. The primary objective of this study is to examine whether negative emotional symptoms prospectively predict increases in BMI *z*-scores (BMI-*z*) across 2 years among a sample of predominantly Black and Latino, urban youth. We hypothesize that more negative emotional symptoms measured at baseline (grades 5 and 6) would predict increases in BMI-*z* scores 2 years later. Results can inform programs and interventions aimed at reducing obesity in youth of color.

Methods

Data are from a longitudinal health study among preadolescent students in 12 randomly selected public schools in an urban area in New England. The study was approved by the Yale University Human Subjects Committee and the Board of Education where the study was conducted. All participants provided parental consent and child assent, obtained in English or Spanish.

Participants

Wave I of the study (Fall 2009), included students in grades 5 and 6. Wave 2 (Fall 2011) included the same students then in grades 7 and 8. These analyses included 767 students who completed survey and physical measures during both waves of data collection. Descriptive statistics of the study sample are in Table 1.

Procedure

In both 2009 and 2011, trained research staff read questions aloud to participants; students entered responses into online surveys on a desktop computer. Trained research assistants

took physical measures. The school district provided sociodemographic data. A small incentive (eg, water bottle) was provided on completion.

Measures

Main Predictor: Emotional Symptoms—During Wave 1, participants completed a measure adapted from the World Health Organization Health Behaviour in School-Aged Children⁸ survey to assess negative emotional symptoms. Participants indicated how often they experienced certain symptoms in the past 6 months, including 10 items such as feeling sad, feeling nervous, and having difficulty getting to sleep on a scale of 1 (*About every day*) to 5 (*Rarely or never*). Items were all reverse-scored, and a mean was calculated, so that higher scores indicate greater frequency of negative emotional symptoms (Cronbach's $\alpha = .78$)

Sociodemographic Characteristics—Sociodemographic characteristics were obtained from the school district, including age, gender, race/ethnicity, and eligibility for free or reduced price lunch (used as a proxy for socioeconomic status—a common practice with noted limitations).⁹ These were included in all analyses as control variables.

Outcome Variable: BMI-z Scores—During both waves of data collection, participants' height and weight were taken according to the World Health Organization Expanded STEPS protocol to calculate BMI (kg/m^2)⁸. Based on the guidelines established by the Centers for Disease Control and Prevention, age- and gender-adjusted BMI-z scores were calculated.¹⁸

Data Analysis

A regression analysis was conducted using SAS 9.2 PROC SURVEYREG, controlling for school clustering, BMI-z score at Wave 1, gender, age, race/ethnicity, eligibility for free or reduced price lunch, and change in height from Wave 1 to Wave 2. Negative emotional symptoms at Wave 1 was the main predictor variable, and BMI-z score at Wave 2 was the outcome variable; thus, this analysis modeled change in BMI-z score from Wave 1 to Wave 2.

Results

The analytic sample ($N = 767$) was 55% female. Mean age at Wave 1 was 10.87 ($SD = 0.73$). Approximately 47% identified as Latino and 39% as Black. More than 90% of the sample qualified for free or reduced price lunch. There was a mean score of 1.96 ($SD = 0.84$) on the negative emotional symptoms measure, indicating experiencing symptoms monthly, on average. Mean BMI-z score was 0.80 ($SD = 1.14$; 78.8th percentile) at Wave 1 and 0.82 ($SD = 1.06$; 79.4th percentile) at Wave 2.

Main Regression Analysis

Greater negative emotional symptoms at baseline predicted increased BMI-z scores 2 years later, even after controlling for BMI-z score at Wave 1, school clustering, and sociodemographic control variables (Table 2). Results were consistent using raw BMI or BMI percentile scores (data not shown).

Discussion

In this sample of predominantly Black and Latino students, more frequent negative emotional symptoms (eg, feeling sad, feeling nervous) among students in grades 5 and 6 predicted increased BMI-z scores 2 years later. Findings suggest that negative emotional symptoms increase youths' risk for weight gain.

These findings extend past work by investigating a more broad range of emotional health symptoms and testing the association between emotional symptoms and weight change prospectively. In addition, this study contributes to our understanding of the research questions in a population at increased risk for obesity and related negative health outcomes. Unlike previous studies,^{7,17,19} this sample is younger, predominantly Black and Latino, and socioeconomically disadvantaged. Understanding factors that contribute to overweight and obesity is essential for the development of prevention and intervention programs aimed at reducing these intractable health disparities.

Although findings from the current investigation support that emotional symptoms at baseline prospectively predicted change in BMI from baseline to follow-up, this does not rule out that reverse causality could also be operating. Indeed, there may be a cyclical effect in which emotional symptoms can lead to increases in BMI, and increases in BMI then lead to increases in emotional symptoms.^{7,12,17} Future longitudinal studies should explore these associations with multiple repeated measures of both mental health factors and BMI over time to further tease apart direction of effects and possible cyclical effects.

Mental health and childhood obesity both have received increased national attention. These longitudinal findings provide evidence that emotional symptoms contribute to obesity among adolescents, suggesting the need to assess and intervene on emotional health among youth to reduce prevalence of and disparities in obesity. Programs designed to identify and address concerns related to mental health and emotional well-being, as well as physical health outcomes such as obesity, will benefit from transdisciplinary approaches to prevention and intervention.²⁰ School-based health centers, which often employ mental and physical health providers, may provide an ideal environment in which to facilitate integrated behavioral health approaches to promote adolescent health.

Acknowledgments

This research was conducted in affiliation with Community Interventions for Health, Oxford Health Alliance, Oxford England.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Funding for this study came from the Patrick and Catherine Weldon Donaghue Medical Research Foundation; The Kresge Foundation, Emerging and Promising Practices; and an R01 from the National Institute for Child and Human Development (1R01 HD070740).

References

1. Ogden CL, Carroll MD, Curtin LR, Lamb MM, Flegal KM. Prevalence of high body mass index in US children and adolescents, 2007–2008. *JAMA*. 2010; 303:242–249. [PubMed: 20071470]

2. Bethell C, Simpson L, Stumbo S, Carle AC, Gombojav N. National, state, and local disparities in childhood obesity. *Health Aff (Millwood)*. 2010; 29:347–356. [PubMed: 20194972]
3. Wang Y, Beydoun MA. The obesity epidemic in the United States—gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. *Epidemiol Rev*. 2007; 29:6–28. [PubMed: 17510091]
4. US Department of Health and Human Services. The Surgeon General’s Call to Action to Prevent and Decrease Overweight and Obesity. Rockville, MD: US Department of Health and Human Services, Public Health Service, Office of the Surgeon General; 2010.
5. Friedman MA, Brownell KD. Psychological correlates of obesity: Moving to the next research generation. *Psychol Bull*. 1995; 117:3–20. [PubMed: 7870862]
6. Cornette, RE. The emotional impact of obesity on children. In: Bagchi, E., editor. *Global Perspectives on Childhood Obesity*. New York, NY: Elsevier; 2011. p. 257-264.
7. Goodwin RD, Sourander A, Duarte CS, et al. Do mental health problems in childhood predict chronic physical conditions among males in early adulthood? Evidence from a community-based prospective study? *Psychol Med*. 2012; 39:301–311. [PubMed: 18507873]
8. Currie C, Nic GS, Godeau E. The health behaviour in school-aged children: WHO Collaborative Cross-National (HBSC) study: origins, concept, history and development 1982–2008. *Int J Public Health*. 2009; 54(suppl 2):131–139. [PubMed: 19639260]
9. Harwell M, LeBeau B. Student eligibility for a free lunch as an SES measure in education research. *Educ Researcher*. 2010; 39:120–131.
10. Mustillo S, Worthman C, Erkanli A, Keeler G, Angold A, Costello EJ. Obesity and psychiatric disorder: developmental trajectories. *Pediatrics*. 2003; 111:851–859. [PubMed: 12671123]
11. Lumeng JC, Gannon K, Cabral HJ, Frank DA, Zuckerman B. Association between clinically meaningful behavior problems and overweight in children. *Pediatrics*. 2003; 112:1138–1145. [PubMed: 14595059]
12. Anderson SE, Cohen P, Naumova EN, Must A. Association of depression and anxiety disorders with weight change in a prospective community-based study of children followed up into adulthood. *Arch Pediatr Adolesc*. 2006; 160:285–291.
13. Hasler G, Pine DS, Kleinbaum DG, et al. Depressive symptoms during childhood and adult obesity: the Zurich Cohort Study. *Mol Psychiatry*. 2005; 10:842–850. [PubMed: 15838533]
14. Claire Wang Y, Gortmaker SL, Taveras EM. Trends and racial/ethnic disparities in severe obesity among US children and adolescents, 1976–2006. *Int J Pediatr Obes*. 2011; 6:12–20. [PubMed: 20233157]
15. Liese AD, D’Agostino RB, Hamman R, et al. The burden of diabetes mellitus among US youth: prevalence estimates from the SEARCH for Diabetes in Youth Study. *Pediatrics*. 2006; 118:1510–1518. [PubMed: 17015542]
16. Wang Y, Monteiro C, Popkin B. Trends of obesity and underweight in older children and adolescents in the United States, Brazil, China and Russia. *Am J Clin Nutr*. 2002; 75:971–977. [PubMed: 12036801]
17. Blaine B. Does depression cause obesity? A meta-analysis of longitudinal studies of depression and weight control. *J Health Psychol*. 2008; 13:1190–1197. [PubMed: 18987092]
18. Kuczmarski RJ, Ogden CL, Guo SS, et al. 2000 CDC growth charts for the United States: methods and development. *Vital Health Stat*. 2002; 11(246):1–190.
19. Mamun AA, O’Callaghan MJ, Cramb SM, Nahman JM, Williams GR, Bor W. Childhood behavioral problems predict young adults BMI and obesity: evidence from a birth cohort study. *Obesity*. 2009; 17:761–766. [PubMed: 19148130]
20. Ewing LJ, Cluss P, Goldstrohm S, et al. Translating an evidence-based intervention for pediatric overweight to a primary care setting. *Clin Pediatr*. 2009; 48:397–403.

Table 1

Characteristics of Analytic Sample (N = 767).

	% or Mean (SD)
Emotional symptoms, Wave 1	1.96 (0.84)
BMI z-score, Wave 1	0.80 (1.14)
BMI z-score, Wave 2	0.82 (1.06)
Female	54.60%
Age (in years), Wave 1	10.87 (0.73)
Black	39.20%
Latino	46.80%
Eligible free or reduced price lunch	90.50%
Change in height, Wave 1 to Wave 2 (in cm)	11.38 (5.01)

Abbreviation: SD, standard deviation; BMI, body mass index.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2

Results of Regression Analysis With BMI-z Score at Wave 2 as Outcome, Controlling for School Clustering (N = 767).

	Unstandardized Betas (and Standard Errors)
Emotional symptoms, Wave 1	.05 (.02)*
BMI-z score, Wave 1	.84 (.02)**
Female	-.01 (.03)
Age (in years), Wave 1	-.04 (.01)**
Black	.08 (.03)*
Latino	.03 (.02)
Eligible free or reduced price lunch	.02 (.05)
Change in height, Wave 1 to Wave 2 (in cm)	-.01 (.00)*

Abbreviation: BMI, body mass index.

* $P < .05$.

** $P < .01$.