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Weight Status, Gender, and Race/Ethnicity: Are There Differences in Meeting Recommended Health Behavior Guidelines for Adolescents?

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Abstract

Healthy behaviors including limited screen time (ST), high physical activity (PA), and adequate fruits and vegetables consumption (FV) are recommended for adolescents, but it is unclear how gender, race/ethnicity, and weight status relate to these public health guidelines in diverse urban adolescents. Participants ($N = 384$) were recruited from three public high schools in or near New Haven, Connecticut. Descriptive statistics and logistic regression analyses were conducted. Most adolescents exceeded recommended levels of ST (70.5%) and did not meet guidelines for PA (87.2%) and FV (72.6%). Only 3.5% of the sample met all three guidelines. Boys were more likely to meet guidelines for PA ($p < .01$), while girls were engaged in less ST ($p < .001$). Black, non-Latinos were less likely to meet PA guidelines ($p < .05$). There were no significant differences in meeting ST, PA, or FV guidelines by weight status for the overall sample or when stratified by gender or race/ethnicity. We found alarmingly low levels of healthy behaviors in normal weight and overweight/obese adolescents.

Keywords

health behavior; sedentary lifestyle; exercise; physical fitness; nutrition; obesity; body weight; adolescence; youth; school nursing

Introduction

The prevalence of overweight and obesity in adolescents has more than tripled in the past three decades (Ogden, Carroll, Kit, & Flegal, 2014). Over 18% of adolescents in the United States are obese, and over 30% of adolescents are overweight or obese (Ogden, Carroll, Kit, & Flegal, 2012). Adolescent obesity negatively affects psychological well-being by contributing to low self-esteem, depression, and social stigma and affects physical health by increasing the risk of developing earlier onset and greater severity of type 2 diabetes and

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cardiovascular disease (Guo, Wu, Chumlea, & Roche, 2002; Prendergast & Gidding, 2014). Obese youth have a very high risk of being obese adults (Torgan, 2002), and they are likely to suffer from other obesity-related health conditions due to the difficulty of losing weight and changing healthy lifestyle in their later life (Reilly & Kelly, 2010).

Physical activity (PA), healthy eating, and reduction in time spent in sedentary behaviors are established modifiable obesity-related risk behaviors (Franz et al., 2002; Kipping, Jago, & Lawlor, 2008). Although there is some evidence that adolescent health behaviors have improved from 2001 to 2009, there is still considerable need for further improvement, as most adolescents do not eat adequate amounts of fruits and vegetables, consume high-fat diets, and drink sugary beverages (Iannotti & Wang, 2013). In addition, 35% of adolescents report watching television for 3 or more hours per school day and most do not meet recommended levels of moderate-to-vigorous PA (Eaton et al., 2008; Iannotti & Wang, 2013). Furthermore, the results of the National Health Interview Survey indicated that age-related declines in PA expenditure are particularly pronounced between 15 and 18 years of age, and further declines often occur in young adulthood, particularly with life events such as marriage or becoming a parent (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008).

Adolescents, particularly urban adolescents, often live in an “obesogenic” environment. This term refers to the influence of an environment that promotes weight gain or is not conducive to weight loss, within one's community, home, or workplace (Swinburn, Eggar, & Raza, 1999). In adolescents, an obesogenic environment is one that promotes unhealthy eating and physical inactivity, with easy access to foods that are high in fat, sugar, and salt, as well as pervasive access to technology (e.g., television, smartphones, and tablets) and sedentary lifestyle (American Academy of Pediatrics, 2011; Booth et al., 2001). In addition, advertisements for junk food, fast food, and sugary drinks increase awareness and desire for these foods and drinks in children and adolescents (American Academy of Pediatrics, 2011). Importantly, successful efforts have been made to modify the obesogenic environment by focusing on the community or school level, which may help to support an individual's adoption of healthy behaviors (Flodmark, Marcus, & Britton, 2006; Stice, Shaw, & Marti, 2006). School nurses are poised for this role, as they oversee the implementation of school health policies and programs, serve as the health-care expert in the school providing quality health care, and promote public health and safety (Lorentson et al., 2013). Recently, the goal for school nurses to be more involved in health education and promotion has been advocated (Centers for Disease Control and Prevention [CDC], 2012b).

While contributing factors for adolescent obesity-related health behaviors may be multifactorial, including individual, social, and environmental contexts (Huang & Glass, 2008), little is understood about differences in behaviors between overweight and normal weight adolescents with respect to meeting health behavior guidelines. There is some evidence to support that overweight or obese adolescents have lower levels of PA and more screen time (ST; Gordon-Larsen, Adair, & Popkin, 2002). Yet, recent studies on obese children who are not at high risk of cardiovascular disease, diabetes, or other conditions (i.e., metabolically healthy obese) showed that PA and healthy eating have an effect on health outcomes, independent of obesity status (Loos, 2013; Prince, Kuk, Ambler, Dhaliwal, & Ball, 2014).

In addition, evidence regarding differences in health behaviors by gender and weight status is conflicting. Some research has shown greater PA in boys compared to girls (Lenhart et al., 2012); however, in other studies, these differences have not been statistically significant (Allison, Adlaf, Dwyer, Lysy, & Irving, 2007; Fakhouri et al., 2014). Studies have also shown that the cause and time of onset (before and after puberty) of obesity and the consequences of obesity on health and psychological well-being may be different between adolescent boys and girls (Freedman et al., 2005; Merten, Wickrama, & Williams, 2008; Taylor, Gold, Manning, & Goulding, 1997). There is also evidence to support differences in race/ethnicity with respect to ST, PA, and healthy eating (Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003; Sallis, Prochaska, & Taylor, 2000).

In sum, there are mixed findings regarding whether adolescents meet the health behavior guidelines for ST, PA, and healthy eating, as well as the influence of overweight/obesity. In order to address this gap in knowledge, the purposes of this study were to: (1) describe differences in obesity-related health behaviors between normal weight and over-weight/obese adolescents and how gender and race/ethnicity may influence these relationships; and (2) examine attainment of health guidelines for ST, moderate-to-vigorous PA, and fruit/vegetable intake by gender, race/ethnicity, and weight status. The results generated from this study may help to design relevant and targeted school-based intervention programs to reduce and prevent overweight/obesity and the morbidity and mortality of obesity-related conditions in adolescents. In addition, this study is aligned with the Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity in 2001 to assess the degree to which adolescents meet federal guidelines for health behaviors (U.S. Department of Health and Human Services, 2001).

Methods

Study Design

A cross-sectional, descriptive comparative study was used to analyze baseline data from a randomized clinical trial (RCT) that compared the effectiveness of two Internet-based obesity prevention programs delivered in three high schools. The main intervention program (HEALTH[e]TEEN) provided interactive education and behavioral support on healthy eating and PA. The other program (HEALTH[e]-TEEN + Coping Skills Training [CST]) supplemented the material from the first program with lessons on coping skills designed to address the psychosocial challenges of healthy eating and PA. The primary end points of the RCT were reductions in body weight and body mass index (BMI) with secondary end points of health behaviors (ST, PA, and nutrition behavior), and self-efficacy. The Yale Institutional Review Board and the Boards of Education approved the study. Informed consent was obtained from a parent or guardian, and assent was obtained from adolescents. This article is based on data from the baseline assessment of both HEATH[e]TEEN and HEALTH[e]TEEN + CST. The National Heart, Lung and Blood Institute's ecological model of diet, sedentary behavior, and PA was used to frame the health behaviors that influence obesity outcomes (NHLBI, 2004).

Procedures

Details of the study methods, design, implementation, and the primary study results have been described in greater detail elsewhere (Whitte-more, Jeon, & Grey, 2013; Whitte-more, Chao et al., 2013). In brief, a convenience sample of adolescents between the ages of 14 and 17 years (Grades 9 to 11) was recruited from classrooms in three high schools in or near New Haven, Connecticut, between October 2010 and January 2011. Students (n = 2) were excluded from participation in the primary RCT due to inability to independently read or write, which was necessary to complete the computer-based surveys and program materials. A total of 403 students were approached to participate in the study, and 384 students from 35 classes across three high schools enrolled in the study. The sample was diverse with approximately 64% of participants from minority backgrounds, and within each school, the percentage of minority students who enrolled in the study was equivalent to or greater than the overall school demographic characteristics (Whittemore, Chao et al., 2013). Nurses and teachers in the schools in which the HEALTH[e]TEEN program was implemented were supportive of the program (Whittemore, Chao et al., 2013); however, their role in health education was primarily provided during individual and specific encounters with students, not as a component of structured obesity prevention health classes. Indeed, two of the three schools required physical education classes for at least 1 year, which also included some health content on nutrition and PA. All students in the sample had access to a school nurse, but the role of the school nurse varied per institution from full-time to part-time to a school-based health clinic.

Measures

Height and weight—Trained research staff collected heights and weights. Height was measured by a wall-mounted stadiometer, and weight was measured by a calibrated floor scale. Each measure was obtained twice, and the mean of the readings was calculated. BMI was calculated from the height and weight, and computed as weight (kilograms) divided by the square of height (meters). Weight status was categorized for age and gender percentile using 2000 CDC BMI Growth Charts Categories (Kuczmarski et al., 2002).

ST—Sedentary behavior was measured using an adapted version of a validated survey developed by Robinson and Killen (1995). The instrument was adapted by changing the response format from fill-in-the-blank to a forced numerical response. Nonschool ST, or discretionary time spent watching television, playing video games, or using the computer was used as a proxy for sedentary behavior given the positive association with BMI (Tremblay et al., 2011). Participants responded to 8 items reporting how much time they spent “watching television,” “watching movies or videos on DVD,” “playing video games,” or “using the computer” separately for before and after school for “yesterday” and “last Saturday.” The total amount of time was calculated, and guidelines from the American Academy of Pediatrics were used to determine whether the participants met ST guidelines of fewer than 2 hr per day (American Academy of Pediatrics, 2011). However, for the purposes of this analysis, fewer than 4 hr per day was used as the cutoff because less than 5% (n = 16) of the participants engaged in ST for fewer than 2 hr per day.

PA—PA was measured using the exercise survey items from the Youth Risk Behavior Survey (CDC, 2009), which has adequate test–retest reliability (Brener et al., 2002). Two self-reported items pertaining to daily expenditure of moderate-to-vigorous PA (e.g., bicycling, playing basketball, jogging, etc.) were used. Meeting PA guidelines referred to a duration of ≥50 min or more per day of moderate-to-vigorous activity (CDC, 2012).

Healthy eating—Items from the After School Student's Questionnaire (Prochaska & Sallis, 2004) were used to measure adolescents' daily consumption of fruits and vegetables. The questionnaire was developed based on the Health Behavior Questionnaire (Edmundson et al., 1996) and the School-Based Nutrition Monitoring Student Questionnaire (Hoelscher, Day, Kelder, & Ward, 2003), both of which have acceptable internal consistency. The 2010 *Dietary Guidelines for Americans* of the U.S. Department of Agriculture and *Healthy People* 2010 of the U.S. Department of Health and Human Services were used to determine whether participants met the recommendation for the consumption of four or more servings of fruits and vegetables per day (Dietary Guidelines Advisory Committee, 2010; United States Department of Health and Human Services, 2012). The selected items have evidence of adequate test–retest reliability (Prochaska & Sallis, 2004).

Analyses

Data were checked for missing values, distribution, outliers, and normality. Descriptive statistics were calculated. Consistent with pediatric standards for adolescent obesity, participants were dichotomized into normal weight (BMI ≥5th to < 85th percentile) and overweight/obese (BMI ≥85th percentile; Barlow, 2007). Race/ethnicity was stratified into the following categories: White, non-Latino; White, Latino; Black, non-Latino; Asian; and Multi-race. Participants missing race/ethnicity data (n = 10) and Native Americans (n = 2) were excluded from race/ethnicity analyses. To test for differences in health behaviors by weight status, Student's t-tests were used. To test for potential modification by gender and race/ethnicity, the sample was stratified and Student's t-tests were used to examine differences based on weight status.

To test for differences in adolescents who met guidelines by gender, race/ethnicity, and weight status, a series of logistic regression analyses was performed. First, we evaluated the main effects of gender, race/ethnicity, and weight status on meeting guidelines for each health behavior. Depending on the model, analyses were adjusted for gender, race/ethnicity, and/or weight status. Next, we added interaction terms for gender × weight status and race/ethnicity × weight status. SPSS version 22.0 (IBM SPSS, Armonk, NY) and STATA version 13.0 (STATA, College Station. TX) were used for statistical analyses. All analyses were reported as two-tailed, with an α level of .05.

Results

The study sample (n = 384) had a mean age of 15.3 ± 0.7 years and the majority of the sample was female (62.0%). Of those who reported race/ethnicity, participants self-identified as White, non-Latino (35.6%), White, Latino (22.6%), Black, non-Latino (22.1%), multi-race (13.2%), and Asian (5.7%). Additional sample characteristics are presented in Table 1. The mean BMI of the sample was 24.7 ± 5.6 kg/m^2. Overall, 54.1% of the sample was of normal weight, 22.2% were overweight, and 23.7% were obese (45.9% overweight/obese).

Health Behaviors and Weight Status

There were no significant differences in ST, moderate-to-vigorous PA, or fruit/vegetable consumption between normal weight and overweight/obese adolescents for the overall sample or when stratified by gender or race/ethnicity (Tables 2 and 3).

Attainment of Health Behavior Guidelines

Overall, most adolescents exceeded recommended levels of ST (70.5%) and did not meet the guidelines for moderate-to-vigorous PA (87.2%), and fruits/vegetables intake (72.6%). Only 3.5% of the sample met all three guidelines.

Boys were more likely to meet guidelines for PA ($p < .01$), whereas girls were more likely to meet guidelines for limited ST ($p < .001$). There was no difference between boys and girls for fruit/vegetable intake (Table 4).

Similarly, there were no statistically significant differences by race/ethnicity for meeting guidelines for fruit/vegetable intake or ST. However, individuals who identified as Black, non-Latino were less likely to meet guidelines for moderate-to-vigorous PA ($p = .04$; Table 4).

There were no significant differences in the percentage of adolescents who met guidelines for ST, PA, or fruits/vegetables based on weight status ($p = .58, .45, .07$, respectively). There was no significant interaction by gender × weight status or race/ethnicity × weight status in meeting for health behavior guidelines guidelines (Table 4). Unadjusted analyses led to the same conclusions.

Discussion

Adolescents demonstrated alarmingly low levels of recommended behaviors associated with positive health outcomes and optimal weight regardless of gender, race/ethnicity, or weight status. The majority of adolescents did not meet guidelines for limiting ST, participation in PA, and daily fruit/vegetable intake. There were no differences in meeting any of the health behavior guidelines between normal weight and overweight/obese adolescents for the overall sample or when stratified by gender or race/ethnicity. These results are consistent with other research in which multiple health behaviors were examined that documented high levels of ST, low levels of PA, and poor dietary intake of adolescents (Butcher, Sallis, Mayer, & Woodruff, 2008; Fakhouri et al., 2014; Foltz et al., 2011; Iannotti & Wang, 2013).

While the results from this study suggest that there may be benefit for gender-specific interventions and culturally tailored interventions to improve engagement in health behaviors, there is clear indication that interventions promoting limited ST, PA, and healthy eating ought to reach all adolescents regardless of weight status, race/ethnicity, or gender. All adolescents have the potential to benefit from educational and behavioral support about healthy eating and PA and providing such a program, in a school setting, may help to avoid the stigmatization associated with programs focused only on adolescents who are overweight or obese (Thomas, 2006).

Adolescence is a critical developmental phase for providing health education on limiting ST, and promoting PA and healthy eating. Increased autonomy in adolescence often results in poor health behaviors at a time when lifestyle habits are being established. This deleterious trend is promulgated by adolescents' preference and ease of access to high-calorie and low-nutrient foods and beverages, the inundation of mass media messages that promote unhealthy foods and beverages, and abundant opportunities to live a sedentary lifestyle (Booth et al., 2001). This "obesogenic" environment is particularly challenging for adolescents who often lack the knowledge and experience to make positive health decisions (Tao & Glazer, 2005). Thus, adolescents are in need of innovative health promotion programs to help them establish positive health behaviors that can be sustained into young adulthood.

Adolescence is an important developmental phase for health education efforts as capacity to learn is high, new lifestyle habits are being developed, and self-efficacy for healthy lifestyle is becoming established during this time of emerging independence (Nelson et al., 2008; Steinbeck, Baur, Cowell, & Pietrobelli, 2009). In addition, health behaviors established during adolescence can have a lifelong impact (Steinbeck et al., 2009). Adolescents, especially youth of diverse race/ethnicity and low socioeconomic status, are an underserved population with respect to health promotion programs. For adolescent girls of diverse race/ethnicity and low socioeconomic status, who have a higher likelihood of becoming a parent in their later adolescence or early adulthood (Kost, Henshaw, & Carlin, 2010), adolescence has been identified as a critical time for intense nutritional education (Koplan, Liverman, & Kraak, 2005).

Schools provide an ideal environment for population-based health education programs (Brackney & Cutshall, 2014; Thomas, 2006). Research on school-based interventions to promote health behaviors has proliferated in the past two decades, as schools have an existing infrastructure that can be targeted to integrate health education into the curriculum (Baranowski et al., 2002; Flodmarket al., 2006; Koplan et al., 2005; Nguyen, Kornman, & Baur, 2011; The HEALTHY Study Group, 2010). The majority of programs have been heterogeneous and include some combination of health education (e.g., healthy eating and PA), behavioral strategies (e.g., goal setting), parental education and support, environmental modification (e.g., salad bar in cafeteria), and/or policy change (e.g., physical education class requirement). Results of numerous meta-analyses and systematic reviews indicate that most programs (>75%) demonstrate significant improvements in knowledge, self-efficacy, and health behavior (i.e., ST, PA, and healthy eating; Flodmark et al., 2006; Stice et al., 2006). Unfortunately, few school-based programs have had widespread dissemination and implementation; rather, individual schools may implement various programs and strategies depending on school-based priorities and resources, which vary in terms of funding, curriculum, and time allocated to PA. Therefore, greater dissemination of evidence-based strategies that can be implemented in schools is warranted. Future obesity prevention programs should also target policy, system, and environment changes, as these aspects may be more sustainable and less dependent on individual-level change.

School Health Services and School Nursing Implications

School nurses are in key positions to endorse obesity prevention efforts by promoting engagement in PA and healthy eating, as well as limits to ST. In a recent survey of school nurses in Minnesota, 76% of school nurses endorsed the use of school health services for obesity prevention efforts (Kubik, Story, & Davey, 2007). However, only 29% reported that they were adequately prepared to provide leadership in school-based obesity prevention initiatives (Kubik et al., 2007). These findings suggest that school nurses may need additional education on nutrition, PA, and behavior change counseling. Such education on obesity prevention and treatment is available through self-study, webinars (e.g., American Academy of Pediatrics obesity presentations and webinars), and professional meetings such as the National Association for School Nurses (e.g., School Nurse Childhood Obesity Prevention Education). School nurses may also experience other barriers that inhibit obesity prevention efforts, including lack of time, high workloads, lack of parental support, and lack of school, state or national policy to identify and treat obesity in schools (Moyers, Bugle, & Jackson, 2005; Stalter, Chaudry, & Polivka, 2010, 2011). Facilitating factors that may help to address these barriers for school nurses include access to classroom teachers and workspaces, parent volunteers for obesity prevention programs, community interest in obesity reduction, and a nurse to student ratio at 1:750 (Stalter, Chaudry, & Polivka, 2011).

Research supports that multifaceted interventions targeting adolescents, their parents/family, and the school environment have the potential to promote healthy behaviors in adolescents (Katz et al., 2005). School nurses are uniquely poised to capitalize on existing resources and the structured nature of schools to facilitate health promotion programs. For example, a health course could be revised to add a unit on healthy eating, regular PA, and limits to ST. Adolescents report a limited understanding of how to eat healthily (Power, Bindler, Goetz, & Daratha, 2010) and lack of access for a safe place to participate in physical activities (Wilson, 2007), and such curricula may help to address these barriers.

Other possible strategies for targeting adolescents include increasing sport clubs and activities (e.g., dance, yoga, tai chi, obstacle courses, and basketball), offering open gym hours during study halls or after school, or eliciting peer leaders to promote healthy eating, PA, or limits to ST (Goh et al., 2009). School nurses can also promote the use of age-appropriate Internet sites aimed at healthy eating and PA for adolescents and teachers (e.g., choosemyplate.-gov; kidshealth.org).

There are a number of national and statewide initiatives that have numerous resources for school nurses to access in order to implement a health promotion or obesity prevention program. For example, the Northern Virginia Healthy Kids Coalition has developed a campaign to promote healthy lifestyle for youth called 9-5-2-1-0 that could be adapted to the school setting. In this initiative, obesity prevention information is simplified by promoting 9 hr of sleep, 5 servings of fruits and vegetables, 2 hr or less of ST outside of school, 1 hr of PA, and 0 sugary beverages per day (Northern Virginia Healthy Kids Coalition, 2012). The web-site provides access to resources for professionals, fact sheets, posters, and tools for schools (tippingthescales.type-pad.com/blog). The CDC has also published a report, “School Health Guidelines to Promote Healthy Eating and Physical Activity,” that can serve as a resource for school nurses (CDC, 2011).

In a study of perceived barriers to promoting healthy behaviors in adolescence, parents acknowledged their role in improving their child's behavior, but reported a lack of skills and tools to initiate and sustain behavior change (Goh et al., 2009). The 9-5-2-1-0 initiative is an example of a school-based program that could also involve parents and families. Newsletters, flyers, and/or information sheets could be sent home with adolescents to review with their parents (Birnbaum, Lytle, Story, Perry, & Murray, 2002; Lytle et al., 2004). At school-based activities that families attend (e.g., open houses and sporting events), information or interactive content on a health initiative could be provided (e.g., educational booth). Other family-based strategies could include open gym nights for families, family activities (e.g., fun run), or family classes (e.g., healthy snacks for adolescents).

Changes to the school environment have also been shown to improve the health behaviors of adolescents (Cowell, 2011; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). School nurses can advocate for improving the nutritional value of school lunches with salad bars, fresh vegetables, and sliced fruits. Healthy foods could be placed in a more prominent location (Goh et al., 2009) or labeled using the stoplight method (green for healthy, yellow for eating in limited portions, and red for eating only once in a while or in a small portion; National Heart, Lung and Blood Institute, 2013). As previously mentioned, school nurses could also advocate for more opportunity for students to participate in PA through structured and unstructured opportunities. Sedentary behavior could also be lessened through the integration of standing or stand-biased desks in the classroom. Although the evidence base is emerging, researchers of standing desk pilot studies have found meaningful reductions in caloric expenditure and improved academic success, including attention, on-task behavior, alertness, and classroom engagement (Benden, Blake, Wendel, & Huber, 2011; Cardon, De Clercq, De Bourdeaudhuij, & Breithecker, 2004). Other less resource-intense options include promoting a standing culture in classrooms, whereby students stand while reading excerpts from books, watching educational videos, or reviewing other assignments. Nevertheless, future research is warranted to identify optimal implementation and sustainability practices of obesity prevention initiatives provided in the school setting.

Limitations and Conclusions

Limitations of this study include the use of self-report measures to define health behaviors, which may have attributed to recall or reporting bias. Second, information is lacking about how or if students who participated in the RCT differed from those who did not participate. In addition, data were not collected regarding the socioenvironmental influences on youth behavior (e.g., built environment and socioeconomic status). Third, adolescents were recruited from one geographical area; however, the racial/ethnic diversity of the sample enhances generalizability. Fourth, it was not possible to perform other subgroup analyses (e.g., Black boys vs. Black girls) due to an inadequate sample size. Fifth, multiple statistical comparisons were undertaken, which increases the likelihood of finding statistical significance. Finally, results for the multi-race and Asian race/ ethnicity subgroups must be interpreted with caution due to a small number of participants, heterogeneity among the multi-race group, and Asian race/ethnicity-specific BMI cutoffs were not used. Nevertheless, the logistic regression models were run excluding the Asian and multi-race subgroups and similar results were achieved, thus increasing confidence in the presented results for the White, non-Latino, White, Latino, and Black, non-Latino race/ethnicity subgroups.

In summary, adolescents in our diverse sample reported little engagement in healthy, obesity-related behaviors, and very few adolescents met the health behavior guidelines for ST, PA, and healthy eating. Moreover, weight status did not have an effect on meeting health behavior guidelines in the overall sample, or by gender and race/ethnicity, which suggests that future interventions ought to target all adolescents. Schools present an ideal setting to implement healthy lifestyle education, and school nurses are poised to capitalize on existing resources and the structured nature of schools to facilitate health promotion educational and activity-based programs. Starting small, gaining support of adolescents, parents, colleagues, and administrators is also an important part of the process.

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Table 1

Demographic and Anthropometric Sample Characteristics.

Characteristic	*n* (%) or Mean (*SD*)
Age	15.3 ± 0.7 years
Gender	
Male	146 (38.0%)
Female	238 (62.0%)
Race/Ethnicity	
White, non-Latino	134 (35.6%)
White, Latino	85 (22.6%)
Black, non-Latino	83 (22.1%)
Multi-race	49 (13.2%)
Asian	21 (5.6%)
Household income	
<US$40,000	129 (43.6%)
US$40,000 – US$79,999	112 (37.8%)
US$80,000+	55 (18.6%)
BMI	24.7 ± 5.6 kg/m^2
BMI category	
Normal weight (<85th percentile)	205 (54.1%)
Overweight (≥ 85th to <95th percentile)	84 (22.2%)
Obese (≥ 95th percentile obese)	90 (23.7%)

Note. BMI = body mass index; *SD* = standard deviation.

Table 2

Comparisons of Health Behaviors by BMI Status for Overall Sample and Gender.

Health Behavior	Total Sample (*N* = 384)			Girls (*n* = 238)			Boys (*n* = 146)		
	Normal Weight[a]	**Overweight/ Obese**[b]	***p***	**Normal Weight**[c]	**Overweight/ Obese**[d]	***p***	**Normal Weight**[e]	**Overweight/ Obese**[f]	***p***
Screen time (hours/day)									
Total weekday	5.84	5.94	.67	5.51	5.74	.45	6.43	6.24	.62
Total weekend	6.18	6.27	.75	5.87	5.99	.73	6.77	6.66	.82
Physical activity (days/week)									
Vigorous exercise[g]	3.38	3.33	.83	2.83	2.59	.41	4.23	4.28	.71
Moderate exercise[h]	3.87	3.64	.36	3.48	3.13	.29	4.59	4.31	.48
Healthy eating (servings/day)									
Fruits and Vegetables	2.76	2.91	.41	2.65	2.83	.44	2.96	3.00	.90

Note. BMI = body mass index; ST = screen time.

[a]BMI < 85th percentile (<23.85 kg/m^2).

[b]BMI ≥ 85th percentile (≥23.85 kg/m^2).

[c]BMI < 85th percentile (<24.20 kg/m^2).

[d]BMI ≥ 85th percentile (≥24.20 kg/m^2).

[e]BMI < 85th percentile (<23.60 kg/m^2).

[f]BMI ≥ 85th percentile (≥ 23.60 kg/m^2).

[g]Number of days per week where the duration is 20 min or longer.

[h]Number of days per week where the duration is 30 min or longer.

Table 3

Comparisons of Health Behaviors by BMI Status for Race/Ethnicity.

Health Behavior	White, non-Latino (*n* = 134)			White, Latino (*n* = 85)			Black, non-Latino (*n* = 83)			Multi-race (*n* = 49)			Asian (*n* = 21)		
	Normal Weight[a]	Overweight/ Obese[b]	*p*	Normal Weight[a]	Overweight/ Obese[b]	*p*	Normal Weight[a]	Overweight/ Obese[b]	*p*	Normal Weight[a]	Overweight/ Obese[b]	*p*	Normal Weight[a]	Overweight/ Obese[b]	*p*
Screen time (hours/day)															
Total weekday	5.60	5.96	.36	5.31	5.44	.81	6.40	6.15	.66	6.50	6.00	.85	5.92	6.89	.29
Total weekend	5.99	6.25	.57	5.14	5.93	.21	6.91	6.69	.71	6.71	6.18	.71	7.17	6.67	.12
Physical activity (days/week)															
Vigorous exercise[c]	3.92	3.75	.69	2.70	3.05	.46	3.56	2.81	.15	3.08	4.41	.19	2.58	2.56	.23
Moderate exercise[d]	4.29	3.87	.32	3.33	3.30	.96	3.79	3.45	.54	3.83	4.50	.07	4.08	3.56	.80
Healthy eating (servings/day)															
Fruits and Vegetables	2.78	3.03	.42	2.51	2.60	.82	2.67	2.87	.62	1.57	2.19	.83	2.25	1.33	.07

Note. BMI = body mass index.

[a]BMI < 85th percentile (<23.85 kg/m^2).

[b]BMI ≥ 85th percentile (≥ 23.85 kg/m^2).

[c]Number of days per week where the duration is 20 min or longer.

[d]Number of days per week where the duration is 30 min or longer.

Table 4

Logistic Regression Models for Meeting Guidelines for Health Behaviors by Gender, Race/Ethnicity, and Weight Status.

	Fruit/Vegetable Intake				Moderate-to-Vigorous Physical Activity				Screen Time[d]			
		95% CI for Adjusted OR				95% CI for Adjusted OR				95% CI for Adjusted OR		
Variable	**Adjusted[c] OR**	**Lower**	**Upper**	***p***	**Adjusted[c] OR**	**Lower**	**Upper**	***p***	**Adjusted[c] OR**	**Lower**	**Upper**	***p***
Regression models[a]												
Race/ethnicity[b]												
Black, non-Latino	1.12	.60	2.1	.72	.37	.14	.97	.04	1.53	.80	2.91	.20
White, Latino	.71	.36	1.38	.31	.43	.17	1.08	.07	.64	.36	1.15	.14
Multi-race	1.63	.78	3.40	.20	1.44	.61	3.43	.41	1.53	.70	3.34	.29
Asian	2.51	.97	6.51	.06	.20	.03	1.61	.13	1.82	.57	5.85	.31
White, non-Latino	ref				ref				ref			
Gender[b]												
Female	.70	.43	1.13	.15	.29	.15	.56	.001	.43	.26	.72	.001
Weight status[b]												
Overweight/obese	1.50	.93	2.41	.10	1.17	.61	2.2	.64	1.01	.63	1.62	.96
Interaction terms[c]												
Race/Ethnicity × Weight Status												
Black, Non-Latino × Over-weight/ Obese	.46	.13	1.63	.23	.17	.02	1.90	.15	.73	.20	2.72	.64
White, Latino × Overweight/Obese	.45	.12	1.73	.25	.89	.14	5.55	.90	.71	.22	2.35	.58
Gender × Weight Status												
Gender × Overweight/Obese	.92	.31	2.75	.88	2.49	.58	10.74	.22	.89	.29	2.73	.84

Note. $N = 384$.

[a]Main effects model. Fruit/vegetable intake, $R^2 = .051$, Homer and Lemeshow test: $\chi^2 = 14.16$, $df = 8$, $p = .078$. Physical activity, $R^2 = .129$, Homer and Lemeshow test: $\chi^2 = 10.36$, $df = 8$, $p = .241$. Screen time, $R^2 = .076$, Homer and Lemeshow test: $\chi^2 = 1.06$, $df = 9$, $p = .998$.

[b]Race/ethnicity, gender, and weight status adjusted for the others.

[c]Multi-race or Asian subgroups were not included in the interaction models due to small sample sizes.

[d]Lower values of indicate less total screen time (ST). x Denotes interaction.