Predictors of Physical Activity in the Transition After High School Among Young Women

Deborah B. Horn, Jennifer R. O'Neill, Karin A. Pfeiffer, Marsha Dowda, and Russell R. Pate

Purpose: The purpose of this study was to identify factors associated with physical activity (PA) in women during the first year following high school. ***Methods:*** Females from 22 high schools (n = 915) completed the 3-Day Physical Activity Recall in 12th grade and reported if they were sports participants. After graduation, 305 women (18.9 ± 0.6 years) completed the International Physical Activity Questionnaire. They reported time spent per day in moderate-to-vigorous PA (MVPA) and vigorous PA (VPA) for the previous week. Multiple logistic regression was used to predict postgraduate PA. ***Results:*** The odds of being in the high-active group were greater in women who were sports participants (OR = 1.93) in 12th grade. The odds of being in the high-active group were greater among white women (OR = 2.09) and greater among currently employed women compared with unemployed women (OR = 5.57). MVPA had borderline significance in the regression model. ***Conclusion:*** Sports participation and being currently employed predicted physical activity at postgraduation.

Keywords: adolescence, sports participation, employment, African American

Physical inactivity is a major public health problem in the United States and contributes to multiple disease states, including obesity, cardiovascular disease, diabetes, elevated cholesterol, and hypertension in adults.[1-3] Physical activity levels decrease during adolescence,[4,5] and the decline in girls is markedly sharper than the decline in boys.[5-7] The National Growth and Health Study demonstrated that physical activity levels in girls decreased 83% from age 9 to 19, with the most dramatic decline occurring by ages 15 to 16.[6,8] The 2005 Youth Risk Behavior Surveillance Survey reported the prevalence of participation in moderate or vigorous physical activity to be 16.7 percentage points higher in 9th-grade female students (68.4%) than 12th-grade female students (51.7%).[5] The difference in male students was only 6.5% (78.4% to 71.9%).[5] Physical activity levels have also been shown to decline during the transition from adolescence to early adulthood, both cross-sectionally[9]

Horn is with the Dept of Community and Family Medicine, Duke University School of Medicine, CHSPR Fellow, Durham, NC 27701. O'Neill, Dowda, and Pate are with the Dept of Exercise Science, University of South Carolina, Columbia, SC 29208. Pfeiffer is with the Dept of Kinesiology, Michigan State University, East Lansing, MI 48824.

and longitudinally.[10,11] This decline is also more dramatic among females than among males,[9] which highlights the need for studies examining factors related to physical activity in young women.

In addition to a decline in physical activity, other age-related, adverse health trends occur during the transition between adolescence and early adulthood. The National Longitudinal Study of Adolescent Health found that during a 5-year period from adolescence to young adulthood, obesity incidence increased 12.7%, with an additional 9.4% of participants remaining obese.[12] Health behaviors that increase the risk of cancer, including physical inactivity, smoking, alcohol consumption, sexual practices, and sun exposure, also have been shown to increase during the transition from adolescence to early adulthood.[13,14] This transition, termed *emerging adulthood*, is a critical period of decision-making that might contribute to adult habits and health-related behaviors.[11]

Few studies have examined the role of this life transition and its impact on women's physical activity levels. The transition often includes major life changes in place of residence, academic status, employment status, marital status, childbirth, and the assumption of new social roles and responsibilities. Marriage, having children, and cohabitating with a significant other have been associated with physical inactivity in young women.[11,15] Employment has been reported to be both positively[16] and negatively[15] associated with physical activity participation. In a study of women age 18 through 23 years with a 4-year follow-up period, Brown and Trost reported that women who began paid work were 1.18 times more likely to be inactive at follow-up than women who did not begin paid work.[15] Alternatively, Leslie and colleagues found that women who were not employed were 1.23 times more likely to be insufficiently active than women who were employed.[16] Sports participation in adolescence[4,10,17] and participation in physical activity throughout adolescence[18] have been associated with increased physical activity in adulthood. However, no study has examined how the combination of the above factors is related to physical activity behavior during the transition from adolescence to young adulthood. Therefore, the purpose of the current study was to identify factors associated with physical activity in young women in the year following graduation from high school, based on 12th-grade physical activity levels and other 12th-grade and postgraduation characteristics.

Methods

Study Design and Participants

This study reports longitudinal data that were collected as part of the measurement protocol in a large school-based physical activity intervention study, the Lifestyle Education for Activity Program (LEAP). Participants were 12th-grade girls in 22 high schools in South Carolina who were contacted 11.5 to 17.5 months after graduation from high school. Results of the initial intervention study, which examined physical activity levels of the same participants during 8th and 9th grade, have been published previously.[19] For the 12th-grade assessment, all girls in the participating high schools were invited to enroll in the study. Each girl and her primary guardian (if <18 years) provided written informed consent.

To be eligible for the postgraduate assessment, girls must have completed the questionnaires at 12th grade and provided their telephone number, because they were recruited by telephone. The total number of eligible 12th-grade girls was 915. Approximately 5 attempts were made to contact them at various times. Family members often redirected the surveyor if girls had moved away from home, gone to college, or obtained a cell phone during the transition year. Additional methods included reverse look-up attempts in electronic phone books. Once contacted, they were reminded of their participation as 12th graders in the LEAP study and were invited to participate in the follow-up. Participants gave their consent, and the survey was conducted at that time. Participants received a summary of their results, a long-distance calling card, and entry into a drawing for several portable CD players in exchange for their participation. All telephone interviews were conducted by trained research assistants.

A total of 314 girls provided complete physical activity data in 12th grade and at postgraduation. Outliers were deleted (n = 9) as recommended by the International Physical Activity Questionnaire (IPAQ) Web site: http://www.ipaq.ki.se/. The racial/ethnic composition of this study group (58% African American, 42% white) is similar to that of those eligible to participate (54% African American, 41.7% white). Although eligible to participate, there were no Hispanic girls in this follow-up sample. In addition, this study group is similar to those girls who were eligible to participate with regard to age (17.6 ± 0.6, 17.6 ± 0.6), body mass index (25.3 ± 6.2, 25.2 ± 6.4), number of blocks of moderate-to-vigorous physical activity (MVPA) (4.4 ± 3.7, 4.8 ± 3.9), and number of blocks of vigorous physical activity (VPA) (1.1 ± 2.2, 1.2 ± 2.2), respectively. The study was approved by the University of South Carolina Institutional Review Board.

Measures

12th-Grade Physical Activity.   Physical activity was assessed in 12th-grade girls using the 3-Day Physical Activity Recall (3DPAR).[20,21] This instrument has been validated against accelerometry in adolescent females, with correlations ranging from .35 to .51 for self-reported total metabolic equivalents (METs), blocks of MVPA, and blocks of VPA.[20] The 3DPAR was administered to participants in the spring of their 12th-grade year by trained research assistants. The 3DPAR required participants to recall their physical activity behavior from the previous 3 days, beginning with the most recent day. Participants were asked to complete a grid for each day recalled. They reported their predominant activity in each of the 30-minute blocks, beginning at 7:00 AM and ending at 12:00 midnight. A list of 59 activities was provided that included sedentary activities, activities of daily living, physical activities, physical education, and sports. Participants also indicated if the activity was performed at a light, moderate, hard, or very hard intensity. Light activities were described as requiring little or no movement with slow breathing, moderate activities as requiring some movement and normal breathing, hard activities as requiring moderate movement and increased breathing, and very hard activities as requiring quick movements and hard breathing.

Data were reduced to 2 summary variables: an average of 1 or more 30-minute blocks of VPA (≥6 METs) per day and an average of 2 or more 30-minute blocks

of MVPA (≥3 METs) per day. MET values were obtained from the Compendium of Physical Activities.[22]

Sports Participation.   Sports participation was assessed using 2 questions. The first question was, "During the past 12 months, how many sports teams run by your school did you play on?"[23] In a similar manner, girls were asked about teams run by organizations outside of school. If a girl reported 1 or more sports teams from either question, she was considered a sport participant.

Postgraduate Physical Activity.   Because the method of survey administration changed (ie, participants were contacted via telephone for the follow-up), the 3DPAR was not appropriate to assess postgraduate physical activity. Therefore, the IPAQ Long 7-Day Version was used to assess physical activity participation.[24] The IPAQ is a 7-day recall of participation in moderate, vigorous, and walking activities across 5 domains: occupational, transportation, housework/family caring, recreation/sport, and time spent sitting. The telephone version of the questionnaire includes a script that assists subjects by giving predetermined clarifications and prompts to questions regarding physical activity intensity and assistance in estimating duration. Participants were asked to estimate the number of days in the last week they spent participating in a given activity and then to indicate the typical amount of time spent per day on that activity. The IPAQ has preassigned MET values for each activity.[24] Data were reduced to MET-minutes of activity per week. Outliers were deleted (n = 9) as recommended by the IPAQ Web site: http://www.ipaq.ki.se/. The IPAQ is a reliable and valid instrument for use in adults, with a pooled Spearman repeatability coefficient of 0.81 (95% CI: 0.79–0.82) and criterion validity with a pooled agreement of 0.33 (95% CI: 0.26–0.39).[24]

In order to compare the responses obtained from the 3DPAR administered in 12th grade with the level of physical activity reported in the year after high school, participants were divided into tertiles based on their physical activity levels at postgraduation. "High-active" individuals were those in the upper tertile and "low-active" individuals were those in the 2 lowest tertiles.

The decision to use tertiles was predicated on the fact that a ceiling effect occurred with 72% of the women being placed in the high-active group when analyzing the data using the categorical form recommended by the IPAQ Data Processing and Analysis document.

Weight Status.   For 12th-grade girls, height was measured to the nearest 1.0 cm with a portable stadiometer, and weight was measured to the nearest 0.1 kg with a digital scale. In the follow-up phone survey, height and weight were self-reported.

Body mass index (BMI) was calculated by dividing weight in kilograms by height in meters squared. Twelfth-grade girls who were less than 18 years of age (n = 134) were classified as normal weight if their BMI was less than the 85th percentile of the Centers for Disease Control and Prevention's BMI-for-age Growth Charts.[25] Participants who were 18 and older were classified as normal weight if their BMI was less than 25, according to the cut-points established by the National Institutes of Health.[26] These categorizations allowed for comparable categories across the 2 age groups in which weight status was defined as normal weight and above normal weight.

Researchers have reported high agreement between female adolescents' self-report and objective measurement of height (intraclass correlation coefficients R = .82 to .89) and weight (intraclass correlation coefficients R = .92 to .97).[27] In another sample of female adolescents, high agreement between self-report and objective measurement was also found: The intraclass correlations for height and weight were .77 and .92, respectively.[28]

Additional Postgraduate Characteristics.   In addition to physical activity data, demographic information regarding typical changes that occurred during the transition from high school to post–high school was collected. This included full- or part-time work status, academic enrollment, pregnancy status, number of dependent children, and marital status. Each of these characteristics was self-reported.

Statistical Analyses

Descriptive statistics, which included means (standard deviations) and percentages, were calculated for the total group of young women (n = 305). Crude odds ratios and 95% confidence intervals were calculated for categorical variables of interest. T tests were performed for continuous variables.

A multivariate logistic regression model was used to predict postgraduate activity from 12th-grade variables and current employment status. The dependent variable in the analysis was activity level at postgraduation (1 = high, 0 = low). Independent variables were entered into the multivariate model if P values in the univariate analysis were .10 or less. All analyses were performed with SAS (version 9.1).[29]

Results

Characteristics of the young women are shown in Table 1. A total of 305 young women were successfully contacted and interviewed. The mean age (± standard deviation) of the participants postgraduation was 18.9 (0.6) years, and their BMI was 24.7 (5.2) kg/m^2. Most of the young women were single (98.0%), 58% were African American, and 75.3% were students.

The distribution of the independent variables and corresponding odds ratios, including 95% confidence intervals, are presented in Table 2. The odds of being in the high-active group at postgraduation were greater in young women who participated in an average of 2 or more blocks of MVPA per day (OR = 2.22) in 12th grade. The odds of being in the high-active group were 2.09 times greater among white women compared with African American women and 5.50 times greater among currently employed women compared with women currently not employed. In addition, young women who reported sports participation in 12th grade were more likely to be in the high-active group (OR = 2.11) compared with non–sports participants.

Results of the multiple logistic regression are shown in Table 3. After deletion of nonsignificant variables, sport participation (OR = 1.93) and being currently employed (OR = 5.57) were significantly related to women being active postgraduation. MVPA and race had borderline significance in the regression model.

Table 1 Characteristics of Girls Followed From 12th Grade to 11.5–17.5 Months Post–High School (n = 305)

Characteristic	Mean (SD) or %	Range
Age (postgraduation), y	18.9 (0.6)	18–21
Body mass index (postgraduation)	24.7 (5.2)	14.5–43.9
Race		
African American	58.0	
White	42.0	
Status		
student, work part-time	36.0	
student, full-time job	15.3	
full-time student	24.0	
part-time job	7.0	
full-time job	10.7	
unemployed	7.0	
Marital status		
single	98.0	
married	1.6	
divorced	0.0	
other	0.3	
Children		
≥1	7.9	
0	92.1	
Weight status		
normal weight at both time points	55.6	
above normal weight at both time points	31.5	
normal weight at 12th grade, above normal weight postgraduate	7.0	
above normal weight at 12th grade, normal weight postgraduate	6.0	
Physical activity tertiles		
60–3786 MET-min/wk	100 females	
3915–9016 MET-min/wk	101 females	
9184–42,563 MET-min/wk	101 females	

Table 2 Percentage, Unadjusted Odds Ratios, and 95% CI for Categorical Variables and Activity Status (104 = High, 201 = Low) of 305 Young Women

Variable	n	% High active	P	OR (95% CI)
Race				
White	128	43.8	.003	2.09 (1.29–3.38)
African American	177	27.1		
1+ block VPA (12th grade)				
yes	111	39.6	.12	1.47 (0.90–2.39)
no	194	30.9		
2+ block MVPA (12th grade)				
yes	208	39.4	.004	2.22 (1.28–3.85)
no	97	22.7		
<6 blocks TV (12th grade)				
yes	265	32.5	.82	0.92 (0.45–1.87)
no	40	34.3		
Above normal weight (12th grade)				
yes	119	31.9	.52	0.85 (0.52–1.39)
no	186	35.5		
Sport participation (12th grade)				
yes	163	41.7	.003	2.11 (1.29–3.44)
no	142	25.4		
Currently employed (full-time or part-time)				
yes	209	44.0	<.001	5.50 (2.83–10.69)
no	96	12.5		
Currently a student (full-time or part-time)				
yes	227	33.0	.74	0.91 (0.52–1.58)
no	74	35.1		

Abbreviations: VPA, vigorous physical activity; MVPA, moderate-to-vigorous physical activity; TV, television.

Table 3 Multiple Logistic Regression for Activity Group at Postgraduation

	OR	95% CI	P
Race	1.66	0.98–2.81	.06
2 blocks MVPA	1.67	0.92–3.03	.09
Sport participation	1.93	1.13–3.31	.02
Job	5.57	2.82–11.00	<.001

Abbreviation: MVPA, moderate-to-vigorous physical activity.

Discussion

This study examined physical activity in young women during the life transition from 12th grade to the first year postgraduation. This study is unique in the literature because it specifically examines this initial transition year in relation to physical activity. The 2 most important predictors of physical activity at postgraduation were sport participation in 12th grade and employment status in the first year after graduation. Young women who reported participating in school or community sport teams were more likely to be in the high-active group at follow-up than were young women who did not report sport participation.

Our findings showed that girls who played sports in 12th grade were 1.9 times more likely to be highly active 1 year postgraduation. Results of our previous investigations have indicated that 8th- and 9th-grade sport participants were more likely to be vigorously physically active in 12th grade.[30] Similarly, other studies have shown a relationship between sport participation at younger ages and physical activity during adulthood.[17,31] Telama et al[32] also found that physical activity participation in adolescence is associated with increased physical activity in adulthood. In a recent review paper, Tammelin (2005) concluded that although physical activity levels decline from adolescence to young adulthood, participation in physical activities and sports during adolescence increases the probability of an active lifestyle during adulthood.[33] A Finnish study showed a statistically significant relationship between sport participation and future physical activity in a study involving children and youth ages 9, 12, 15, and 18.[34] Our study and others indicate that sports participation in adolescence is important for continued participation in activity in adulthood.

Current employment had a significant positive relationship with physical activity in the first year after high school graduation. Overall, reported work activity ranged from 0% to 98% of total activity, with a mean of 45% (SD = 33.5). Most of the young women reported their type of employment, and most were in entry-level positions, including cashier, waitress, or childcare worker. Such jobs often include light to moderate physical activity. These findings are consistent with other studies, including one in which 12th-grade girls who worked accumulated approximately 30% of their reported MVPA while at work.[35] Bell and Lee reported cross-sectional data indicating that employed young women (ages 18–27) accumulated more physical activity than young women who were not employed.[11] In another study of college-aged women (median age = 20) transitioning to adult behavior patterns, employment was associated with engaging in 30 minutes of MVPA daily.[16] These studies highlight the importance of activity that is accumulated while working, and our study demonstrates the novel finding that current employment predicted increased physical activity levels even in this first year of emerging adulthood.

The 3DPAR and the IPAQ (Long 7-Day Version) assessed physical activity on the previous 3 days and 7 days, respectively.[20,24] Although these measures differ in their method of administration and the number of days assessed, both the 3DPAR and the IPAQ measure total activity. The 3DPAR measures activity from 7:00 AM to 12:00 AM and includes sedentary, leisure-time/sport, transportation, occupational, and school-related activities. The IPAQ assesses activity across 5 domains: occupational, transportation, housework/family caring, recreation/sport, and time spent sitting. However, for this study, time spent sitting was not included

in "total activity," as recommended by the IPAQ data-analysis procedures. For this analysis, total activity was calculated for postgraduate women, and the upper tertile and the lower 2 tertiles were considered the high-active and low-active groups, respectively. Meeting a standard of 2 or more 30-minute blocks of MVPA in the 12th grade was used to predict the activity group at postgraduation. This method of dividing the continuous variables into categories of high active and low active is similar to that of Bell and Lee.[11]

The study is unique in that the period of follow-up is specific to the initial year in the *emerging adulthood* transition. Strengths of this study include the large sample size; the approximately equal numbers of African American and white girls; and the inclusion of high schools in rural, suburban, and urban areas of South Carolina. One limitation of the study was the low response rate for the postgraduate assessment. This postgraduate year lead to frequent changes in participants' residence and contact information. As previously indicated, multiple attempts to locate the women at follow-up were pursued. Despite these challenges, we were successful in finding a large number of the initial participants. Furthermore, our study sample was similar to those eligible to participate with regard to race/ethnicity, age, BMI, and blocks of MVPA. The other study limitation was the different methods of physical activity assessment: the 3DPAR for 12th grade and the IPAQ for postgraduate. Although the 2 physical activity assessments are different surveys, they are similar in nature and are both validated, self-report instruments in the populations for which they were used.[20,24,36]

The findings of this investigation suggest several essential areas for public health intervention to increase physical activity in young women as they transition from high school to emerging adulthood. First, promoting physical activity in the 12th grade through school-based and extracurricular programs might encourage young women to adopt more active lifestyles. This is an important suggestion given long-standing and controversial discussions regarding the necessity and funding of scheduled physical activity in US schools. Previous attempts to promote physical activity during emerging adulthood have been unsuccessful but might have occurred later in the transition process.[37] For example, Calfas et al attempted to increase physical activity participation among college seniors (mean age = 24).[37] Although physical activity overall was unchanged, the authors did find that young women improved significantly on experiential and behavioral processes of change.[37] This research suggests that earlier intervention might be necessary to promote the adoption of a physically active lifestyle during the emerging adulthood transition. By providing programs in the 12th grade, schools and community programs might be more effective in helping young women maintain recommended physical activity levels during early adulthood. Second, studies targeted at a more detailed analysis of occupation-related physical activity might provide suggestions regarding how to assist young women in making workplace choices that encourage an active lifestyle.

In summary, this study's unique contribution to this literature is its demonstration, in adolescent girls and young women, that sports participation during high school predicts physical activity participation during the critical initial transition into adulthood. We also observed that currently employed young women were more active than those who were not employed. This suggests that entry-level jobs might provide important amounts of light- and moderate-intensity physical activity. Future

studies should investigate the longer term effects of high school physical activity in young women and identify interventions that support healthy decision-making regarding physical activity during the transition to independent adult living.

Acknowledgments

References

1. US Department of Health and Human Services. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta, GA: US Dept of Health and Human Services, Centers for Disease Control and Prevention; 1996.
2. Blair SN, Kohl HW III, Paffenbarger RS Jr, Clark DG, Cooper KH, Gibbons LW. Physical fitness and all-cause mortality: a prospective study of healthy men and women. *J Am Med Assoc*. 1989;262(17):2395-2401.
3. Kesaniemi YK, Danforth E Jr, Jensen MD, Kopelman PG, Lefebvre P, Reeder BA. Dose-response issues concerning physical activity and health: an evidence-based symposium. *Med Sci Sports Exerc*. 2001;33(suppl 6):S351-S358.
4. Dovey SM, Reeder AI, Chalmers DJ. Continuity and change in sporting and leisure time physical activities during adolescence. *Br J Sports Med*. 1998;32(1):53-57.
5. Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance—United States, 2005. *Morb Mortal Wkly Rep Surveill Summ*. 2006;55(SS05):1-108.
6. Kimm SY, Glynn NW, Kriska AM, et al. Decline in physical activity in black girls and white girls during adolescence. *N Engl J Med*. 2002;347(10):709-715.
7. Strong WB, Malina RM, Blimkie CJ, et al. Evidence based physical activity for school-age youth. *J Pediatr*. 2005;146(6):732-737.
8. Kimm SY, Glynn NW, Kriska AM, et al. Longitudinal changes in physical activity in a biracial cohort during adolescence. *Med Sci Sports Exerc*. 2000;32(8):1445-1454.
9. Caspersen CJ, Pereira MA, Curran KM. Changes in physical activity patterns in the United States, by sex and cross-sectional age. *Med Sci Sports Exerc*. 2000;32(9):1601-1609.
10. Nelson MC, Gordon-Larsen P, Adair LS, Popkin BM. Adolescent physical activity and sedentary behavior: patterning and long-term maintenance. *Am J Prev Med*. 2005;28(3):259-266.
11. Bell S, Lee C. Emerging adulthood and patterns of physical activity among young Australian women. *Int J Behav Med*. 2005;12(4):227-235.
12. Gordon-Larsen P, Adair LS, Nelson MC, Popkin BM. Five-year obesity incidence in the transition period between adolescence and adulthood: the National Longitudinal Study of Adolescent Health. *Am J Clin Nutr*. 2004;80(3):569-575.
13. Baranowski T, Cullen KW, Basen-Engquist K, et al. Transitions out of high school: time of increased cancer risk? *Prev Med*. 1997;26(5 Pt 1):694-703.
14. Johnson MF, Nichols JF, Sallis JF, Calfas KJ, Hovell MF. Interrelationships between physical activity and other health behaviors among university women and men. *Prev Med*. 1998;27(4):536-544.
15. Brown WJ, Trost SG. Life transitions and changing physical activity patterns in young women. *Am J Prev Med*. 2003;25(2):140-143.
16. Leslie E, Owen N, Salmon J, Bauman A, Sallis JF, Lo SK. Insufficiently active Australian college students: perceived personal, social, and environmental influences. *Prev Med*. 1999;28(1):20-27.

17. Tammelin T, Nayha S, Hills AP, Jarvelin MR. Adolescent participation in sports and adult physical activity. *Am J Prev Med*. 2003;24(1):22-28.
18. Telama R, Yang X, Viikari J, Valimaki I, Wanne O, Raitakari O. Physical activity from childhood to adulthood: a 21-year tracking study. *Am J Prev Med*. 2005;28(3):267-273.
19. Pate RR, Ward DS, Saunders RP, Felton G, Dishman RK, Dowda M. Promotion of physical activity in high school girls: a randomized controlled trial. *Am J Public Health*. 2005;95:1582-1587.
20. Pate RR, Ross R, Dowda M, Trost SG, Sirard J. Validation of a three-day physical activity recall instrument in female youth. *Pediatr Exerc Sci*. 2003;15:257-265.
21. McMurray RG, Ring KB, Treuth MS, et al. Comparison of two approaches to structured physical activity surveys for adolescents. *Med Sci Sports Exerc*. 2004;36(12):2135-2143.
22. Ainsworth BE, Haskell WL, Whitt MC, et al. Compendium of physical activities: An update of activity codes and MET intensities. *Med Sci Sports Exerc*. 2000;32(suppl 9): S498-S516.
23. Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance—United States, 2003. *Morb Mortal Wkly Rep*. 2004;53(SS02):1-96.
24. Craig CL, Marshall AL, Sjostrom M, et al. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc*. 2003;35(8):1381-1395.
25. Kuczmarski RJ, Ogden CL, Grummer-Strawn LM, et al. CDC Growth Charts: United States. *Adv Data*. 2000; (314):1-27.
26. National Institutes of Health. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. Washington, DC: US Dept of Health and Human Services; 1998. Report No.: NIH 98-4083.
27. Himes JH, Faricy A. Validity and reliability of self-reported stature and weight of US adolescents. *Am J Hum Biol*. 2001;13:255-260.
28. Himes JH, Hannan P, Wall M, Neumark-Sztainer D. Factors associated with errors in self-reports of stature, weight, and body mass index in Minnesota adolescents. *Ann Epidemiol.* 2005;15:272-278.
29. SAS Institute. *SAS/STAT 9.1 User's Guide*. SAS Institute, Inc; 2004.
30. Pfeiffer KA, Dowda M, Dishman RK, et al. Sport participation and physical activity in adolescent females across a four-year period. *J Adolesc Health*. 2006;39:523-529.
31. Taylor WC, Blair SN, Cummings SS, Wun CC, Malina RM. Childhood and adolescent physical activity patterns and adult physical activity. *Med Sci Sports Exerc*. 1999;31(1):118-123.
32. Telama R, Yang X, Viikari J, Valimaki I, Wanne O, Raitakari O. Physical activity from childhood to adulthood: a 21-year tracking study. *Am J Prev Med.* 2005;28:267-273.
33. Tammelin T. A review of longitudinal studies on youth predictors of adulthood physical activity. *Int J Adolesc Med Health*. 2005;17(1):3-12.
34. Telama R, Yang X, Laakso L, Viikari J. Physical activity in childhood and adolescence as predictor of physical activity in young adulthood. *Am J Prev Med*. 1997;13(4):317-323.
35. Dowda M, Pfeiffer KA, Dishman RK, Pate RR. Associations among physical activity, health indicators, and employment in 12th grade girls. *J Women's Health*. 2007;16(9):1331-1339.
36. Motl RW, Dishman RK, Dowda M, Pate RR. Factorial validity and invariance of a self-report measure of physical activity among adolescent girls. *Res Q Exerc Sport*. 2004;75(3):259-271.
37. Calfas KJ, Sallis JF, Nichols JF, et al. Project GRAD: two-year outcomes of a randomized controlled physical activity intervention among young adults. Graduate Ready for Activity Daily. *Am J Prev Med*. 2000;18(1):28-37.