Changes in Obesity Between Fifth and Tenth Grades: A Longitudinal Study in Three Metropolitan Areas

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WHAT'S KNOWN ON THIS SUBJECT: Obesity among youth can have immediate health effects as well as longer-term consequences during adulthood. Overweight/obese children and adolescents are much more likely than normal-weight children to become overweight/obese adults.

WHAT THIS STUDY ADDS: This large, multisite longitudinal study examines patterns of exit from and entry into obesity between childhood and adolescence. Socioeconomic factors, body image, television habits, and parental obesity were important predictors of whether children remained obese or became obese.

abstract

BACKGROUND: Despite epidemic childhood obesity levels, we know little about how BMI changes from preadolescence to adolescence and what factors influence changes.

METHODS: We studied 3961 randomly selected public school students and 1 parent per student in 3 US metropolitan areas in fifth and again in tenth grades. In each grade, we measured child and parent height/weight and calculated BMI category. We examined whether baseline sociodemographic characteristics, child health-related factors, and parental obesity were significantly associated with exit from and entry into obesity from fifth to tenth grade.

RESULTS: Fifth- and tenth-graders were 1%/2% underweight, 53%/60% normal weight, 19%/18% overweight, and 26%/20% obese, respectively. Among obese tenth-graders, 83% had been obese as fifth-graders and 13% had been overweight. Sixty-five percent of obese fifth-graders remained obese as tenth-graders, and 23% transitioned to overweight. Multivariately, obese fifth-graders who perceived themselves to be much heavier than ideal ($P = .01$) and those who had lower household education ($P = .006$) were less likely to exit obesity; by contrast, overweight fifth-graders were more likely to become obese if they had an obese parent ($P < .001$) or watched more television ($P = .02$).

CONCLUSIONS: Obese fifth-graders face challenges in reducing obesity, especially when they lack advantages associated with higher socioeconomic status or when they have a negative body image. Clinicians and others should educate parents on the importance of preventing obesity very early in development. Children who are not yet obese by fifth grade but who have an obese parent or who watch considerable television might benefit from monitoring, as might children who have negative body images. *Pediatrics* 2014;134:1051–1058

Obesity prevalence has increased substantially among children, adolescents, and adults over the past 3 decades.[1,2] Obese youth experience not only immediate health effects but also longer-term consequences during adulthood.[3] Overweight children are at least twice as likely as normal-weight children to be overweight during adulthood, and 24% to 90% of obese adolescents become overweight/obese adults.[4–6] However, little is known about the relationship between BMI in childhood and in early adolescence and factors associated with change between these 2 periods. A study of US children, which found that overweight kindergarteners were much more likely than their normal-weight peers to become obese in middle school,[7] highlights the importance of intervening in early childhood to prevent later obesity. Understanding factors associated with the transition into and out of obesity would inform efforts to address the obesity epidemic.

We conducted a 2-wave longitudinal study of exit from and entry into obesity from fifth to tenth grades in a large, non-clinical sample from 3 US metropolitan areas with high representation of children who are black or Latino or from low-SES households.[8] This age range starts at 10 to 11 years of age, before most children have begun their pubertal growth spurt (which can be associated with rapid shifts in BMI[9]), and ends at 15 to 16 years of age, after most have finished it.[10] We also examined sociodemographic characteristics[11] and potentially modifiable factors that have been previously associated with BMI (and are thus potential targets of interventions), including child behaviors (ie, consumption of fast food and soda,[12,13] vigorous exercise,[14] and TV viewing[15]), child body image discrepancy (the difference between a child's self-report of the ideal and his/her own body size),[16,17] and parental obesity.[6]

METHODS

Participants

We analyzed data from Healthy Passages, a longitudinal study of fifth-graders (mean [SD] age, 11.1 [0.5] years) recruited through public schools in and around Birmingham, AL, Houston, TX, and Los Angeles County, CA from 2004 to 2006.[8,18] We randomly sampled schools with probabilities designed to provide a balanced sample of children who were non-Latino black, Latino (regardless of race), and non-Latino white. Parents/guardians (hereafter referred to as parents) of 6663 out of 11 532 children in sampled schools permitted us to contact them; 5147 (77%) participated in the study, and 6.7% of the parents were male. Parents provided written informed consent; children provided written assent. For students who participated at baseline, follow-up interviews were collected for 4448 (86%) 5 years later in 2009 to 2011, when most were in 10th grade (age 16.1 [SD, 0.5] years). BMI was unavailable at fifth or tenth grade for 487 students (10.9%), leaving a sample of 3961; most missing anthropometric measures were attributable to lack of parental permission for anthropometric measurement. White children were less likely to be missing BMI than were other children; race/ethnicity was controlled in regressions and nonresponse weights. Relevant institutional review boards approved the study.

Child and Parent BMI

Child and parent BMI calculations were based on weight and standing height obtained according to standard anthropometric protocols[19–21] by trained and certified interviewers. Weight was measured to the nearest 0.1 kg using a Tanita electronic digital scale. Calibration of the scale was checked regularly. Height was measured (with the participant in bare feet or socks) to the nearest millimeter using a portable stadiometer. Two independent measurements were taken for each participant, and if the measurements differed by ≥0.2 kg for weight or ≥0.5 cm for height, a third measurement was taken.[16] The 2 measurements of weight and of height that were closest in agreement were averaged and used to calculate BMI.

BMI percentiles for youth were calculated using standard gender-specific growth charts[22] and categorized as underweight (<5th percentile), normal weight (≥5th to <85th percentile), overweight (≥85th to <95th), and obese (≥95th)[23]; parental BMI ≥30 kg/m^{2} was categorized as obese.[24] A "missing" category was included in analyses for 273 parents who had unknown baseline obesity status, generally because they declined measurement of their weight and height.

Measures

Each child and 1 parent per child completed computer-assisted personal interviews and audio computer-assisted self-interviews (for sensitive questions) in English/Spanish. Parents reported demographics; children reported other information used in the analysis. We assessed 4 BMI-related factors: (1) Body image discrepancy, for which children identified which of 7 outline drawings of bodies, ranging from thinner to heavier, looked most like them and which drawing "a boy (girl) your age should look like"[16,25]; "much heavier" indicates those whose self-image was ≥2 levels heavier than their ideal image, "somewhat heavier" indicates those whose self-image was 1 level heavier than ideal, and "thinner" indicates those whose self-image was thinner than ideal. Although it is not necessarily possible to infer a child's BMI from such drawings, they can be used to compare on the same scale an individual's body image self-perception and perception of the ideal body image. (2) Fast-food and soda consumption, which were measured as number of days in the past 7 days and number of times per day[26]; "high" consumption indicates the top quartile for

frequency of consumption for days or times. (3) Vigorous exercise, which was measured as number of days in the past 7 days in which the child engaged in vigorous exercise for ≥20 minutes.[26] (4) TV viewing, which was derived from categorical responses for viewing duration on Monday through Friday after school before 7 PM, Monday through Thursday after 7 PM, Friday after 7 PM, Saturday, and Sunday[27] (measure details appear in Table 2). To examine whether there was variation in the effect of body image discrepancy based on a child's choice of ideal body size drawing, we conducted a sensitivity analysis additionally adjusting for the child's reported ideal body size, which was not significant.

Because school/neighborhood characteristics can be confounders in the relationship between change in BMI category and BMI-related factors,[28–30] we obtained school-wide indicators of fifth-grade obesity prevalence and household educational level; we also collected and validated child-perceived neighborhood safety and observations of physical characteristics related to commercial activity and decay, residential decay, and residential security.[31]

Statistical Analysis

We used ordinal logistic regressions to assess differences in fifth-grade BMI category across categorical child and parent characteristics, and we used linear regressions to assess differences across BMI categories for continuous BMI-related factors.

We used bivariate and multivariate logistic regressions to assess patterns of exit from and entry into obesity from fifth to tenth grade by baseline child and parent characteristics. Models predicting exit from obesity were restricted to children who were obese at fifth grade. Models predicting entry into obesity were restricted to children who were overweight at fifth grade, as the risk factors for normal-weight or underweight children

may differ from those for overweight children. Because no underweight children and only 2% of normal-weight children became obese at 10th grade, we could not adequately determine whether and how much their risk factors differ from those of overweight children; omitting underweight and normal-weight children allowed for more precise estimation of the risk factors for overweight children, who are at greatest risk. Probability weights were created to reflect the sampling design and nonresponse associated with school, race/ethnicity, and gender. We accounted for design and nonresponse weights, clustering of children within schools, and site stratification using a sandwich estimator and a Taylor series linearization, as implemented by PROC SURVEYLOGISTIC and PROC SURVEYREG in SAS 9.3 (SAS Institute, Inc, Cary, NC).[8,32] Multivariate model fit was evaluated with the c-statistic, with higher values indicating greater agreement between predicted probabilities and observed exit from/entry into obesity. Examples illustrating the model results were presented as predictive margins[33] (ie, predicted proportions of exit from and entry into obesity for hypothetical children with specified covariate values, holding the distribution of all other respondent covariates unchanged). We also conducted additional regression models incorporating school and neighborhood factors as potential confounders in the relationship between change in BMI category and BMI-related factors.

Because the marginal risk/benefit of a change in BMI percentile depends on a child's initial BMI status and is greatest for the obese category, which has been shown to be associated with substantial short- and long-term health problems,[34–36] we assessed changes in obesity status. We adjusted for continuous baseline child BMI percentile in multivariate analyses to ensure that other multivariate results did not merely reflect a factor's association with exact baseline BMI within a BMI category.

RESULTS

Sociodemographic Differences Across BMI Categories at Fifth Grade

In fifth grade, 1% of students were underweight, 53% were normal weight, 19% were overweight, and 26% were obese (Table 1). There were significant differences in BMI category by sociodemographic characteristics. Latino (31%) and black (28%) students were more likely than white (17%; $P = .01$ for each comparison) students to be obese. Distribution of BMI category also varied by education, with 30% of children from households with no 4-year college graduate being obese, compared with 19% of those from households with 4-year college graduates ($P < .001$). Students who had an obese parent were more likely to be obese (37%) than those who had an overweight parent (24%) or a parent who was normal/underweight (12%) ($P < .001$) (Table 1).

Unadjusted Differences in Body Image Discrepancy and Obesity-Related Behaviors by BMI Category at Fifth Grade

Students' body image discrepancy was related to their BMI category ($P < .001$) (Table 2). For example, obese (15%) students were more likely than overweight and normal-weight (2% each) students to identify as being much heavier than ideal, and obese (55%) and overweight (42%) students were more likely than normal-weight (12%) students to identify as being somewhat heavier than ideal.

Students' BMI category was also positively related to hours of television watched per week, with underweight students watching the least (mean, 18 hours) and obese students watching the most (24 hours; $P < .001$).

Changes in BMI Category From Fifth to Tenth Grade

BMI distribution at 10th grade was 2% underweight, 60% normal weight, 18%

TABLE 1 BMI Category by Sociodemographic Characteristics, at Fifth Grade

Characteristic at Fifth Grade	Participants, n	BMI Category at Fifth Grade			
		Underweight (n = 64; 1%)	Normal (n = 2144; 53%)	Overweight (n = 739; 19%)	Obese (n = 1014; 26%)
Gender					
Female	2003	2	54	20	24
Male	1958	1	52	18	29
Race/ethnicity[a],*					
Latino	1199	1	48	21	31
Non-Latino black	1377	2	53	17	28
Non-Latino white	994	3	63	17	17
Other	390	2	53	19	26
Highest education level in household**					
4-year college graduate or higher	1379	2	61	18	19
Some college or lower	2582	1	50	19	30
BMI category of responding parent[b],**					
Neither obese nor overweight	1100	3	70	15	12
Overweight	1105	1	54	21	24
Obese	1483	1	42	20	37
Missing	273	<1	48	23	30

All data are presented as percentages unless otherwise indicated. Household education was reported by the parent, and all other characteristics except for BMI were reported by the child. Complete data were available except for child BMI (reliable height and weight were unavailable at fifth and/or tenth grade for 487 students) and parent BMI (reliable height and weight were unavailable at fifth grade for parents of 1 underweight, 132 normal-weight, 57 overweight, and 83 obese students). * P < .05, ** P < .001 for association, from ordinal logistic regression of sociodemographic characteristics on child BMI category.
[a] P < .05 for black versus white children and for Latino versus white children, from ordinal logistic regression of race/ethnicity on child BMI category.
[b] P < .001 for children whose parents were obese versus students whose parents were neither obese nor overweight, from ordinal logistic regression of parent BMI category on child BMI category.

TABLE 2 Health-Related Characteristics by BMI Category, at Fifth Grade

BMI Category at Fifth Grade	Child Characteristics at Fifth Grade								
	Body Image Discrepancy[a]				Fast-Food and Soda Consumption[b]			Mean Exercise[c] Days Past Week (SD), d	Mean TV[d] h/wk (SD), d
	Much Heavier Than Ideal	Somewhat Heavier Than Ideal	Same as Ideal	Thinner Than Ideal	None	Moderate	High		
All Fifth-Graders	5	29	50	15	7	51	43	3.8 (2.0)	22 (10)
Underweight	1	5	39	55	9	56	35	3.4 (1.8)	18 (8)
Normal	2	12	62	25	7	52	41	3.9 (2.0)	21 (10)
Overweight	2	42	51	5	6	50	44	3.8 (2.0)	22 (10)
Obese	15	55	27	3*	7	48	44	3.8 (2.0)	24 (10)*

All data are presented as percentages unless otherwise indicated. All characteristics except for BMI were reported by the child. Complete data were available except for child BMI (reliable height and weight were unavailable at fifth and/or tenth grade for 487 students). * P < .001 for association, from ordinal logistic or linear regression of BMI category on health characteristics.
[a] Children were shown pictures of 7 bodies ranging from thin to heavy and were asked to identify which picture looked most like them and which picture "a boy (girl) your age should look like." "Much heavier" represents those whose self-image was at least 2 levels heavier than the ideal image, "somewhat heavier" represents those whose self-image was 1 level heavier than ideal, and "thinner" represents those whose self-image was thinner than ideal.
[b] "High" consumption indicates children in the top quartile for frequency of fast-food and soda consumption (ie, for either the number of days in the past 7 days or the number of times per day).
[c] Children were asked the number of days in the past 7 days on which they exercised or took part in physical activity that made their heart beat fast or made them breathe hard for ≥20 min. Examples of activities listed with the item include basketball, soccer, running, swimming laps, fast dancing, or similar aerobic activities.
[d] Derived from categorical responses to items eliciting TV viewing duration during 5 different times of the week (weekdays after school before 7 PM, Monday through Thursday after 7 PM, Friday after 7 PM, Saturday, and Sunday). Hours were estimated as 1 hour more than the minimum for the highest category and as the midpoint of all other categories. Sensitivity analyses estimating hours as the minimum or maximum of each category yielded similar results.

overweight, and 20% obese (Table 3). Among obese fifth-graders, 12% became normal weight, 23% transitioned to overweight, and 65% remained obese. Overweight fifth-graders had the highest probability of becoming obese, with 14% doing so by 10th grade. Normal-weight fifth-graders were particularly stable, with 87% remaining at normal

weight. Looking backward, obese and overweight fifth-graders accounted for 83% and 13%, respectively, of obese tenth-graders (not shown in table).

Predictors of Exit From Obesity

Table 4 provides odds ratios (OR) from models assessing differences between

obese fifth-graders who exited obesity (35%) and who remained obese at 10th grade. Examining OR from bivariate models and adjusted ORs (aOR) from multivariate models of exit from obesity, we found that students who had the same baseline BMI were less likely to exit obesity if they perceived themselves as being much heavier than ideal (OR, 0.30; 95%

TABLE 3 Distribution of BMI Categories at 10th Grade Among Students in Each Fifth-Grade BMI Category

Fifth-Grade BMI Category	Tenth Grade BMI Category			
	Underweight (n = 61; 2%)	Normal (n = 2425; 60%)	Overweight (n = 694; 18%)	Obese (n = 781; 20%)
Underweight (n = 64; 1%)	32	68	0	0
Normal (n = 2144; 53%)	3	87	9	2
Overweight (n = 739; 19%)	0	50	36	14
Obese (n = 1014; 26%)	<1	12	23	65

All data are presented as percentages. All ns are unweighted; all percentages are weighted for the population for which we have child data at fifth grade and parent and child data at tenth grade (N = 4448). n = 3961 for this analysis, as information on child BMI at fifth or tenth grade was unavailable for 487 (11%) of the 4448 children.

confidence interval [CI], 0.18–0.48, $P <$ .001; aOR, 0.54; 95% CI, 0.33–0.87, $P =$ .01) or if they had lower household education (OR, 0.47; 95% CI, 0.36–0.63, $P <$ .001; aOR, 0.60; 95% CI, 0.42–0.86, $P =$ .006). The following were significant in bivariate but not multivariate analysis: students were less likely to exit if they were Latino (OR, 0.58; 95% CI, 0.38–0.89 vs non-Latino whites, $P =$ .01) or had an obese parent (OR, 0.54; 95% CI, 0.39–0.74, $P <$ .001).

To illustrate the magnitude of significant covariates in the multivariate model, we examined predicted probabilities of exiting obesity for hypothetical obese students who differ only in certain specific characteristics from the average obese student.

For example, otherwise similar obese fifth-graders would have a 37% probability of exiting obesity by 10th grade if they did not perceive themselves as much heavier than ideal but only a 26% chance if they did. Likewise, otherwise similar obese fifth-graders would have a 43% chance of exiting obesity if their household had a college graduate, but a 33% chance if it did not.

A bivariate sensitivity test showed that exit from obesity was significantly less likely in schools with higher proportions of obese fifth-graders (OR, 0.23; 95% CI, 0.06–0.89; $P =$ .03) and in schools with lower proportions of households with someone with a 4-year college degree

(OR, 0.39; 95% CI, 0.25–0.62, $P <$ .001). These predictors were no longer significant after adjusting for other variables in the model.

Neighborhood characteristics were not significant bivariate or multivariate predictors of exit from obesity.

Predictors of Entry Into Obesity

We assessed differences between overweight fifth-graders who became obese at 10th grade (14%) and those who did not (Table 4). In analyses of entry into obesity, overweight fifth-graders were more likely to become obese if they watched more TV (OR, 1.47 per 10 hours; 95% CI, 1.22–1.77, $P <$ .001; aOR, 1.26; 95% CI, 1.03–1.53, $P =$

TABLE 4 Exit From Obesity Among Obese Fifth-Graders[a] and Entry Into Obesity Among Overweight Fifth-Graders[b]

Fifth-Grade Characteristic	Exit From Obesity		Entry Into Obesity	
	Bivariate	Multivariate[c] c = 0.759; $P <$ .001	Bivariate	Multivariate[c] c = 0.744; $P <$ .001
Male	0.85 (0.62–1.16)	0.86 (0.61–1.21)	1.31 (0.82–2.09)	1.51 (0.94–2.44)
Race/ethnicity				
Latino	0.58 (0.38–0.89)*	1.03 (0.63–1.70)	0.93 (0.44–2.00)	0.50 (0.22–1.14)
Non-Latino black	0.77 (0.49–1.20)	1.31 (0.77–2.24)	2.11 (1.03–4.32)*	0.93 (0.48–1.78)
Non-Latino white	—	—	—	—
Other	0.91 (0.51–1.63)	1.01 (0.56–1.82)	0.90 (0.32–2.53)	0.52 (0.19–1.42)
No 4-year college graduate in household	0.47 (0.36–0.63)***	0.60 (0.42–0.86)**	2.13 (1.16–3.91)*	1.83 (0.88–3.79)
Responding parent BMI				
Obese	0.54 (0.39–0.74)***	0.75 (0.52–1.07)	3.59 (2.07–6.25)***	2.79 (1.58–4.91)***
Missing	0.80 (0.42–1.52)	1.18 (0.62–2.25)	2.85 (1.30–6.21)**	2.38 (1.05–5.37)*
Not obese	—	—	—	—
Child body image discrepancy much heavier than ideal	0.30 (0.18–0.48)***	0.54 (0.33–0.87)*	2.99 (0.84–10.60)	1.78 (0.66–4.79)
Child high fast-food and soda consumption	0.84 (0.64–1.08)	0.92 (0.68–1.26)	1.65 (1.01–2.68)*	1.13 (0.68–1.89)
Child exercise (days past week)	1.03 (0.97–1.09)	0.99 (0.92–1.06)	0.90 (0.82–0.99)*	0.93 (0.83–1.03)
Child TV (per 10 h/wk)	0.88 (0.77–1.00)	0.95 (0.81–1.11)	1.47 (1.22–1.77)***	1.26 (1.03–1.53)*

All data are presented as OR (95% CI). * $P <$ .05, ** $P <$ .01, *** $P <$ .001 for association, from logistic regression of exit from/entry into obesity on fifth-grade characteristics. Categorical characteristics (ie, race/ethnicity, parent BMI) entered together for bivariate analysis.
[a] Models for exit from obesity include 1014 obese fifth-graders and compare characteristics between the 369 students who were no longer obese (35%) and those who remained obese in 10th grade.
[b] Models for entry into obesity include 739 overweight but non-obese fifth-graders and compare characteristics between the 105 students who became obese (14%) and those who did not become obese in 10th grade.
[c] In addition, multivariate models controlled for continuous child BMI percentile at fifth grade to ensure that results do not merely reflect a factor's association with exact baseline BMI within a BMI category. Obese fifth-grade children who had higher BMI percentile were less likely to exit obesity by 10th grade (OR, 0.52; 95% CI, 0.45–0.59) and overweight fifth-grade children who had higher BMI percentile were more likely to enter obesity (OR, 1.23; 95% CI, 1.12–1.36); $P <$ .001 for both results.

.02), had a parent who was obese at baseline (OR, 3.59; 95% CI, 2.07–6.25, $P <$ .001; aOR, 2.79; 95% CI, 1.58–4.91, $P <$ .001), or whose BMI was unavailable (OR, 2.85; 95% CI, 1.30–6.21, $P =$ .009; aOR, 2.38; 95% CI, 1.05–5.37, $P =$ .04). The following were significant in bivariate but not multivariate analysis: students were more likely to become obese if they were black (OR, 2.11; 95% CI, 1.03–4.32, $P =$ .04), had no one in the household with a 4-year college degree (OR, 2.13; 95% CI, 1.16–3.91, $P =$ .01), or had high fast-food and soda consumption (OR, 1.65; 95% CI, 1.01–2.68, $P =$ .046) and were less likely to become obese if they performed more vigorous exercise (OR, 0.90 per day; 95% CI, 0.82–0.99, $P =$ .04).

From the multivariate model, we found that if the overweight fifth-graders in our analysis watched 30 hours of TV and had obese responding parents (but otherwise had the characteristics we observed), they would, on average, have a 21% chance of becoming obese by 10th grade. Alternatively, if they watched 10 hours of TV per week and had responding parents who were not obese, on average they would have a 6% chance of becoming obese by 10th grade.

Neighborhood and school characteristics were not significant bivariate predictors of entry into obesity.

DISCUSSION

In this study of ∼4000 youth from 3 US communities, a quarter were obese in fifth grade and two-thirds of these obese youth remained obese when they were in tenth grade, with most of the rest transitioning to the overweight category. From the opposite perspective, obese fifth-graders accounted for 83% of obese tenth-graders; most of the rest had been overweight fifth-graders, who had a 14% probability of becoming obese by 10th grade. Although previous research has established the usefulness of teaching youth at any age about healthy eating, physical activity, and screen time,[37] factors that influence BMI may be harder to

change as a child ages, and our findings suggest that it may be necessary to start before adolescence to prevent obesity later in life.

In multivariate analyses, children were more likely to remain obese from fifth to tenth grades if they had lower household education and considered themselves much heavier than ideal. Households with lower socioeconomic status may have competing demands and fewer resources to address childhood obesity. They may have less access to healthier foods, playgrounds, information about obesity, and other resources that help prevent and reduce obesity.[29] In addition, given that obesity rates are higher among people of all ages who have lower socioeconomic status, obesity may be more normative for these children,[38] and there may be fewer family or other pressures to try to address their obesity.

There are several possible interpretations for why the combination of obesity and a self-perception of being much too heavy is a powerful predictor of persistent obesity. There may be fatalism about change on the part of the child, or others may be ridiculing a child's obesity, which could affect self-perception; indeed, research has shown that obese children are more likely to be bullied.[39,40] Regardless, a self-perception of being much heavier than ideal paired with no change in obesity 5 years later raises the possibility of a sustained emotional impact that might make it harder for children to lose weight and might create challenges that reach beyond their obesity. Perhaps for some youth, perceptions of being much heavier than ideal contribute to lower self-worth and, in turn, reduce their self-efficacy to make behavioral changes that would reduce their weight. Future research that elucidates the role of self-perception could have implications for intervention strategies.

Our study has several limitations. First, the sample was recruited from public schools in 3 metropolitan areas that over-represented lower-income and non-

white children, which may have led to a higher obesity rate in the sample than the national average. Second, all measures besides child BMI and neighborhood observations were gathered through self-report, and parent BMI was obtained for only 1 parent per child (although spouses tend to have similar BMI[41]). Furthermore, we conducted sensitivity analyses of baseline school and neighborhood environmental factors but could not control for change in such factors over time.

CONCLUSIONS

Addressing adolescent obesity, which is associated with adult obesity, may be best done at younger ages. This is consistent with evidence that interventions that target younger children (age 6 to 12 years) tend to be more effective than later ones.[37] In addition, addressing behavior-related health issues before adolescence has the advantage of reaching youth during a period when parents still have substantial influence and peer influence is only starting to increase.[42] Furthermore, strategies most supported by research evidence include school-based programs that emphasize physical activity and nutrition education, as well as parent-centered programs that promote physical activity and reduction in screen time[37]; it is also important to avoid strategies that further stigmatize obese children.[43] If children can maintain their BMI at a level that is associated with better health outcomes and if, regardless of their BMI, they can adopt healthful eating and activity habits,[44] benefits may be experienced long into adulthood, both because of childhood antecedents of adult disease[3] and because patterns established in childhood may persist through adolescence and into adulthood.[4]

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STAYING POWER: *The other morning my daughter burst into the house after spending the night with friends, tearily asking if my wife and I were happy together and whether I would be leaving the family. I was a bit surprised, given that my wife and I have been married for more than 30 years — and my daughter is usually embarrassed by the affection we show for each other at home and in public. Evidently, her best friend's parents had suddenly split and, according to her friends, many other parents were not particularly happy. I reassured my daughter that her mom and I were quite happy together. She then asked why we were doing so well when other couples were not. I have often thought about that. According to a blog post on* Redbook *(You & Him: June 30, 2014), happily married couples do several things each day. These include such things as: saying hello when arriving home, arguing over little things, celebrating each other, making time to share fun activities, talking about what they ate for lunch, sharing inside jokes, kissing, and having an open dialogue. Most of these make sense to me. For example, I always yell out when I get home — as does my wife — and I am happy to see her. The old jokes remain funny even after all these years and (according to my daughter) we kiss far too often. One thing we do not do is discuss lunch; I certainly do not need to know every detail in her life. We also do not bicker or argue — even about little issues — very often. While the psychologists say this is a form of communication and prevents bigger issues from building up, we tend to reach a quick compromise or agree that we can live together even if we disagree on the topic. As for my daughter, after a pause, I simply told her that I had married my best friend and that she was still my best friend.*

Noted by WVR, MD

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