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## School-Based Weight Management Program Curbs Summer Weight Gain Among Low-Income Hispanic Middle School Students

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### Abstract

**BACKGROUND:** Research shows that elementary students gain weight over the summer. It is unknown if these findings apply to Hispanic adolescents. We evaluated school and summer standardized body mass index (zBMI) changes in Hispanic middle school students.

**METHODS:** Hispanic middle school students were randomly assigned to a weight management program (N = 230) or control condition (N = 195). Paired sample t-tests compared zBMI change scores during the school year versus summer when not enrolled in a weight management program (eg, control group). We used 2 × 2 repeated measures analysis of variances to determine program group differences in zBMI scores across school versus summer periods separately for normal and overweight/obese students.

**RESULTS:** In the control group, students' zBMI change scores decreased during the school year, but increased during summer for both normal weight and overweight/obese students. Program effects on zBMI indicated school year decreases and summer increases for both normal and overweight/obese students. However, zBMI scores did not differ by program status for normal weight students. Overweight/obese students in the program compared to the control group increased zBMI to a lesser extent over the summer.

**CONCLUSION:** For all students, zBMI increased during the summer. A school-based weight management program protected overweight/obese students against potentially greater summer weight gain.

## Keywords

Hispanic health; adolescent health; school-based weight management; summer weight gain; overweight/obesity

Despite the effort made by United States (US) public health officials, obesity rates remain high for adolescents. Mexican American adolescents have the highest rates of obesity with 23.5% classified as obese compared to non-Hispanic white peers at 20%.<sup>1</sup> Weight-related conditions encompass 4 of the 5 leading causes of death for Hispanic adults: cancer, heart disease, stroke, and diabetes.<sup>2</sup> Thus, obesity and obesity-related comorbidities are a significant concern for Hispanics. Because of the significant health and social consequences associated with obesity,<sup>2-11</sup> identifying time periods when children are at increased risk for gaining weight is essential. Identifying critical time periods may facilitate the development of more targeted programs to address the obesogenic behaviors specifically, when they are more likely to occur. Whereas the media have placed blame for the obesity epidemic on the school environment,<sup>12</sup> research indicates that summer may be a more problematic time period. The preponderance of studies examining seasonal weight gain has focused on the elementary years, demonstrating that elementary school children become heavier during summer which contributes to increases in the prevalence of overweight and obesity.<sup>13-17</sup> Studies examining summer weight gain among children use a combination of body mass index (BMI),<sup>13,14</sup> standardized BMI (zBMI),<sup>16,18-20</sup> and weight categories based on BMI percentiles<sup>14,18-20</sup> depending on their specific analyses and the appropriate measure for the age of their research participants. When synthesizing information across studies that use different indicators of weight status the authors use the terms “become heavier” or “weight gain” to indicate an increase among multiple measures of weight status.

Two analyses of nationally representative cohorts of kindergarteners revealed that zBMIs increased twice as rapidly during the summer compared to the school year.<sup>12</sup> Furthermore, children were more likely to transition to a healthier weight category during the school year and more likely to transition to a heavier weight category during the summer.<sup>14</sup> A 5-year longitudinal study that tracked an ethnically diverse cohort of kindergarteners from Texas for the duration of elementary school demonstrated that the BMIs of students who were overweight/obese decreased during the school year, but increased over the summer. In contrast, BMIs of students who were normal weight increased during both periods, but increased at a greater magnitude over the summer compared to during the school year.<sup>16</sup> These increases in BMI during summer contributed to children’s risk of becoming overweight and obese.<sup>18-20</sup> Similar results have been found among elementary school children in Japan,<sup>21,22</sup> Minnesota,<sup>23</sup> and American Indian girls in third and fifth grade and boys in fourth grade in Wyoming.<sup>24</sup>

However, 2 studies have failed to demonstrate these increases in BMI during summer. Northern Plains American Indian kindergarteners followed from kindergarten through first grade did not demonstrate a significant change in zBMI during summer, but a significant increase was observed during first-grade school year.<sup>25</sup> Among low-income Hispanic third- and fourth-grade students aged 8 to 12 years in southeast Texas, overweight/obese students

decreased their BMIs during the school year and maintained this change over the summer. On the other hand, normal weight children did not exhibit changes in BMIs during either time period.<sup>26</sup>

To our knowledge, only 2 studies have examined summer weight gain among middle school students. Researchers failed to find evidence of a significant change in BMI during summer among seventh-grade students of American Indian descent in Wyoming.<sup>24</sup> White middle school students in Washington State actually demonstrated an improvement in their BMI during the summer break from school.<sup>27</sup> The onset of puberty occurs during adolescence, resulting in developmentally appropriate changes in body composition.<sup>28</sup> Simultaneously, females are known to decrease physical activity levels during adolescence which facilitates weight gain.<sup>29,30</sup> It is possible that due to physiological or social changes that occur during this period of life, patterns in weight may be inherently different than those observed among elementary school children.

When examining ethnic differences in seasonal weight gain, some studies have found no differences across ethnic groups.<sup>14,18</sup> Other studies have found black and Hispanic students increased their BMIs at double the rate of white students,<sup>16</sup> and that black and Hispanic students demonstrated increased probability of becoming overweight and obese during summer.<sup>13</sup> Overall, additional studies are needed to examine summer weight gain among middle school students and ethnic minority groups as certain groups appear to be more at risk for increased BMI during the summer compared to other groups: those who are classified as overweight/obese and race/ethnic minorities, including Hispanics.<sup>15,17</sup>

School-based programs have been a popular approach to reduce child and adolescent obesity, as schools are an ideal location to provide nutritional and physical activity education.<sup>31</sup> Whereas school-based weight loss programs have been able to create short-term success, long-term benefits have been understudied and maintenance of weight management has been underwhelming.<sup>32</sup> One potential factor for a lack of long-term success in school-based programs is that benefits are lost during the summer months as a result of seasonal weight gain.<sup>33–35</sup> It is also possible that students could use the weight management education obtained during the school year to avoid summer weight gain.

Despite the evidence supporting summer weight gain for certain groups of elementary students,<sup>13–17</sup> less is known about this phenomenon among low-income Hispanic middle school students. Additionally, research has not examined how adolescents' weight changes during the summer following school-based weight management programs. The purpose of this study was to examine seasonal weight patterns in low-income, urban, Hispanic middle school students using 3 time points. The first aim of this study was to evaluate changes in students' zBMI during the school year compared to the summer when not enrolled in a weight management program. Similar to elementary school findings, we anticipated middle school students to decrease zBMI during the school year and increase zBMI over the summer.<sup>13–17</sup> Students in this study were also randomized to a school-based weight management program. The second aim of this study was to compare the impact of the program on school year zBMI (ie, during the program) and summer zBMI (ie, after

completion of the program). Parallel to previous studies,<sup>16,26</sup> program comparisons were made separately for normal and overweight/obese students.

## METHODS

### Participants

The current study is a secondary analysis of data aggregated across 5 randomized controlled trials (RCTs) with similar designs from 2005 to 2010.<sup>36–38</sup> It was necessary to aggregate the participants across multiple waves of data collection in order to obtain an adequate sample size to evaluate summer weight gain. While previous publications using this data evaluated the efficacy of these RCTs,<sup>36–38</sup> they did not assess summer weight gain or the impact that the RCTs had on summer weight gain. Sixth- and seventh-grade students at a primarily Hispanic (95%) charter school in Houston, Texas were randomly assigned to either receive a weight management program or a control condition. To evaluate treatment and control groups on particular demographic characteristics, independent sample t-tests were used to examine continuous variables and chi squared analyses were used to explore categorical variables. At baseline, participants did not differ across RCTs by age, zBMI, income, race/ethnicity, or sex ( $p > .05$ ). Only those with measurements recorded during specific windows of time were included: spring post-test (March-May) and fall follow-up (August-October).

### Instruments

**Body mass index.**—Trained research staff measured participants' height with a portable stadiometer (Model 214;Seca Co., Hanover, MD) and weight with a calibrated Tanita model TBF-310 digital scale (Tanita Corp., Tokyo, Japan).<sup>39</sup> Participants were assessed at 3 time points: baseline, spring post-test (March-May), and fall follow-up (August-October). Participants wore light clothing and no footwear for all measures. All measures were obtained twice and averaged; if there was a significant difference between the first and second measurement (eg, 0.5 cm or 0.3 kg), a third measure was obtained. Body mass index was calculated based on measured height and weight ( $\text{kg}\cdot\text{m}^{-2}$ ) and was standardized using age and sex normative data from the US Centers for Disease Control and Prevention.<sup>40</sup> Standardized BMI scores were utilized in all calculations, because raw BMI is not a useful indicator of weight status among adolescents. Increases in raw BMI are a healthy and expected occurrence as adolescents' bodies grow and mature, whereas increases in zBMI indicate becoming more overweight.<sup>40</sup> BMI percentiles were used to classify participants as underweight (<5th percentile), normal weight (5th to 84.9th percentile), overweight (85th to 94.9th percentile), and obese (>95th percentile).<sup>40</sup> Due to small sample size, underweight participants ( $N = 3$ ) were omitted from analyses. To maximize statistical power, overweight and obese were collapsed into a single category.

### Procedure

Participants were randomly assigned to either participate in a weight management program or control condition. Detailed descriptions of program and control conditions have been described elsewhere.<sup>36–38</sup> Brief descriptions are provided below. All conditions met for 35 to 40minutes, 3 ( $N = 319$ ) or 5 ( $N = 106$ ) days per week as a school period for 3 ( $N = 319$ ) to 6 months ( $N = 106$ ). However, all students who received the weight management program

(3 vs 6 month durations; 3 vs 5 days per week) exhibited similar changes in zBMI during the summer ( $p > .05$ ); similar results were observed among the control participants. Because summer zBMI was the primary outcome in this study, it was deemed appropriate to combine groups.

**Weight management program.**—Students randomized to the program condition participated in an instructor-led weight management program. Throughout the program period, students engaged in 2 or more days of instructor lead physical activity, 1 day per week of weight management education (ie, nutrition, goal setting, and self-monitoring) and were provided with a healthy nutritionally dense snack such as vegetables with peanut butter, cereal, or a granola bar. To avoid stigmatization, the studies allowed students of all weight classifications to participate. Program participants were encouraged to increase physical activity and fruit and vegetable consumption regardless of weight status. The program was led by a health professional with a bachelor degree in nutrition, kinesiology, or health promotion. The instructor was assisted by at least 2 aides who were typically college students seeking a degree in a health-related field. All instructors used contingency management, reinforcement, and modeling as strategies to promote adherence to the program. Because the current study is a secondary analysis of data aggregated across 5 RCTs with similar designs, school year (baseline to spring) zBMI<sub>t2-t1</sub> change scores were compared across trials. School year zBMI<sub>t2-t1</sub> change scores were similar across trials ( $p > .05$ ) indicating that the programs were similarly effective. Therefore, it was determined appropriate to combine all trials into one treatment group for analyses.<sup>41–43</sup>

**Control.**—Students randomized to the control condition received 1 of 3 conditions depending on the cohort: self-help condition using *Trim Kids*,<sup>44</sup> a book encouraging increased physical activity and improved diet ( $N = 49$ ), a standard physical education (PE) class led by a PE teacher ( $N = 76$ ), or a standard PE class led by an instructor trained in weight management techniques ( $N = 70$ ). Similar to the weight management program, all trials were combined into one control group for analyses.<sup>41–43</sup>

## Data Analysis

Statistical analyses were performed using SPSS (version 24.0, 2016; SPSS Inc., Chicago, IL). Group differences at baseline were evaluated using t-tests (continuous variables) and  $\chi^2$  (dichotomous variables). School year zBMI<sub>t2-t1</sub> change scores were calculated by subtracting the students' baseline zBMI<sub>t1</sub> from their spring zBMI<sub>t2</sub>. Summer zBMI<sub>t3-t2</sub> change scores were calculated by subtracting students' spring zBMI<sub>t2</sub> from their fall zBMI<sub>t3</sub>. Paired sample t-tests were used to compare school year zBMI<sub>t2-t1</sub> change scores to summer zBMI<sub>t3-t2</sub> change scores. We used  $2 \times 2$  repeated measures analysis of variance to determine group differences by condition across the school year (baseline to spring) and summer (spring to fall) periods. All analyses were stratified by weight status to evaluate changes in normal weight participants and overweight/obese participants separately.

## RESULTS

Overall, participants ( $N = 432$ ) were 12 years old, 50% female, and predominantly overweight/obese (55%) (Table 1). On average, participants resided in households with an income of \$36,446. Mothers (59%) and fathers (71%) had a high school degree or lower. When stratified by weight status, participants did not differ by the program group on any baseline demographic characteristics.

### Seasonal Changes in zBMI by Baseline Weight Status Among the Control Condition

Paired sample t-tests of change scores revealed significant differences in school year  $zBMI_{t2-t1}$  change scores (ie, spring minus baseline zBMI measures) compared to summer  $zBMI_{t3-t2}$  change scores (ie, fall minus spring zBMI measures) (Table 2). Both normal weight and overweight/obese students not receiving the program exhibited decreases in zBMI during the school year but increases during the summer: normal weight [school year  $zBMI_{t2-t1}$  change: 0.11 (0.27) vs summer  $zBMI_{t3-t2}$  change: 0.10 (0.26),  $p < .001$ ]; overweight/obese [school year  $zBMI_{t2-t1}$  change:  $-0.10$  (0.16) vs summer  $zBMI_{t3-t2}$  change: 0.07 (0.14)  $p < .001$ ].

### Program Effects on zBMI by Season and Baseline Weight Status

A series of  $2 \times 2$  repeated measures analysis of variance was used to evaluate changes in zBMI by program group across time (Table 3).

**Normal weight.**—BMI z-scores of program and control participants changed similarly across all seasons (school year:  $F = 0.77$ ,  $p = .38$ ; summer:  $F = 0.24$ ,  $p = .62$ ).

**Overweight/obese.**—BMI z-scores of program and control participants changed differently during both the school year (baseline to spring) ( $p < .01$ ) and the summer (spring to fall) ( $p < .01$ ). On average, program participants' zBMI decreased during the school year from  $\bar{X}_{t1} = 1.86$  (0.45) at baseline to  $\bar{X}_{t2} = 1.70$  (0.54) in the spring. Control participants' zBMI also decreased during the school year, but to a lesser degree from  $X_{t1} = 1.79$  (0.41) at baseline to  $X_{t2} = 1.68$  (0.45) in the spring ( $F = 9.67$ ,  $p < .01$ ). Although both groups increased zBMI during the summer (spring to fall), the program group increased zBMI to a lesser extent than control group ( $F = 7.87$ ,  $p < .01$ ). The zBMI of the program group increased during the summer from  $X_{t2} = 1.70$  (0.54) in the spring to  $X_{t3} = 1.71$  (0.56) in the fall; the zBMI of the control group increased during the summer from  $X_{t2} = 1.68$  (0.45) in the spring to  $X_{t3} = 1.74$  (0.44) in the fall.

## DISCUSSION

The purpose of this study was to examine seasonal weight patterns in low-income, urban, Hispanic middle school students. Specifically, we evaluated changes in students' zBMI during the summer compared to the school year when not enrolled in a weight management program. We found that similar to elementary school students,<sup>13–17</sup> low-income Hispanic middle school students, regardless of their starting weight status, tend to decrease zBMI during the school year, but increase during the summer. This indicates that the school



year promotes healthy zBMIs, but summer weight gain is problematic for Hispanic middle school students regardless of their weight status. Although research consistently has found that elementary school students gain weight during the summer,<sup>13-17</sup> others have not observed this phenomenon in middle school students.<sup>24,27</sup> Our findings may differ from the previous studies on middle school students because of geographical location (Northwest vs South) and sociocultural differences (American Indian and white vs low-income Hispanic). Overall, it has been concluded that among elementary students, certain groups appear to be more at risk for increased BMI during the summer compared to other groups: those who are classified as overweight/obese and race/ethnic minorities, including Hispanics.<sup>15,17</sup> Similarly, we conclude that low-income Hispanic middle school children are at risk for summer weight gain.

Also, we compared zBMI scores across school year and summer for students in a weight management program to that of students in a control group following the completion of the school year program. Normal weight students who participated in the weight management program exhibited similar (non-significant) school year zBMI decreases and summer zBMI increases as those in the control group. This would suggest that the intervention did not impact zBMI during either season among normal weight participants. This finding is not particularly surprising as decreasing zBMI was not a goal for normal weight adolescents. On the other hand, overweight/obese students who participated in the weight management program exhibited decreased zBMI during the school year and blunted summer zBMI increases in comparison to the control group, although the effect size ( $\eta^2 = .04$ ) was small. Therefore, school-based weight management programs continue to have a small beneficial impact on adolescent summer weight gain even after program conclusion.

School-based weight management programs are an efficacious approach to reducing increases in weight status during the school year. This type of programming provides some protection against summer weight gain among overweight/obese Hispanic middle school students. It is possible that the increased physical activity and healthy eating were impressed upon overweight/obese students more than normal weight students. This could have resulted in overweight/obese participants being more cognizant of their physical activity and eating patterns during the summer months.

The results of this study cannot be generalized to all adolescents as it only includes urban Hispanic participants residing in the South; yet, it demonstrates the impact of a school-based weight management program during the summer among an at-risk group for higher weight status. Whereas it may seem unconventional to include normal weight individuals in a weight management program, this is ideal from a prevention standpoint. With a staggering proportion of Hispanic adults (42.5%) being classified as obese,<sup>1</sup> it is important to prevent obesity before it happens,<sup>45</sup> rather than waiting to provide treatment when someone's weight becomes problematic. Thus, the inclusion of both normal weight and overweight/obese students in this program is a strength of this study.

Although this study was underpowered to stratify by sex or economic status, future studies can build off this knowledge by examining school-based weight management program effects by sex or economic status. It is possible that the weight management program

was particularly effective for males and ineffective for females, resulting in null findings among normal weight individuals. During adolescence, the onset of puberty occurs; males and females experience changing body composition differently.<sup>28</sup> Girls tend to increase adipose tissue, whereas boys increase lean mass as they approach puberty. Maintaining healthy behaviors during this period of physiological changes may prevent excess weight gain, especially for girls as it is known that physical activity levels decline during adolescence.<sup>29,30</sup> Evaluating summer weight gain stratified by sex may provide necessary insight as to whether summer weight gain occurs among all adolescents, or if adolescent girls are more susceptible to this phenomenon.

While obesity rates are increasing in all income brackets, low-income individuals have less access to resources to help them maintain a healthy weight.<sup>46</sup> It is possible that adolescents whose families have more resources are provided with more programming opportunities during the summer. Those involved in summer programs which mimic the school year (eg, structured routines and PE) may not increase zBMI or experience increases to a lesser degree than those who do not have these opportunities. Therefore, it is possible that lower income students are driving the finding that adolescents increase zBMI during the summer. If this is the case, then summer programs targeted to lower income students may be especially effective in combating the obesity epidemic in Hispanic adolescents.

The summer weight gain phenomenon has been observed among elementary school students in a variety of geographical locations with varying climates including Japan,<sup>21,22</sup> Minnesota,<sup>23</sup> Wyoming,<sup>24</sup> and Texas.<sup>12,26</sup> The consistency of summer weight gain across elementary school students in multiple geographical climates leads us to infer that our observations among Texan middle school students are not an anomaly specific to the especially hot climate in this area during these months. However, summer changes in zBMI have not been consistently observed among middle school students. Seventh-grade students of American Indian descent in Wyoming did not exhibit changes in zBMI during the summer<sup>24</sup> and white middle school students in Washington State actually demonstrated an improvement in their BMI during the summer.<sup>27</sup> The summer climate of southeast Texas may have played a role in promoting summer weight gain among our participants. If this was the case, it would actually highlight the potential benefits of school-based weight management programs. Our study demonstrates that school-based weight management programs can provide some protection against summer weight gain for overweight/obese middle school students. If the hot climate in Southeast Texas facilitates summer weight gain and our school-based weight management program blunted summer weight gain in this environment, it is possible that school-based weight management programs in cooler climates could have even greater success at preventing summer weight gain among middle school students. Studies examining summer weight gain among middle school students in a variety of climates are needed to improve understanding and prevent this phenomenon.

Aside from weight management programming, there are school policies in place that may prevent zBMI increases during the school year. The 2010 Healthy Hunger Free Kids Act is a comprehensive plan to reform the diets of children during school hours. Specifically, schools that participate in the National School Lunch and School Breakfast Program must now align their meals with the 2010 Dietary Guidelines for Americans.<sup>47</sup> The revised school menu



increases servings of fruits, vegetables, whole grains, reduces levels of sodium and saturated fat, and requires fat-free or low-fat milk to be served instead of whole milk.<sup>48</sup> Furthermore, the school menus are not allowed to have items that contain trans-unsaturated fats, which have been associated with cardiovascular disease.<sup>49</sup> It is estimated that the policy changes to school lunches have the potential to reduce childhood obesity.<sup>50</sup> Although there is not a national school policy focused on physical activity, the 2008 Physical Activity Guidelines for Americans recommends that children and adolescents engage in physical activity for 60 minutes or more a day.<sup>51</sup> In Texas, schools are required to provide students with access to physical activity for 30 minutes a day.<sup>52</sup>

Whereas these policies and guidelines are emphasized during the school year, this type of structure is not consistently in place during the summer. For example, the lack of access to meals that align with the 2010 Dietary Guidelines for America during the summer could result in adolescents consuming more calorically dense and less satiating foods which promote weight gain. This is especially true for adolescents that would typically receive reduced or free meals at school. To create long-term impact, the structure provided by school nutrition policy and physical activity guidelines needs to be consistently implemented year round. Unfortunately, not every school district will have the funds to keep their facilities open during the summer. Instead, community-based strategies can be incorporated to maintain structure. For example, schools could identify locations where meals are provided through the federal Summer Food Service Program. In addition, schools could identify locations to be physically active when students no longer have access to school facilities. These community-based strategies can then be used to create a weight management programs that mirror the structure observed during the school year, similar to the purpose of summer reading programs. Summer reading programs have been implemented for many years to prevent loss of reading skills and promote academic success during the summer months.<sup>53</sup> Using summer reading programs as a blue print, along with community-based resources, may be a way to maintain the health of students.

Last, the inclusion of parents in school-based weight management programs may improve the maintenance of behaviors fostered during the school year throughout the summer. Although practitioners have identified the lack of parental involvement as a key barrier to obesity treatment<sup>54</sup>; the involvement of mothers has been shown to enhance adolescent weight management program efficacy.<sup>55</sup> By creating community- and family-based strategies to continue school year behaviors during the summer, schools can better prepare students for successful weight management during this critical season.

## Conclusions

This study contributes to the literature focusing on summer weight gain among middle school students. Specifically, the study found that among low-income, urban, Hispanic middle school students, zBMI scores decreased over the school year and increased over the summer. This indicates the importance of exploring the causes of summer weight gain to maximize benefits of weight management programming. Previous studies found that school-based weight management program benefits were lost over the summer.<sup>33–35</sup> However, our study demonstrates that the benefits of a school-based weight management program

continue to be slightly protective against summer weight gain among overweight/obese Hispanic adolescents. Future studies are needed to evaluate if weight management programs, which occur during the summer are able to provide even greater protection against summer zBMI increases among adolescents.

## IMPLICATIONS FOR SCHOOL HEALTH

Schools are currently implementing the following strategies to have beneficial impacts on student weight management: national school nutrition policies, state/local physical activity policies, and access to physical activity facilities. However, during the summer months when school is not in session these benefits are no longer in place and students experience zBMI increases, even after participating in an intensive school-based weight management program. Schools are encouraged to extend strategies into the summer months to reduce summer weight gain among children and adolescents. It is recommended that schools continue serving meals and keep facilities accessible for students during the summer. In addition, schools can enhance their existing school-based weight management interventions by extending them into summer to the extent that is feasible. Examples of strategies that schools can use to continue school-based weight management programs during the summer include:

- educating students and parents on locations where students are able to receive federal Summer Food Service Program meals and engage in physical activity
- encouraging students to engage in weight management behaviors similar to summer reading programs
- involving parents in school-based weight management programs and educating parents on strategies to continue weight management behaviors throughout the summer.

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Human Subjects Approval Statement

This study was approved by the Institutional Review Board of the Baylor College of Medicine.

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**Table 1.**

**Baseline Characteristics by Weight Status and Treatment Condition**

	Normal Weight			Overweight/Obese		
	Full Sample	Weight Management Program	Control	Weight Management Program	Control	Control
<b>Child characteristics</b>						
Sample size	425	101	90	129	105	
Age (years)	12.08 (0.63)	12.04 (0.58)	12.12 (0.72)	12.07 (0.66)	12.09 (0.58)	
Sex (% female)	50	54	53	42	52	
Height (cm)	149.61 (7.65)	147.82 (7.15)	147.16 (7.52)	151.87 (7.81)	150.70 (7.06)	
Weight (kg)	52.37 (15.30)	40.76 (6.31)	39.92 (6.17)	63.40 (14.45)	60.81 (11.73)	
<b>Baseline weight classification</b>						
Normal (%)	45	100	100	0	0	
Overweight (%)	19	0	0	33	36	
Obese weight (%)	36	0	0	67	64	
zBMI	1.03 (1.04)	0.12 (0.69)	0.03 (0.68)	1.85 (0.45)	1.79 (0.41)	
<b>Household characteristics</b>						
<b>Marital status</b>						
Married (%)	82	86	79	81	80	
Single (%)	18	14	21	19	20	
Household income (\$)	36,446 (26,811)	44,581 (41,528)	36,438 (25,818)	32,096 (15,592)	34,523 (18,878)	
<b>Maternal characteristics</b>						
<b>Education level</b>						
First-eighth grades (%)	24	23	18	30	18	
9th-12th grades (%)	35	41	34	35	30	
Vocational or some college (%)	27	23	37	25	28	
College graduate or higher (%)	14	13	11	11	24	
<b>Paternal characteristics</b>						
<b>Education level</b>						
First-eighth grades (%)	27	27	18	34	23	



	Normal Weight			Overweight/Obese		
	Full Sample	Weight Management Program	Control	Weight Management Program	Control	Control
9th-12th grades (%)	44	52	40	43	38	38
Vocational or some college (%)	18	13	24	15	23	23
College graduate or higher (%)	11	8	18	8	15	15

**Table 2.**

Seasonal Changes in zBMI by Baseline Weight Status Among Control Condition

<b>Sample</b>	<b>School Year Change in zBMI<sup>†</sup> Mean (SD)</b>	<b>Summer Change in zBMI<sup>‡</sup> Mean (SD)</b>
Normal weight	-0.11 (0.27)	0.10 (0.26) <sup>*</sup>
Overweight/Obese	-0.10 (0.16)	0.07 (0.14) <sup>*</sup>

\* p &lt; .001.

<sup>†</sup>School Year Change = Spring zBMI<sub>t2</sub> - baseline zBMI<sub>t1</sub>.<sup>‡</sup>Summer Change = Fall zBMI<sub>t3</sub> - spring zBMI<sub>t2</sub>.

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**Table 3.**

Intervention Effects on zBMI by Season and Baseline Weight Status

Sample	Weight Management Program				Control	
	Baseline Mean (SD)	Spring Mean (SD)	Fall Mean (SD)	Baseline Mean (SD)	Spring Mean (SD)	Fall Mean (SD)
Normal weight	0.12 (0.69)	-0.03 (0.70)	0.05 (0.73)	0.02 (0.70)	-0.09 (0.65)	0.01 (0.65)
Overweight/Obese	1.86 (0.45)	1.70 (0.54)*	1.71 (0.56)**	1.79 (0.41)	1.68 (0.45)	1.74 (0.44)

\* p &lt; .01 significantly different in zBMI from baseline to spring (ie, school year) compared to the control group.

\*\* p &lt; .01 significantly different in zBMI from spring to fall (ie, summer) compared to the control group.