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Objectively Measured Physical Activity in 6th Grade Girls

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Abstract

Objectives—To describe the objectively-measured physical activity (PA) characteristics of a diverse sample of 6th grade girls, to examine influences on PA, and to report compliance with PA guidelines.

Design—Cross-sectional study.

Setting—Six locations across the United States.

Participants—1578 6th grade girls. Actigraph accelerometers were worn for 7 days, and data for 6 days were included in the analyses.

Main exposure—Race/ethnicity, free-or-reduced price lunch (FRPL), and geographic region

Main outcome measure—Six operational definitions of adequate activity (60 min or 30 min of daily MVPA at or above 4.6, 3.8 or 3.0 METS (metabolic equivalents)) were applied to examine whether girls met physical activity guidelines.

Results—Average time spent in sedentary, light, moderate, and vigorous activities was 460, 342, 18, and 6 min/day, respectively. White girls were more active than girls in other race/ethnic groups, and girls who did not receive FRPL were more active than girls who did. Girls in western states were most active. Percentages of girls in compliance with the 6 thresholds for adequate activity varied widely, and ranged from 0.6% to 99.8%.

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Author Contribution
Russell R. Pate, Ph.D., had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Conclusions—When physical activity is measured objectively and a 4.6 MET cutpoint for MVPA is applied, most 6th grade girls fall below guidelines for adequate physical activity. One notable finding was the impact of different accelerometer scoring protocols on estimates of compliance. Conceptual and empirical work is needed to define appropriate physical activity for youth using objective physical activity measures.

Introduction

Numerous government health agencies and private organizations have emphasized the importance of physical activity to public health.[1–4] Among children and adolescents, higher levels of physical activity are associated with reduced risk of obesity, more favorable cardiovascular risk profiles, greater lean weight and bone mass, and enhanced psychological well-being.[5–9] Because of the immediate and likely long-term benefits of physical activity for young people, several organizations have issued guidelines on participation in physical activity for children and adolescents. The consensus recommendation is that young people should participate in moderate-to-vigorous physical activity for at least 60 minutes on most days.[10–13]

The significance of physical activity to the health of children and adolescents has led to increased interest in developing surveillance systems to monitor compliance with physical activity guidelines in young people.[14, 15] Most large-scale studies of physical activity behavior have relied on self-report measures, but this approach has clear limitations for use with children.[16] Because accelerometers have not yet been applied in a surveillance capacity to evaluate large samples of youth in the United States, there is uncertainty regarding activity levels of youth and the percentage who meet current physical activity recommendations.[17] Although accelerometers are objective measures, there are challenges in using them in studies of children and youth.[18] For example, there is no consensus on the methods of converting accelerometer output to minutes of physical activity,[19] so it is important to explore the effect of different accelerometer scoring protocols on the interpretation of results.

Previous studies of young people consistently have shown that physical activity declines with increasing age and that girls tend to be less active than boys.[14, 15, 17, 20–22] Further, there is some evidence that physical activity is associated with demographic factors such as socioeconomic status,[23, 24] race/ethnicity,[20, 25] and geographic location.[1] However, no previous studies have used accelerometers to examine the associations with these demographic factors in population-based samples of youth.

To respond to the need to increase physical activity in girls, the National Heart, Lung, and Blood Institute (NHLBI) is sponsoring the Trial of Activity for Adolescent Girls (TAAG), a multi-center study designed to promote physical activity in middle school girls. The primary goal of TAAG is to determine if a physical activity intervention that links schools to community organizations reduces the age-related decline in moderate-to-vigorous physical activity in girls in 6th through 8th grades. The purposes of this paper are to describe the baseline physical activity characteristics of a diverse sample of 6th grade girls using an objective measure of physical activity and to examine the relation of race/ethnicity, socioeconomic status, and geographic region to physical activity levels in those girls. The percentage of girls meeting physical activity guidelines and the influence of varying accelerometer scoring protocols also are reported.

Methods

Subjects

This is a cross-sectional examination of 6th grade girls recruited from six communities in the United States. University-based field centers were located in and around the cities of Tucson,

Arizona; San Diego, California; New Orleans, Louisiana; Washington, D.C. and Baltimore, Maryland; Minneapolis, Minnesota; and Columbia, South Carolina. Six middle schools in each community were recruited for the study. To be eligible schools had to have a minimum of 90 girls in the 8th grade and offer physical education at all grade levels. Schools were selected by convenience, but with ethnic diversity as a goal. Within each school girls were selected by random sampling of all eligible 6th grade girls. Girls were considered eligible unless they had a health problem that contraindicated physical activity or if a school administrator requested that the girl not be included in the study. Study coordination was provided by the University of North Carolina at Chapel Hill and the NHLBI Project Office.

The study was approved by the participating universities' Institutional Review Boards. Each participant's parent or guardian provided written informed consent, and all subjects assented to participation. Consent for measurement was obtained for 1721 girls (80% of the random sample), and 92% of consented girls completed the measurement protocol. Differences in measurement rates across racial and ethnic groups were not significant. For the analyses described in this paper, girls who were missing data for ethnicity (n = 6), free/reduced price lunch (n = 27), or physical activity (n = 110) were excluded. The analysis sample included 1578 girls.

Measures

Girls classified themselves in one of 5 race/ethnicity categories: Asian, Black, Hispanic, White or other. Girls were categorized as Hispanic if they indicated Hispanic ethnicity on the questionnaire. Otherwise, girls who indicated more than one race group or who selected "Native Hawaiian or other Pacific Islanders" were classified as "other." Socioeconomic status was assessed by asking each girl if she received free or reduced price school lunch. The answer set included the options: yes, no, or don't know. The investigators found that reported school lunch eligibility associated well with U.S. Census figures for neighborhood income among TAAG subjects. Date of birth was self-reported. Weight and height were measured using standard protocols.

Physical activity was measured using Actigraph accelerometers (MTI model 7164, Fort Walton Beach, FL). Participating girls wore an accelerometer during most waking hours for 7 consecutive days. Accelerometers were initialized prior to data collection and were set to begin collecting data at 5:00 AM on the day after they were distributed to participants; thus, data for 6 complete days were available for analysis. Data were collected and stored in 30-sec intervals. Trained and certified staff members provided detailed verbal and written instruction on how and when to wear the monitors. Girls wore the accelerometer on their right hip, attached to a belt. They were asked to wear it all the time, except at night while sleeping and while bathing or swimming.

Measurement coordinators from each field site were trained and certified at a centralized training event. The TAAG Measurement Committee provided oversight for all measures. Based on the recommendations of a TAAG preliminary study, all data were collected over at least 2 separate calendar weeks in each participating school. This was intended to minimize the school-level intraclass correlation between girls within a school.[26]

Data Reduction

Data from the accelerometers were downloaded to the same laptop computer that was used to initialize them. Accelerometer data were reduced using methods previously described by Treuth et al.[19] Briefly, missing accelerometry data within a girl's 6-day record were replaced via imputation based on the Expectation Maximization (EM) algorithm; details on the imputation methods are provided elsewhere.[27] On average, approximately 12 hours of data

per girl were imputed over the 6 days of data collection. The count thresholds (counts·30 sec^{-1}) established by Treuth and colleagues[19] in a study of 8th grade girls were used for the activity intensities of interest: sedentary (<50), light physical activity (51–1499), moderate physical activity (1500–2600), and vigorous physical activity (>2600).

The primary analyses performed in this study were conducted using an accelerometry count cutpoint for moderate intensity physical activity (1500 per 30 sec) corresponding to 4.6 METS (metabolic equivalents; 1 MET = 3.5 mL $O_2 \cdot kg^{-1} \cdot min^{-1}$). Thirty-second time increments with counts at or above that level were summed over the period between 6 am and midnight to determine minutes of moderate-to-vigorous physical activity (MVPA). Also, for each time increment above the 4.6 MET cutpoint METS was estimated using a regression equation.[19] MET-weighted minutes of MVPA were calculated as the sum of the MET values for all time increments above the 4.6 MET cutpoint. As previously reported, the 4.6 MET cutpoint was selected as the intensity that best discriminated between slow and brisk walking in 8th grade girls.[19] Two additional cutpoints for defining MVPA were used in some analyses. A 3 MET cutpoint (579 counts per 30 sec) was used because it has been taken as the threshold for moderate intensity physical activity in some studies of youth[17, 28, 29] and is typically used in studies of adults.[1, 30] A 3.8 MET cutpoint (1047 counts per 30 sec) was used because it is the intensity that fell midway between the means for slow and brisk walking in the accelerometry calibration study.[19]

Because accelerometry is a recent innovation in public health surveillance of physical activity, there is no broad consensus as to how physical activity guidelines should be defined in terms of accelerometry data. Accordingly, compliance with physical activity guidelines was calculated using six different operational definitions. In the first definition, a girl was considered compliant if she had accumulated 60 or more minutes of physical activity at or above a cutpoint of 4.6 METS on four or more of the six days on which the accelerometer recorded physical activity data. The second definition was similar but applied the 3.8 METS cutpoint. A third definition applied a cutpoint of 3.0 METS, a standard that is often used with adults.[1] We also examined compliance using 30 minutes per day of physical activity as the standard instead of 60 minutes, as 30 minutes of daily activity is the consensus guideline for adults.[1]

Statistical Methods

Data were analyzed using the Statistical Analysis System version 8.2 (PROC MIXED and PROC GLIMMIX). Unadjusted means and frequencies were calculated. Mixed models were used to test for group differences in mean levels of activity, and generalized linear models with a logit link function were used to test for group differences in the proportion of girls who met physical activity guidelines. By treating “school” as a random effect, these models account for the correlation in responses resulting from clustering of girls within schools. Means, adjusted for clustering of girls nested within schools, and proportions were estimated using least square means based on the observed marginal distributions of categorical variables (the OM option in SAS). Three-way and two-way interactions between location, ethnicity and lunch subsidy were tested.

Results

Table 1 describes characteristics of the girls by state, arbitrarily listed from west to east. The average age of the girls ranged from 11.7 (0.4) years to 12.3 (0.7) years across the six sites. Each of four ethnic groups was represented at each of the six study sites, although distributions varied considerably. In Arizona, Maryland, Minnesota, and South Carolina the highest percentage of girls was white, in California the highest percentage was Hispanic, and in Louisiana the highest percentage was African American. Fewer than 10 Asian American girls

participated at the Arizona and South Carolina sites, and fewer than 10 African American girls participated at the Arizona and Minnesota sites. Overall 706 white girls, 344 African American girls, 343 Hispanic girls, and 61 Asian American girls participated. The percentage of girls who reported receiving subsidized school lunch ranged from 23.8% in Minnesota to 76.2% in Louisiana. Across the sites, 9.5% to 25.7% of girls did not know if they received a subsidy for school lunch.

Table 2 shows the adjusted mean minutes and unadjusted overall mean minutes of sedentary, light, moderate, and vigorous physical activity by location, ethnicity and school lunch subsidy status. Overall, on a daily basis girls spent 459.9 minutes in sedentary activity, 341.6 minutes in light activity, 18.1 minutes in moderate activity, and 5.6 minutes in vigorous activity. Girls in Arizona and California had the smallest number of sedentary minutes and the largest number of moderate and vigorous minutes. Examination of adjusted means showed that Asian American girls had the largest number of sedentary minutes and the smallest number of moderate and vigorous minutes, compared to the other racial/ethnic groups. Girls who reported they did not receive subsidized school lunch had the largest number of moderate and vigorous minutes.

As a first step in the examination of the independent effects of location, race/ethnicity, and subsidized school lunch, we tested the 3-way interaction and found that it was not statistically significant for any of the physical activity variables. We then tested 2-way interactions. Two-way interactions with school lunch subsidy were not significant, but the location × race/ethnicity interaction was significant ($p<0.05$) for sedentary and vigorous activity, moderate and vigorous activity and for MET-weighted MVPA using the 4.6 METS cutpoint. Visual examination of plots of residuals indicated that African American girls in Arizona were likely responsible for the interaction between location and race/ethnicity. African American girls living in Arizona were more active than African American girls in other locations.

Table 3 shows the percentage of girls meeting a physical activity guideline, which differed markedly depending on the operational definition used. Using the guideline of 60 minutes per day at or above the 4.6 MET cutpoint, less than 1% of girls met the guideline. However, when the lower cutpoints of 3.8 and 3.0 METS were applied with the same requirement of 60 minutes, the percentage increased to 11.8 and 87.7%, respectively. Reducing the amount of time of MVPA from 60 to 30 minutes resulted in 16.1% of girls meeting the standard when the 4.6 MET cutpoint was used. When the 3.8 and 3.0 MET cutpoints were used, 73.3% and 99.8% of girls met the standard. The differences were highly significant for all pairwise comparisons.

Comment

This study is the first to use an objective measure of physical activity to describe the physical activity levels of a large and diverse sample of American youth. Accelerometers were worn by over 1500 6th grade girls in six widely separated geographic locations. Intensity-weighted time spent in moderate to vigorous physical activity was higher in girls residing in western states compared with those living in other regions. Activity was higher in white girls than in ethnic minority groups. Also, using school lunch subsidy as an indicator of socioeconomic status, girls in the higher SES stratum were more active than girls in the lower SES group.

The overall sample of 6th grade girls engaged in an average of 24 minutes of moderate to vigorous physical activity per day. Of this total, less than six minutes per day were of vigorous intensity. Several expert panels have recommended that youth participate in at least 60 minutes of moderate to vigorous physical activity per day, and this recommendation was recently reaffirmed by a panel convened by the U.S. Centers for Disease Control and Prevention.[13] The findings of this study suggest that most 6th grade girls fall well below the prevailing public

health guideline for physical activity. However, it should be noted that, in the present study as in previous studies, physical activity showed high inter-individual variability. The standard deviation for daily minutes of moderate to vigorous physical activity was 11.8 minutes, indicating that many girls performed as much as 88 minutes while others engaged in as little as 3 minutes.

The observation that physical activity levels differed across geographic areas is consistent with previous surveys based on self-report measures. In the 2003 Youth Risk Behavior Survey (YRBS) high school girls in the western states reported participating in more vigorous physical activity than girls in other regions.[15] Girls in the southern states reported the lowest level of vigorous physical activity, and those in the eastern and midwestern states reported activity levels between those of girls in the western and southern regions. A similar pattern was observed in the present study. Activity levels were lowest in South Carolina and Louisiana, slightly higher in Maryland and Minnesota, and highest in Arizona and California. The geographic pattern for time spent being sedentary was, in general, inversely related to the time spent in moderate to vigorous physical activity, with girls in Arizona and California spending less time being sedentary than girls at the other sites.

Previous studies have found that white adolescents were more physically active than adolescents from other race/ethnic groups,[25, 31] and a national survey found white youth reported more vigorous physical activity than African American or Hispanic youth.[15] In TAAG, white girls had slightly higher minutes of moderate and vigorous physical activity than girls in the other race/ethnic groups and had the highest MET-weighted MVPA. White girls had a higher prevalence of meeting the 60 minute MVPA guidelines than African American or Hispanic girls. However, the differences among White, African American and Hispanic girls were small for minutes of moderate and vigorous physical activity considered separately. Few studies have evaluated the physical activity behavior of Asian American girls. Although the present sample was relatively small, Asian American girls consistently had the lowest levels of physical activity and highest levels of sedentary behavior. These findings of race/ethnic differences in large samples of adolescents using an objective measure of physical activity confirm the disparities reported in studies that used self-report measures.[32–34] These disparities appear to increase as minority youth move from adolescence to adulthood,[32] so interventions to promote physical activity in minority adolescents should be designated as a public health priority. Research to improve understanding of the reasons for these disparities in physical activity is also needed.

Findings on the relationship between socioeconomic status and physical activity in adolescents have been inconsistent,[31] possibly because a wide range of indicators of socioeconomic status have been used. A large national survey, however, did find that vigorous physical activity was directly related to family income and education, after adjusting for other variables.[32] In TAAG, reported free or reduced-price lunch was used as an indicator of family income (although approximately 12% of girls did not know their free- or reduced-price lunch status). We found no variation in physical activity by lunch subsidy status for sedentary, light, and moderate PA. However, girls who received no lunch subsidy engaged in significantly more vigorous physical activity than those who did receive a subsidy, similar to the findings in a national survey.[32] This finding suggests that lower-income adolescent girls may be less physically active, but the mean difference in the present study was very small. A prudent interpretation is that adolescent-reported lunch subsidy status did not permit an adequate test of the relationship of socioeconomic status to physical activity.

One of the most notable findings of the present study was the impact of different accelerometer scoring protocols on estimates of physical activity. Although there is reasonable consensus that 3.0 METs is an appropriate cutpoint for moderate intensity physical activity in adults,[1] there

is no such consensus in youth. Resting energy expenditure in children is higher than the assumed value of 3.5 ml/kg/min, so a value of 3 METS will represent a lower relative activity level for youth. Differences in metabolic and biomechanical efficiency due to growth and maturation [35] also alter the relationship between accelerometer counts and energy expenditure. A detailed calibration study conducted by the TAAG investigators determined that a value of 4.6 METS provides an appropriate cutpoint for moderate intensity physical activity in adolescent girls. [19] Operationally, this cutpoint was established using accelerometer values that distinguished between a slow and a brisk walk. The activity levels reported with this cutpoint are considerably lower than those reported in most other studies[17, 36] but this is due to the differences in cutpoints used in the different studies.

By definition, cutpoints impart a somewhat artificial categorization to continuous data. To provide an indication of how the cutpoint can influence the results, the data were also analyzed using 3.0 and 3.8 MET cutpoints, the former being a value commonly used in other studies. [17] The percentage of girls meeting the current physical activity standard for youth (i.e., 60 minutes of MVPA per day) varied dramatically depending on the accelerometry cutpoint for moderate intensity physical activity. Using the 4.6 MET cutpoint, almost no girls met the standard. However, if a 3 MET cutpoint was applied, over 87% of girls met the standard. If the adult guideline (30 minutes per day) was applied, almost all the girls met the standard when a 3 MET cutpoint, but only 16% met the 30-minute goal when the 4.6 MET cutpoint was used. Applying the 3.8 MET cutpoint yielded compliance rates that were intermediate to those obtained with 4.6 and 3.0 METS, but with a different pattern for the 60 and 30 min standards. Only 11.8% of girls met the 60 min/3.8 MET standard, but most of them met the 30 min/3.8 MET standard (73.3%). The difference in compliance estimates due to choice of cutpoints makes it difficult to draw definitive conclusions about the activity patterns in these youth. The cutpoint of 3.0 provides a liberal estimate of activity patterns and favors sensitivity over specificity, whereas the 3.8 and 4.6 cutpoints provide more conservative estimates and favor specificity over sensitivity. Misclassification is always a concern when attempting to determine compliance with public health recommendations, and the dramatic differences demonstrate the need to develop consensus guidelines for reducing and reporting accelerometer data. In addition, conceptual and empirical work is likely to be needed to define health-related physical activity for youth. At the present time physical activity guidelines for youth are based on a body of knowledge that experts agree is too limited.[13] Hence, there is a need to both strengthen the basis for physical activity guidelines and adopt improved methods for monitoring compliance with those guidelines.

While absolute determinations of activity levels must be made with caution, this study demonstrates the potential for large-scale surveillance of activity patterns with accelerometers. Data from large and ethnically diverse samples were collected in a standardized way from six different regions throughout the United States. Obtaining objective physical activity information for seven days is a major strength, as this time frame has been shown to be sufficient to capture reliable patterns.[37] Sophisticated data reduction procedures and imputation methods were employed to improve the accuracy and stability of the reported values. Applying cutpoints for moderate to vigorous activity that were empirically determined specifically for adolescent girls is another strength. As the data suggest, the proportion of girls meeting national recommendations varies substantially based on the MET cutpoint that is applied. Given the rising epidemic of obesity in adolescents,[38, 39] it is likely that the percent of girls achieving sufficient physical activity is reflective of the data reported using the 4.6 MET cutpoint. Without having conducted this prior work and being able to apply this cutpoint, the data would suggest almost 90% of 6th grade girls met recommendations.

There are some limitations in the design that should be noted. First, the data cannot be considered representative of youth in these regions. The participating TAAG sites were from

predominantly urban settings, so the participating schools tended to be from the densely-populated metropolitan areas. Second, subtle differences in population profiles, community characteristics and seasonality could explain the interaction observed between location and ethnicity, but additional research will be needed to understand these influences and to capture possible differences between rural and urban youth. Designs that permit linkages with GIS and census data may be particularly helpful in examining the influence of social, environmental and policy variables on physical activity. The results are limited in that not all geographic regions of the country were represented. Nonetheless, an ethnic/racially diverse sample was obtained. Although the schools were not randomly selected, the girls within the schools were randomly selected. Because girls were sampled from middle schools that met eligibility criteria for participation in the TAAG trial, there is a loss of generalizability. TAAG schools offered physical education in all three grades, and girls who participate in physical education may be more active than girls who do not.

The present study demonstrated the feasibility of using accelerometers to collect objective physical activity data in a large number of adolescents. Race/ethnic disparities in physical activity levels were documented, with White girls having slightly higher activity levels than ethnic minority groups. On average, girls living in the West were more physically active than those in other parts of the United States. The difficulty of estimating the prevalence of meeting physical activity guidelines was demonstrated by the dramatic effect of different accelerometer protocols on prevalence rates. Because there is no consensus on the most suitable protocols, a high priority should be given to research to guide the development of accelerometer scoring protocols that can be applied across all ages.

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Table 1

Descriptive characteristics of girls by states

	CA	AZ	MN	LA	SC	MD
	(n=291)	(n=229)	(n=269)	(n=286)	(n=274)	(n=229)
Age (years, mean (SD))	11.8 (0.4)	12.0 (0.3)	12.0 (0.4)	12.3 (0.7)	12.1 (0.5)	11.7 (0.4)
Weight (kg, mean (SD))	47.1 (12.7)	46.6 (12.8)	47.5 (11.3)	51.7 (14.4)	52.0 (16.6)	48.5 (14.8)
Height (cm, mean (SD))	150.8 (7.0)	151.9 (7.7)	153.9 (7.3)	153.4 (7.7)	153.5 (7.7)	150.8 (7.4)
Ethnicity (N (%))						
Asian American	14 (4.8)	6 (2.6)	10 (3.7)	10 (3.5)	7 (2.6)	14 (6.1)
Black	18 (6.2)	7 (3.1)	5 (1.9)	154 (53.8)	102 (37.2)	58 (25.3)
Hispanic	122 (41.9)	86 (37.6)	27 (10.0)	56 (19.6)	18 (6.6)	34 (14.8)
White	104 (35.7)	122 (53.3)	210 (78.1)	44 (15.4)	121 (44.2)	105 (45.9)
Other	33 (11.3)	8 (3.5)	17 (6.3)	22 (7.7)	26 (9.5)	18 (7.9)
School lunch subsidy (N (%))						
No	143 (49.1)	122 (53.3)	136 (50.6)	56 (19.6)	137 (50.0)	126 (55.0)
Yes	115 (39.5)	80 (34.9)	64 (23.8)	218 (76.2)	111(40.5)	73 (31.9)
Don’t know	33 (11.3)	27 (11.8)	69 (25.7)	12 (4.2)	26 (9.5)	30 (13.1)

Table 2

Adjusted* mean (SE) minutes of physical activity and MET-weighted minutes of physical activity by geographic location, ethnicity, and receipt of subsidy for school lunch

	Sedentary	Light	Moderate	Vigorous	MVPA (≥4.6 METS)	MET-weighted MVPA (≥ 4.6 METS)
Location						
P-Value	.003	.009	<.001	.002	<.001	<.001
California	453.3 (5.6)	347.0 (5.8)	20.5 (0.7)	6.7 (0.4)	27.1 (1.0)	166.7 (7.1)
Arizona	438.9 (6.0)	346.8 (6.0)	20.8 (0.8)	6.9 (0.4)	27.7 (1.1)	173.5 (7.5)
Minnesota	456.0 (5.8)	351.2 (5.9)	18.1 (0.7)	4.8 (0.4)	22.9 (1.1)	136.7 (7.2)
Louisiana	465.4 (5.7)	349.1 (5.8)	16.3 (0.7)	5.2 (0.4)	21.5 (1.1)	134.2 (7.1)
South Carolina	473.6 (5.7)	321.7 (5.8)	15.7 (0.7)	5.1 (0.4)	20.8 (1.1)	130.1 (7.2)
Maryland	470.4 (6.0)	334.2 (6.0)	17.4 (0.8)	5.1 (0.4)	22.5 (1.1)	137.8 (7.5)
Ethnicity						
P-Value	.09	.99	.004	.001	.001	.001
Asian American	478.8 (9.0)	340.0 (7.5)	14.6 (1.1)	3.9 (0.6)	18.5(1.6)	110.8 (10.8)
Black	465.2 (4.6)	342.8 (4.2)	18.0 (0.6)	5.7 (0.3)	23.7 (0.9)	146.6 (6.0)
Hispanic	456.5 (4.5)	340.8 (4.1)	17.7 (0.6)	4.9 (0.3)	22.6 (0.9)	137.3 (5.8)
White	457.0 (3.5)	341.7 (3.3)	18.6 (0.5)	5.9 (0.3)	24.6 (0.7)	152.7 (4.8)
Other	459.3 (6.5)	342.4 (5.6)	18.4 (0.8)	6.1 (0.4)	24.5 (1.2)	152.2 (8.0)
School Lunch Subsidy						
P-Value	.49	.59	.23	.01	.07	.03
No	458.8 (3.5)	341.8 (3.3)	18.5 (0.5)	6.0 (0.2)	24.5 (0.7)	152.5 (4.5)
Yes	458.9 (3.7)	342.8 (3.4)	17.8 (0.5)	5.3 (0.3)	23.1 (0.7)	140.9 (4.7)
Don't Know	465.1 (5.5)	338.0 (4.7)	17.8 (0.7)	5.3 (0.4)	23.1 (1.0)	142.0 (6.7)
OVERALL*	459.9 (1.7)	341.6 (1.4)	18.1 (0.2)	5.6 (0.1)	23.7 (0.3)	146.1 (2.1)

* Adjusted for clustering of girls nested within schools; Overall means are unadjusted.

Table 3

Adjusted proportion of girls meeting guidelines for MVPA by geographic location, ethnicity, and receipt of subsidy for school lunch

	≥ 60 m/day of MVPA on 4+ days/week			≥ 30 m/day of MVPA on 4+ days/week		
	≥ 4.6 METS	≥ 3.8 METS	≥ 3.0 METS	≥ 4.6 METS	≥ 3.8 METS	≥ 3.0 METS
Location						
P-Value	.53	.008	.01	<.001	.004	.99
California	0.3	15.4	95.1	24.0	85.7	99.8
Arizona	1.3	19.5	91.9	25.3	75.5	100
Minnesota	0.0	7.3	91.4	12.6	80.0	100
Louisiana	1.4	12.6	87.2	11.9	70.1	100
South Carolina	0.4	5.2	79.4	8.4	61.5	100
Maryland	0.4	12.1	84.2	15.2	68.4	100
Ethnicity						
P-Value	.66	.09	.19	.03	.007	.99
Asian American	0.0	1.7	82.3	4.8	55.5	100
Black	1.2	13.9	90.6	20.2	74.8	100
Hispanic	0.0	12.0	87.1	13.0	70.5	99.9
White	0.6	10.1	80.0	15.0	76.7	100
Other	1.6	14.6	87.9	17.8	77.4	100
School Lunch Subsidy						
P-Value	.87	.01	.84	.55	.64	.88
No	0.6	12.8	89.2	16.6	73.0	99.9
Yes	0.8	11.5	88.5	14.7	74.9	99.9
Don't Know	0.5	5.3	89.9	14.3	76.0	100
OVERALL *	0.6	11.8	87.7	16.1	73.3	100

* Adjusted for clustering of girls nested within schools; Overall proportions are unadjusted.