

Original article

The Association Between Body Mass Index in Adolescence and Obesity in Adulthood

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Abstract

Purpose: This study used data from the National Longitudinal Study of Youth 1979 to examine the association between body mass index (BMI) in adolescence and obesity in adulthood.

Methods: Measurements of height and weight from 1981 and 2002 were used to calculate BMI for a cohort of 1309 adolescents at baseline and during adulthood. Associations between BMI at age 16/17 and obesity (BMI ≥ 30) at age 37/38 were analyzed using logistic regression analysis.

Results: When the predicted probability of adult obesity equaled 0.5, the point on the adolescent BMI distribution was close to the 85th percentile for both sexes (83rd percentile for females and 86th percentile for males). Among adolescents with a BMI in the 85th–<95th percentile, 62% of the males and 73% of the females became obese adults. Among those with a BMI ≥ 95 th percentile, 80% of the males and 92% of the females became obese adults. Versus those with a BMI <85th percentile, those with a BMI in the 85th–<95th percentile were more likely to be obese (odds ratio = 7 for males, 11 for females) as adults, and those with a BMI ≥ 95 th percentile were most likely to be obese (odds ratio = 18 for males, 49 for females) as adults.

Conclusion: Adolescents with a BMI ≥ 85 th percentile are at elevated risk for obesity in adulthood. To prevent the development of obesity and its associated health risks, population-based efforts combined with targeted interventions for these high-risk adolescents are needed. © 2008 Society for Adolescent Medicine. All rights reserved.

Keywords: Obesity; Tracking of BMI; Adolescence; Adulthood

During the past 2 decades, the prevalence of overweight (defined as a body mass index [BMI] ≥ 95 th percentile) has nearly tripled, from 6.5% to 18.8%, for children aged 6 to 11 years and risen even more, from 5.0% to 17.4%, for adolescents aged 12 to 19 [1,2]. The primary concern about these trends is their potential impact on physical health, not only in childhood but also in adulthood [3]. For most children and adolescents, complications of overweight do not become apparent for decades, but severely overweight young people may suffer serious morbidity such as hyper-

cholesterolemia, impaired fasting glucose, gallstones, hepatitis, sleep apnea, and increased intracranial pressure [4–6]. In addition, the metabolic and physiologic changes associated with overweight in childhood and adolescence tends to track into adulthood [3]. Obesity in adults is associated with increased risks of premature death, heart disease, type 2 diabetes, stroke, several types of cancer, osteoarthritis, and many other health problems [4,5]. Accordingly, obtaining a good understanding of the associations between BMI during childhood and adolescence and obesity in adulthood would be beneficial for prevention efforts. First, it would help identify boys and girls with a high risk of becoming obese adults so that targeted interventions might be implemented at an early stage. Second, it would help researchers to predict the long-term impact of prevention programs.

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Although several investigators have examined the tracking of BMI from childhood to adulthood [7–13], most of the studies followed their cohorts only to young adulthood (early 20s to early 30s) [7–12]. Just one study tracked BMI from childhood to age 35 [13]. However, the cohort of this study was Caucasian only, and grew up in the 1930s and 1940s when obesity was not the major epidemic as it is now. To better reflect the effects of overweight in adolescence on the risk of adulthood obesity among today's population, we need assessments on the tracking of BMI to adulthood in a more current and diverse population. The purpose of the present study was to use data from the National Longitudinal Study of Youth 1979 (NLSY79) to examine the association between BMI in adolescence and obesity in adulthood.

Methods

The NLSY79 is a nationally representative sample of 12,686 young men and women who were aged 14–22 years when initially interviewed in 1979. They were interviewed annually through 1994 and biennially from 1996 to the present. Sponsored by the Bureau of Labor Statistics of the U.S. Department of Labor, the primary purpose of the NLSY79 is to collect data on the experiences of the labor force. However, the actual content of the survey covers a broad range of topics, including educational attainment, training investments, income and assets, health conditions, workplace injuries, insurance coverage, alcohol and substance abuse, sexual activity, and marital and fertility histories.

Although the NLSY79 was first conducted in 1979, questions about height and weight were first asked in 1981. We assessed the risk of obesity in 2002 among a subsample of respondents who were aged 16/17 years in 1981. Height and weight were self-reported; height was reported in 1981, 1982, and 1985 and weight in 1981, 1982, 1985, 1986, 1988–1990, and 1992–2002. Height was assumed to remain constant after 1985, when our study population was already 20/21 years old.

A total of 2513 youth aged 16/17 years in 1981 participated in the NLSY79. We excluded 1204 youth who had missing data for height or weight in either 1981 or 2002 or notably inconsistent data for height (decline in stature ≥ 2 inches from 1981–1982, 1981–1985, or 1982–1985). Of the 1204 excluded, 837 had missing data for height or weight in 2002 because of several reasons: refusal, unable to locate, deceased, difficult cases, dropped, and other. We compared sample characteristics between the study sample and the excluded sample to determine whether certain subgroups were more likely to be excluded than others. Therefore, this study was based on a cohort of 1309 persons, including 189 whose reported reduction in stature was no more than 1 inch (in such case, an average of the two different reported heights [from 1981, 1982, and 1985] was used for 1981 and 2002). We calculated BMI for each participant based on the data for height and weight from 1981 and 2002. Adult obesity was defined as BMI at or above 30.

The analysis was conducted in two steps. First, we used logistic regression to predict obesity status at age 37/38 from a participant's baseline BMI, race/ethnicity, baseline age, and educational attainment at age 37/38. The logistic regression model was $\log(p/1-p) = \alpha + \beta_i X_i$, where p was the probability of obesity in adulthood and X_i were predictor variables. The regression model was run for males and females separately. A set of predicted individual probabilities of adult obesity was generated and compared between different racial/ethnic groups based on adolescent BMI. There was one point on the baseline BMI distribution where participants were equally likely to be obese (BMI ≥ 30) or not obese (BMI < 30) as adults. This point occurs when $p = 0.5$, and thus we used $\alpha + \beta_i X_i = 0$ to identify cutoff points on the BMI distribution for demarcating groups we would analyze for their risks of obesity in adulthood. (This approach has been used in previous research [9].) BMI cutoff points were further converted into sex- and age-specific BMI percentiles by using the 2000 revised CDC growth chart [14]. Second, we employed logistic regression to examine the associations between groups defined by the BMI percentile cutoff points and being obese in adulthood while controlling for age, race/ethnicity, and educational attainment in adulthood. Exact odds ratios (ORs) were computed because the data set contained some small cells. Multivariate-adjusted group probabilities of adult obesity were computed as predicted marginal values from the logistic model, and the significance of differences was determined from t -tests. SAS (version 9) was used for the data analysis [15].

Results

The size and characteristics of the study sample and the excluded sample are summarized in Table 1. Of the 1309 study cohort, 39% were aged 16 and 61% aged 17 years at baseline. The sample was 20% Hispanic, 28% black, and 52% white/other (classified as nonblack/non-Hispanic in the NLSY79 data). Fifty-two percent ($n = 684$) were males, 47% had a college degree or above by 2002, and 50% had a family income above \$20,000 in 1981. At age 16/17 years, 11% of the cohort had a BMI ≥ 85 th percentile and 3% had a BMI ≥ 95 th percentile. At age 37/38 years, 69% of the sample was overweight and 26% was obese. Compared to the study sample, those who were excluded were more likely to be white/other in race/ethnicity, had lower family income at baseline, lower education attainment at follow-up, and a higher prevalence of at risk for overweight at baseline.

In the logistic regression model that quantified risk for adult obesity, both baseline BMI and race/ethnicity were significant predictors of adult obesity in both sexes when there was control for baseline age and educational attainment in adulthood. The model had good predictive ability, with an area under the receiver operating characteristic

Table 1
Characteristics of the sample

	Study sample n (%)	Excluded sample n (%)	p-value ^a
Sample size	1309	1204	
Age in 1981 (age in 2002), years			
16 (37)	516 (39)	434 (36)	0.089
17 (38)	793 (61)	770 (64)	0.089
Race/ethnicity			
Hispanic	256 (20)	199 (17)	0.055
Black	366 (28)	287 (24)	0.021
White/other	687 (52)	718 (60)	0.000
Sex			
Male	684 (52)	625 (52)	0.896
Female	625 (48)	579 (48)	0.896
Education attainment (2002) ^b			
12th grade or less	698 (53)	291 (67)	0.000
College or above	611 (47)	144 (33)	0.000
Family income in 1981 (\$) ^b			
Mean	22233	18551	0.000
Median	20000	15000	na
BMI percentile in 1981, n (%) ^b			
<85th	1163 (89)	540 (85)	0.013
85th–<95th	101 (8)	72 (11)	0.012
≥95th	45 (3)	25 (4)	0.686
Weight status in 2002, n (%)			
Nonoverweight (BMI <25)	405 (31)	na	na
Overweight (25 ≤ BMI <30)	559 (43)	na	na
Obese (BMI ≥30)	345 (26)	na	na

BMI = body mass index.

^a The bolded p-values indicate significant differences in proportions or means between the study sample and excluded sample.

^b In the study sample, 1002 subjects had data available for family income. In the excluded sample, 435 subjects had data available for education attainment, 826 for family income and 637 for BMI at baseline.

(ROC) curve of 0.80 for both sexes. When baseline BMI increased by 1 unit (1 kg/m²) the odds of adult obesity increased by a factor of 1.5 (95% confidence interval [CI], 1.4–1.6) in both sexes. Among males, Hispanics and blacks were respectively 2.7 (95% CI, 1.6–4.4) and 2.3 (95% CI, 1.4–3.6) times as likely as whites/others to be obese adults.

Among females, blacks were 2.0 (95% CI, 1.3–3.2) times as likely as whites/others and 2.1 (95% CI, 1.2–3.8) times as likely as Hispanics to be obese adults.

The predicted individual probabilities of adult obesity based on adolescent BMI are presented in Table 2. As expected, the predicted probabilities increased with greater

Table 2
Predicted probabilities of adult obesity at age 37/38 based on adolescent BMI at age 16/17

BMI	Male				Female			
	All	White/other	Black	Hispanic	All	White/other	Black	Hispanic
16	0.02	0.02	0.04	0.04	0.03	0.03	0.05	0.02
18	0.05	0.03	0.08	0.09	0.07	0.05	0.10	0.05
20	0.11	0.07	0.16	0.18	0.13	0.11	0.21	0.11
22	0.21	0.15	0.29	0.32	0.26	0.22	0.36	0.21
24	0.38	0.28	0.48	0.52	0.43	0.39	0.56	0.37
26	0.57	0.47	0.67	0.70	0.63	0.58	0.74	0.57
28	0.75	0.66	0.82	0.84	0.79	0.76	0.86	0.75
30	0.87	0.81	0.91	0.92	0.89	0.87	0.93	0.87
32	0.94	0.91	0.96	0.96	0.95	0.94	0.97	0.94
34	0.97	0.96	0.98	0.98	0.98	0.97	0.99	0.97
36	0.99	0.98	0.99	0.99	0.99	0.99	0.99	0.99
38	0.99	0.99	1.00	1.00	1.00	0.99	1.00	0.99
40	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

BMI = body mass index.

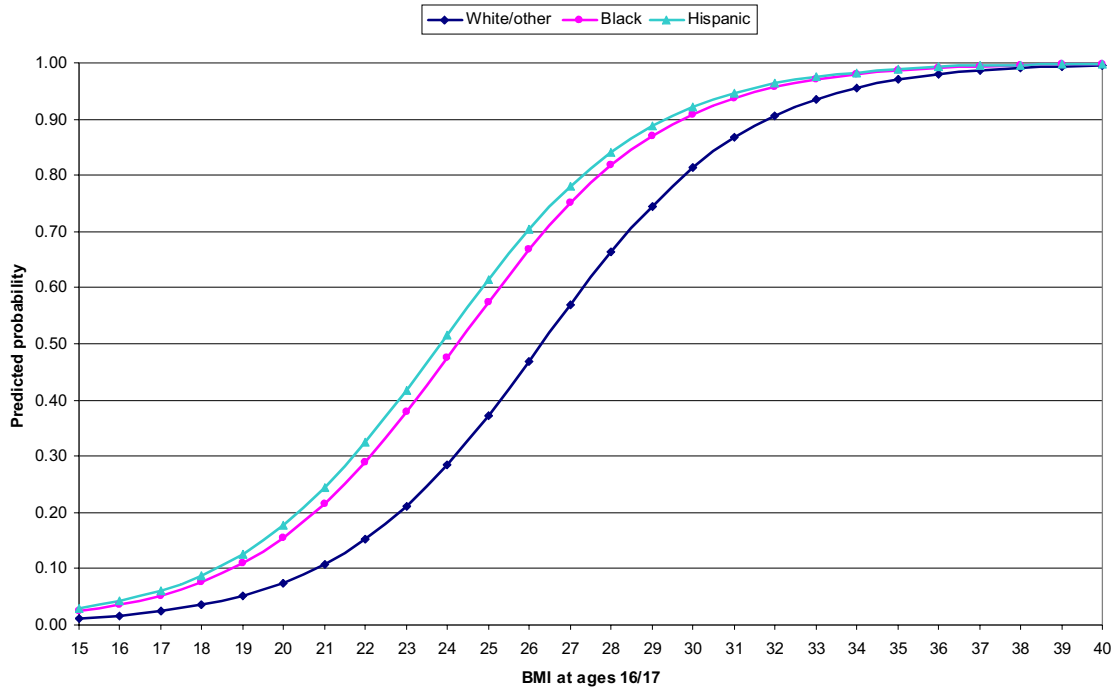


Figure 1. Predicted probability of males becoming obese adults by race/ethnicity.

values for the adolescent BMI. For example, a female adolescent with a BMI of 24 had a 43% chance of being obese as an adult; if the BMI was 26 the chance was 63%. As shown in Figures 1 and 2, the predicted probabilities varied by race/ethnicity. In males, this value was highest in His-

panics, followed by blacks and whites/others. In females, the probability was greatest in blacks, followed by whites/others and Hispanics.

When the predicted probability of adult obesity equaled 0.5, the BMI percentiles were 86th in males and 83rd in

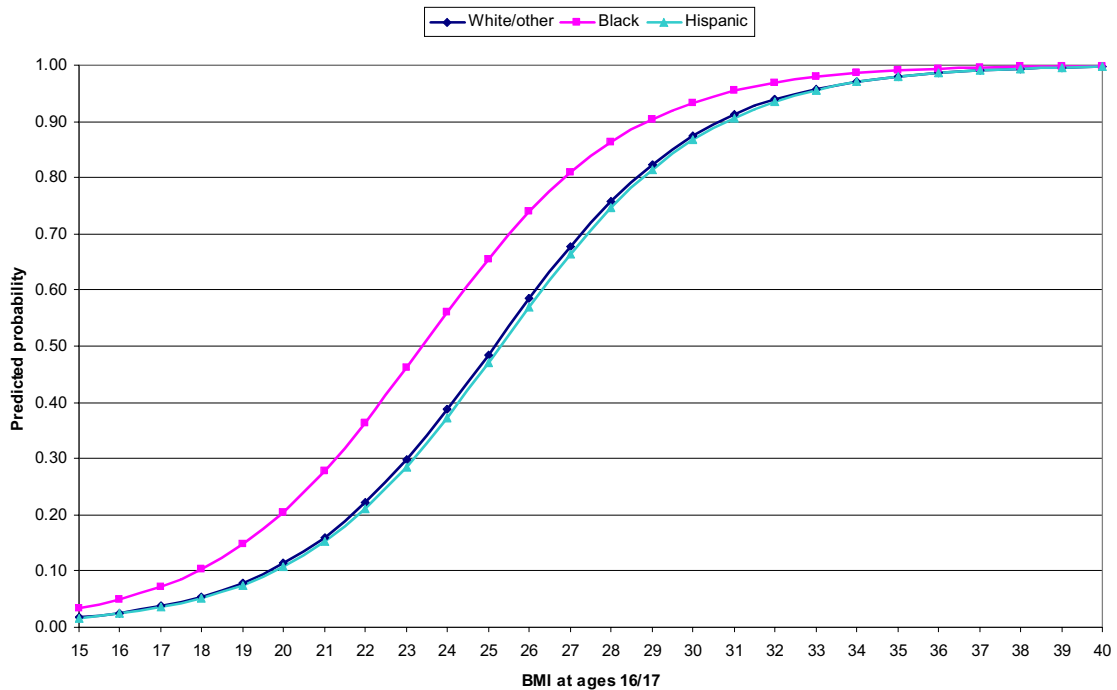


Figure 2. Predicted probability of females becoming obese adults by race/ethnicity.

Table 3
Probability of obesity at age 37/38 by sex and BMI at age 16/17

Sex	BMI percentile at age 16/17	No. of participants obese as adults/total no. of participants ^a	Predicted probability of obesity as adults (95% CI) ^b	Adjusted exact odds ratio (95% CI) ^b
Male	<85th	123/602	0.21 (0.17–0.24)	1
	85th–<95th	33/53	0.62 (0.49–0.75)	6.7 (3.5–13.1)
	≥95th	24/29	0.80 (0.65–0.96)	17.9 (6.4–62.3)
Female	<85th	114/561	0.21 (0.17–0.24)	1
	85th–<95th	36/48	0.73 (0.60–0.86)	10.7 (5.2–23.5)
	≥95th	15/16	0.92 (0.78–1.00)	49.3 (7.3–2107.3)

BMI = body mass index; CI = confidence interval.

^a In adulthood, obesity is defined as BMI ≥30.

^b Differences in age, race/ethnicity, and education level were adjusted.

females. These cutoff points varied by race/ethnicity and sex. In males, Hispanics had the lowest cutoff point (78th percentile of BMI), followed by blacks (81st), and whites/others (91st). In females, blacks had the lowest cutoff point (75th percentile of BMI), followed by whites/others and Hispanics (85th). Because the BMI cutoff points were close to the 85th percentile for both sexes, we used the 85th percentile to define the high-risk (BMI ≥85th percentile) and low-risk (BMI <85th percentile) groups. We further divided the high risk group into two subgroups: BMI ≥85th but <95th percentile and BMI ≥95th percentile.

The predicted group probabilities of adult obesity based on baseline BMI categories are shown in Table 3 by BMI group (below the 85th percentile, ≥85th but below the 95th percentile, and ≥95th percentile). Adolescents with a BMI ≥95th percentile had the highest probability of adult obesity (males, 80%; females, 92%), followed by the intermediate group and then the group with BMI below the 85th percentile. Versus adolescents with a BMI <85th percentile, those with a BMI between the 85th and 95th percentiles were more likely to be obese (male, OR = 7; female, OR = 11) adults, and those with a BMI ≥95th percentile were most likely to be obese (male, OR = 18; female, OR = 49) adults.

Discussion

The present study fills a void in the current literature by using recent data (from 2002) to determine risk for adult obesity among males and females who were aged 16–17 years in 1981. As we expected, youth who were classified as high risk (in this case, at the 85th percentile or higher in terms of BMI) were at significantly greater risk for obesity as adults than were their counterparts who were not considered high risk. When we examined youth whose BMI was at the 95th percentile or higher, we found that the OR was quite high indeed; among girls this value reached 49 for risk of obesity (using those below the 85th percentile as the referent).

We derived both predicted and observed probabilities in this study, but direct comparison of our estimates with those of other studies is difficult because of differences in birth

years and the ages at which follow-up assessments were performed. The most comparable cohort we could find in earlier studies is a subgroup of 15–17-year-olds in the recent Bogalusa Heart Study [12]. This study followed a cohort of 2610 children (from Bogalusa, LA) aged 2–17 years for an average of 17.6 years; a subgroup of 15–17-year-olds in 1975 was followed into their early 30s in 1993. In this group, the probabilities of adult obesity among those with a BMI between the 85th and 94th percentile were 59% among males and 69% among females; among those with a BMI ≥95th percentile these probabilities rose to 86% among males and 90% among females. These estimates are very close to those of our study (62% among males and 73% among females for the 85th–<95th percentile group; 80% among males and 92% among females in the group with a BMI ≥95th percentile).

The set of predicted individual probabilities of adult obesity we developed provides an easy way to assess an adolescent's risk of becoming an obese adult. Understanding the associations between adolescent BMI and the likelihood of adult obesity can help adolescents to set goals for themselves; for example, if a male adolescent with a BMI of 30 wants to drop his risk of adult obesity from 87% to 75%, he will need to reduce his BMI from 30 to 28. The actual reduction in the probability of adult obesity may be different from our prediction because factors other than those included as controls (i.e., genetic and environmental factors) were not considered in our study.

The set of predicted group probabilities of adult obesity that we derived might enable researchers to predict an intervention's long-term impacts. Because overweight during childhood involves both immediate and long-term risks to physical health, it is important for those who evaluate interventions to capture both their immediate and long-term impacts. The study of remote aftereffects, however, requires long-term follow-up to obtain information on morbidity and mortality. And yet, such investigations are unusual, because most current evaluation studies assess only immediate impacts [16–19], such as increases in physical activity, reduction in fat intake, decreases in BMI, or reduction in percent body fat. An alternative approach to long-term follow-up is

to project an intervention's long-term reduction of risk based on participants' risk reduction in the immediate term. For example, if an intervention program can help female adolescents aged 16/17 years reduce BMI from the ≥ 95 th percentile to the 85th–<95th percentile, their probabilities of adult obesity will drop from 92% to 73%. This approach was previously used in an economic study of a school-based program for preventing obesity [20].

A few limitations of our study should be considered. First, this study was based on self-reported data for height and weight. Although large national studies have shown older adolescents and young adults can self-report their height and weight fairly accurately [21–23], other studies have shown larger differences between self-reported and measured BMI [24,25]. All of these studies, however, found that self-reported and measured BMI were highly correlated [21–25]. Thus, in our study cohort, bias in the self-reported heights and weights at ages 16/17 and at 37/38 should not affect significantly the validity of our findings on tracking. Second, the study cohort was a subgroup of the NLSY79, and thus it was no longer a nationally representative sample. Furthermore, 1204 (48%) of the 2513 persons aged 16/17 years in 1981 who participated in the NLSY79 were excluded from this study, 70% of them because of missing data at follow-up. Versus those who were included in our study, those who were excluded were more likely to be white/other in race/ethnicity, had lower family income at baseline, lower education attainment at follow-up, and a higher prevalence of at-risk for overweight at baseline. Third, because of the lack of sufficient data on family income, it is not known whether the probabilities for tracking BMI from adolescence to adulthood differ by family income.

In the present study, we found that adolescents with a BMI ≥ 85 th percentile were at high risk for obesity in adulthood. We believe that targeted interventions should be offered to these high-risk adolescents. The greatest probabilities of adult obesity were found among Hispanic males and black females. In previous research, similar racial/ethnic differences were observed in the time to onset of obesity for 17/18-year-old adolescents who were not obese. Using data from the NLSY79, McTigue et al. [26] found that Hispanic males demonstrated the most rapid onset of obesity, followed by black males and white males. Among females, being black was associated with the most rapid onset of obesity, followed by Hispanic and then white. One possible explanation for such racial/ethnic differences in risk of adult obesity is self-perceived body image. Researchers have suggested that body images of black females may contribute to their high risk for obesity, although such impact varies by socioeconomic status (SES). Compared to their white counterparts, black females with low SES are more likely to choose heavier body ideals, see themselves as thinner than physicians' ratings, and more satisfied with their bodies; while black females with high SES have body

images more like those of white females [27,28]. Our findings highlight the need for culturally diverse interventions that target adolescents at high risk for the development of obesity.

Our finding of a strong association between adolescent and adult BMI, along with findings from other studies [7,12,13], suggests that early intervention in preadolescence is important to prevent the high risk of adult obesity and its related health risks in adulthood. Population-based efforts combined with targeted interventions for these high-risk adolescents are needed.

Acknowledgments

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References

- [1] Hedley AA, Ogden CL, Johnson CL, et al. Prevalence of overweight and obesity among US children, adolescents, and adults, 1999–2002. *JAMA* 2004;291:2847–50.
- [2] Ogden CL, Carroll MD, Curtin LR, et al. Prevalence of overweight and obesity in the United States, 1999–2004. *JAMA* 2006;295:1549–55.
- [3] Koplan JP, Liverman CT, Kraak VA, eds. *Preventing Childhood Obesity: Health in the Balance*. Washington, DC: The National Academies Press, 2005.
- [4] Dietz WH. Health consequences of obesity in youth: childhood predictors of adult disease. *Pediatrics* 1998;101:518–25.
- [5] U.S. Department of Health and Human Services. *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General, 2001. [Available from: U.S. GPO, Washington.]
- [6] Must A, Strauss RS. Risks and consequences of childhood and adolescent obesity. *Int Obes Relat Metab Disord* 1999;23(Suppl 2):S2–11.
- [7] Whitaker RC, Wright JA, Pepe MS, et al. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med* 1997;337:869–73.
- [8] Kimm SY, Barton BA, Obarzanek E, et al. Obesity development during adolescence in a biracial cohort: the NHLBI Growth and Health Study. *Pediatrics* 2002;110(5):e54.
- [9] Williams S. Overweight at age 21: the association with body mass index in childhood and adolescence and parents' body mass index. A cohort study of New Zealanders born in 1972–1973. *Int J Obes Relat Metab Disord* 2001;25:158–63.
- [10] Qing H, Johan K. Prediction of adult overweight during the pediatric years. *Pediatr Res* 1999;46:697–703.
- [11] Freedman DS, Khan LK, Dietz WH, et al. Relationship of childhood obesity to coronary heart disease risk factors in adulthood: the Bogalusa Heart Study. *Pediatrics* 2001;108:712–8.
- [12] Freedman DS, Khan LK, Serdula MK, et al. The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics* 2005;115:22–7.
- [13] Guo SS, Wu W, Chumlea WC, et al. Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence. *Am J Clin Nutr* 2002;76:653–8.

- [14] Kuczmarski RJ, Ogden CL, Guo SS, et al. 2000 CDC Growth Charts for the United States: methods and development. *Vital Health Stat 11* 2002;246:1–190.
- [15] SAS Institute Inc. *SAS User's Guide: Statistics*. Version 9.0. Cary, NC: SAS Institute Inc., 2003.
- [16] Luepker RV, Perry CL, McKinlay SM, et al. Outcomes of a field trial to improve children's dietary patterns and physical activity. The Child and Adolescent Trial for Cardiovascular Health. CATCH collaborative group. *JAMA* 1996;275:768–76.
- [17] Gortmaker SL, Peterson K, Wiecha J, et al. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med* 1999;153:409–18.
- [18] Robinson TN. Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA* 1999;282:1561–7.
- [19] Yin Z, Gutin B, Johnson MH, et al. An environmental approach to obesity prevention in children: Medical College of Georgia FitKid Project year 1 results. *Obes Res* 2005;13:2153–61.
- [20] Wang LY, Yang Q, Lowry R, et al. Economic analysis of a school-based obesity prevention program. *Obes Res* 2003;11:1313–24.
- [21] Kuczmarski MF, Kuczmarski RJ, Najjar M. Effects of age on validity of self-reported height, weight, and body mass index: findings from the third National Health and Nutrition Examination Survey, 1988–1994. *J Am Diet Assoc* 2001;101:28–34.
- [22] Himes JH, Faricy A. Validity and reliability of self-reported stature and weight of US adolescents. *Am J Hum Biol* 2001;13:255–60.
- [23] Goodman E, Hinden BR, Khandelwal S. Accuracy of teen and parental reports of obesity and body mass index. *Pediatrics* 2000;106:52–8.
- [24] Brener ND, McManus T, Galuska DA, et al. Reliability and validity of self-reported height and weight among high school students. *J Adolesc Health* 2003;32:281–7.
- [25] Himes JH, Story M. Validity of self-reported weight and stature of American Indian youth. *J Adolesc Health* 1992;13:118–20.
- [26] McTigue KM, Garrett JM, Popkin BM. The natural history of the development of obesity in a cohort of young U.S. adults between 1981 and 1998. *Ann Intern Med* 2002;136:857–64.
- [27] Dekkers JC, Podolsky RH, Treiber FA, et al. Development of general and central obesity from childhood into early adulthood in African American and European American males and females with a family history of cardiovascular disease. *Am J Clin Nutr* 2004;79:661–8.
- [28] Flynn KJ, Fitzgibbon M. Body images and obesity risk among black females: a review of the literature. *Ann Behav Med* 1998;20:13–24.