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Low Physical Fitness Among Fifth- and Seventh-Grade Students, Georgia, 2006

Kenneth E. Powell, MD, MPH, Alice M. Roberts, BSPH, James G. Ross, MS, Mary Ann C. Phillips, MPH, Dawud A. Ujamaa, MS, Mei Zhou, MA, MS

Background: The nationwide epidemic of obesity may be due, in part, to declining levels of physical activity, raising the possibility that other components of health-related physical fitness may also be in decline. Few data are available to describe and monitor the physical fitness of children and youth. The Georgia Youth Fitness Assessment was conducted to assess health-related fitness in Georgia's fifth- and seventh-grade students, provide a baseline against which future progress could be measured, and guide public and private leaders and decision makers.

Methods: A statewide probability sample of fifth- and seventh-grade students designed to enable grade-specific comparisons by gender, race/ethnicity, and urban/rural status was drawn. Measurements included aerobic capacity; body composition; and muscular strength, endurance, and flexibility. Physical activity during the most recent 3 days was assessed. The survey was conducted in 2006; the data were analyzed in 2007–2008.

Results: Ninety-three schools (86% response rate) and 5248 students (77% response rate) participated. Fifty-two percent of students did not meet the standard for healthy aerobic fitness; 23% did not meet the standard for muscular strength, endurance, and flexibility; 30% were outside the recommended range for BMI. Twenty-two percent did not achieve the recommended 60 minutes of daily moderate-to-vigorous physical activity. All subgroups (e.g., boys/girls, urban/rural) scored poorly.

Conclusions: Substantial numbers of Georgia's fifth- and seventh-grade students exhibit unhealthy levels of physical fitness. These data are consistent with the suggestion that physical inactivity has led to deficient levels of health-related fitness in more areas than just body composition. Monitoring all components of health-related fitness would provide helpful information about the health of children and youth.

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Introduction

Cardiovascular endurance, muscular strength and endurance, flexibility, and body composition are a set of physiologic characteristics commonly referred to as health-related fitness.¹ They enable people to conduct routine daily activities with vigor and are associated with the prevention of several chronic diseases.²

The nation is known to be experiencing an epidemic of obesity among adults and children.^{3,4} The possibility

that declining levels of physical activity are contributing to the obesity problem suggests that other components of health-related physical fitness may also be in decline, further threatening the population's health. Although trend data for U.S. children are not available,⁵ data from other countries indicate that the cardiovascular fitness of children and youth has been in decline since the 1960s and that the decline has been most rapid in recent decades.^{6–9}

Aside from surveys of body composition, few population-based assessments of health-related physical fitness of American children have been conducted.⁵ State-specific surveys are uncommon. The Georgia Youth Fitness Assessment (GYFA) was conducted to (1) document current levels of health-related fitness in selected grades, (2) estimate the percentage of students meeting national recommendations for moderate to vigorous physical activity, (3) provide a baseline against which future progress could be measured, and (4) further stimulate public and private leaders and decision makers to consider potentially helpful actions. The purpose

From private consultancy (Powell), Georgia Health Policy Center, Andrew Young School of Policy Studies, Georgia State University (Phillips, Ujamaa, Zhou), Atlanta, Georgia; and Macro International, Inc. (Roberts, Ross), Calverton, Maryland

Address correspondence to: Kenneth E. Powell, MD, MPH. E-mail: nekllwop@hotmail.com.

Address reprint requests to: Mary Ann C. Phillips, MPH, Georgia Health Policy Center, Andrew Young School of Policy Studies, Georgia State University, P.O. Box 3992, Atlanta GA 30302-3992. E-mail: mphilips2@gsu.edu.

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of this article is to share the methods and primary results of the GYFA. To the best of our knowledge, the GYFA is the first statewide survey of youth fitness to use a complex survey design.

Methods

Objectives

The primary measurement objective of the GYFA was to provide quantitative estimates for the health-related components of physical fitness for Georgia's fifth- and seventh-grade students and to be able to compare differences by grade, gender, race/ethnicity, and urban/rural status. A secondary objective was to provide quantitative estimates of the students' physical activity behaviors.

Survey Design and Management

The survey, conducted in the fall of 2006, was designed and implemented by a private company and managed by the Georgia Health Policy Center at Georgia State University. Data were analyzed in 2007–2008.

The Sample

The sample was designed to provide point estimates with 95% CIs of $\pm 5\%$ for boys and girls, urban and rural students, and black and white students in each grade; and $\pm 7\%$ for Hispanic students in each grade. Drawing from all public and private schools in Georgia with a fifth or seventh grade, the two-stage design first sampled schools in a manner proportional to their size and stratified by grade level, urban/rural status, and race/ethnicity. The urban stratum included schools in the 14 counties with the highest population density and containing half the state's population. Schools with $\geq 55\%$ black students or $\geq 30\%$ Hispanic students were oversampled. Small schools were drawn from a separate stratum to ensure equitable representation without affecting the efficiency of the sampling process. The second stage sampled randomly from class lists for a required subject.

Approval from IRBs, Consent, and Incentives

The survey was approved by the IRBs of Georgia State University and Macro International, Inc. Active parental consent and student assent were obtained before collecting data from any student. Students with medical conditions that contraindicated fitness testing were not fitness tested. Participating schools were promised and awarded (1) \$500, (2) a licensed version of the Fitnessgram (use of trade names is for convenience and does not imply endorsement by Georgia State University or Macro International, Inc.) software, (3) a file containing data collected at the school, (4) a summary report comparing fitness levels of the school's participants with students in the same grade statewide, and (5) the opportunity to be included in a drawing to receive fitness testing equipment used in conducting the survey. Teachers with primary responsibility for collecting consent forms or who helped with testing and data collection were given a \$25 gift card to a nationally known bookstore. Participating students received an individualized report of their performance and tips on how to improve.

Data Collectors

Twelve data collectors, all college graduates with pertinent educational backgrounds (e.g., behavioral science, education), were hired for this survey and given 3 days of training. Two field supervisors remained in close contact with data collectors throughout the fielding period. Data collectors' early field experiences were monitored on site by expert fitness testers to confirm high levels of adherence to testing protocols.

Data Collection Instruments

Fitness tests. Fitnessgram, a tool with recognized and accepted fitness test options, was selected to support the fitness testing of the GYFA.¹⁰ Fitnessgram uses health-related, criterion-referenced standards to assess the various dimensions of fitness. In so doing, it emphasizes fitness for health and minimizes competitive comparisons among children. Fitnessgram uses the term healthy fitness zone (HFZ) to describe a range of age- and gender-specific scores indicating a level of fitness thought to provide adequate protection from health risks and which most children can attain if they participate regularly in physical activity. Fitnessgram also provides data-collection software that can be adapted to survey use and is capable of providing both student- and school-specific summaries. Additional information about Fitnessgram is available elsewhere.^{11–13}

Six tests of health-related physical fitness were selected. As a surrogate for body composition, BMI was used. Aerobic capacity was assessed by the 15-meter option of the progressive aerobic cardiovascular endurance run (PACER) shuttle run; flexibility of the hamstring muscles by the back-saver sit and reach test; strength and flexibility of the back by the trunk lift; strength and endurance of the abdominal muscles by the curl-up; and strength and endurance of the upper body by the modified pull-up. More detailed information about these tests is available.^{10,12}

Physical activity survey. The 3-day physical activity recall (3DPAR) is a self-completed instrument suitable for classroom administration. It is a modification of the reliable and valid previous-day physical activity recall^{14,15} and has been validated in eighth- and ninth-grade girls.¹⁶ Although the 3DPAR had not previously been used with students younger than sixth grade, the reliability and validity of the previous-day physical activity recall and other self-report instruments have been reported for children as young as fifth grade.^{15,17,18} The data-collection sheet is organized into a grid, partitioning each of the most recent 3 days into 34 blocks of time, each 30 minutes, from 7:00 AM to 12 MN.

Students are provided a numbered list of common activities. For each 30-minute block of time, students select the primary activity they performed during that time. For non-sedentary activities, students also indicate whether the activity was performed at a light, moderate, hard, or very hard level of intensity. To help students determine the level of intensity, they are provided with a booklet called *Intensity Level Handout*. Data collectors assisted students with the completion of the form. The 3DPAR normally was scheduled for Tuesday or Wednesday so that information could be obtained for at least one weekday and one weekend day. A Spanish version of the instrument was not available.

Data Collection

Data from fitness tests were recorded initially on a scorecard provided to each student. After each session, data collectors entered the scores using Fitnessgram software. Students completed the 3DPAR forms during a 45-minute classroom session. After review by data collectors and central office staff, data were key-entered by a data-processing firm. About one third of all electronic records were verified against the corresponding hard copy of the questionnaire.

Data Analysis

Physical fitness scores. Participants who failed to achieve the lower limit of the age- and gender-specific Fitnessgram standard for any of the five performance-based tests of physical fitness were considered outside the HFZ for that test. They were categorized outside the HFZ for BMI if they were below or above the age- and gender-specific Fitnessgram standard. To simplify reporting and discussion of the GYFA, the results of the four tests of muscular strength, muscular endurance, and flexibility (i.e., modified pull-up, curl-up, trunk lift, and back-saver sit and reach) were combined into a single score. Among students who completed all four tests, those who failed to attain the HFZ for at least two of the tests were categorized as failing to meet the criteria for healthy fitness of muscular strength, endurance, and flexibility.

Physical activity scores. The recommended amount of moderate-to-vigorous physical activity (MVPA) for children and youth is 60 minutes per day.¹⁹ Every acceptable activity/intensity combination on the 3DPAR has been assigned a MET value using tables based on activity-specific adult energy expenditures.^{16,20} (MET is equal to the ratio of one's metabolic rate during a given activity to one's resting metabolic rate. One MET is the energy required to sit quietly, equals approximately 3.5 ml of O₂/kg-min, and may also be expressed as 1 kcal/kg-hr.)

Although energy expenditures per kilogram appear to be slightly higher for children than adults for any given activity,²¹ to be consistent with previously published research with the 3DPAR,^{16,22} activities with MET values ≥ 3 have been categorized as moderate or vigorous intensity. Children who reported on the 3DPAR an average of two or more 30-minute periods per day during which their predominant activity required ≥ 3 METs were said to have met current recommendations. If more than four errors were present for a single day's report, that day was disallowed. Errors included not providing an activity or providing an inappropriate intensity for a given activity.

Weighting and Analysis

Survey data were weighted to produce population estimates. Survey weights reflect the inverse of the initial probabilities of selection and adjust for nonresponse at school and student levels. In addition, the adjusted weights were poststratified such that the sum of the weights of the surveyed population is proportionate to the demographics of the enrolled statewide student population. For this report, data were analyzed using SAS version 9.1 for Linux. Prevalence estimates were considered significantly different if the *p* value of the *t*-test analysis was < 0.05 .

Table 1. Characteristics of participants by grade, Georgia, 2006

Characteristic	Grade 5 <i>n</i> (%)	Grade 7 <i>n</i> (%)	Total <i>n</i> (%)
Total	2766 (100)	2482 (100)	5248 (100)
Male	1371 (49.6)	1391 (56.0)	2762 (52.6)
Female	1395 (50.4)	1091 (44.0)	2486 (47.4)
Black	1266 (45.8)	860 (34.6)	2126 (40.5)
Hispanic	580 (21.0)	463 (18.7)	1043 (19.9)
White	796 (28.8)	1037 (41.8)	1833 (34.9)
Urban	1497 (54.1)	972 (39.2)	2469 (47.0)
Rural	1269 (45.9)	1510 (60.8)	2779 (53.0)

Results

Participation Rates and Final Sample Characteristics

Of the 108 sampled schools, 93 (86%) participated in the GYFA. Participation rates were similar for schools with fifth (88%) and seventh (85%) grades, and for schools in urban (84%) and rural (94%) locations. Only four of eight small schools participated, and six of 11 private schools. One public school participated in only fitness tests.

Of 6432 students eligible for fitness testing, 5045 (78%) completed at least one fitness test; 4124 (64%) completed all six fitness tests. Of 6303 students eligible for the physical activity survey, 4876 (77%) completed at least seven of 207 variables; 3981 (63%) provided sufficient information for at least 1 day's activity. In total, 5248 students participated (Table 1): 4673 participated in both surveys; 372 participated in the fitness survey only; 203 participated in the physical activity survey only. Group-specific participation rates cannot be calculated because the demographic composition of nonparticipants is unknown. However, participation by all subgroups appeared to be satisfactory. Participation by black and Hispanic students (40% and 20% of the final sample, respectively) exceeded sampling goals. Ninety-six percent of participants were aged 10–14 years.

Summary Findings

Among fifth- and seventh-grade students in Georgia in the fall of 2006, 30% were not in the HFZ for BMI; 52% were not in the HFZ for cardiovascular fitness; 23% were not in the HFZ for at least two of the four tests of muscular strength, endurance, and flexibility; and 22% reported insufficient daily physical activity (Figure 1).

Among the many possible comparisons between students by grade, gender, race/ethnicity, and urban/rural location, there were several significant ($p < 0.05$) differences (Table 2). In general, boys were significantly more likely than girls to be out of the HFZ for BMI and cardiorespiratory fitness. Hispanics were more likely than blacks or whites to fail the modified pull-up

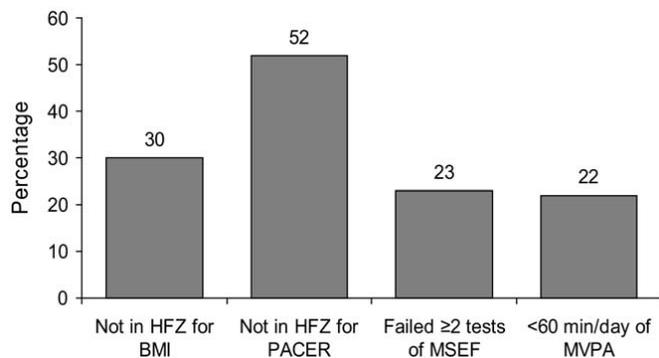


Figure 1. Percentage of fifth- and seventh-grade students with unhealthy fitness scores or insufficient daily physical activity, Georgia, 2006

HFZ, Healthy Fitness Zone; MSEF, muscular strength, endurance, and flexibility; MVPA, moderate-to-vigorous physical activity; PACER, progressive aerobic cardiovascular endurance run

and curl-up, and to fall short on the composite score for muscular strength, endurance, and flexibility. Blacks and Hispanics were more likely than whites to report insufficient physical activity.

Discussion

Substantial percentages of fifth- and seventh-grade students in Georgia are unfit and, as a result, unhealthy. Although there were some significant differences in test scores between demographic subgroups, a more important finding is that none of the subgroups performed very well on any of the measures.

Although participation rates in the fitness tests were high, students who were less active and presumably less fit may have been less likely to participate. Of the 3981 students who provided sufficient information for at least 1 day's activity on the 3DPAR, 168 completed the 3DPAR only, and 3813 participated in both the 3DPAR and the fitness tests. Significantly more (26%) of the 168 than of the 3813 (22%) did not meet recommendations for MVPA. Therefore, the reported findings may overestimate the level of fitness for Georgia's children.

For each of the 3 days to be covered by the 3DPAR, about one third of the records were unsuitable for analysis. Exclusions were more common among fifth-grade students than seventh-grade students (42% and 32%, respectively), and among Hispanic and black students than white students (46%, 43%, and 27%, respectively). Whether the students whose records were excluded were more or less active than the students with useable forms is unknown. These findings substantiate the difficulties of obtaining thorough and accurate information about the physical activity practices of elementary and middle school children.

Fitnessgram's HFZ for BMI does not correspond exactly with more commonly used percentile rankings

based on growth charts for children. The latter categorize children whose BMI is <5th percentile as underweight, ≥ 95 th percentile as obese, and from the 85th to <95th percentile as overweight. (The terminology based on the percentile rankings varies. Originally, children ≥ 95 th percentile were described as overweight and children from the 85th to <95th percentile were said to be at risk for overweight. The recent recommendation²³ to categorize children and youth ≥ 95 th percentile as obese and those from the 85th to <95th percentile as overweight has been followed here in order to minimize confusion with terminology in common use for adults.)

Fitnessgram categorized 1% of Georgia's fifth- and seventh-grade students as below the HFZ, whereas 2% were <5th percentile and would have been categorized as underweight using BMI percentile categories. Fitnessgram categorized 29% of Georgia's students as above the HFZ, whereas 20% were ≥ 95 th percentile (essentially all above the HFZ), and another 20% were in the 85th to <95th percentile (about half of whom were above the HFZ). Both systems have advantages and disadvantages; the difference between them concerns primarily children in the overweight category.

The percentage of fifth-grade girls (14%) who were below the HFZ for the PACER test of cardiorespiratory fitness was considerably lower than that for fifth-grade boys (65%), seventh-grade boys (74%), and seventh-grade girls (52%). The general consistency of scores across subgroups for all other fitness measures suggests that the Fitnessgram standards for the PACER test for young girls may be set too low. This problem has been reported previously.²⁴

Comparison with other surveys must be done with caution because apparent differences in results may be due to different sampling and measurement methods rather than to true differences between groups. With that in mind, the fitness results of the GYFA are compared with results from the 1999–2004 National Health and Nutrition Examination Survey (NHANES)⁹; surveys of height and weight of all students in Arkansas public schools (www.achi.net); and the use of Fitnessgram in selected grades in California and Missouri (www.cde.ca.gov, www.dese.mo.gov).

Based on data from the 1999–2004 NHANES and using the same value of VO_{2max} used to define the Fitnessgram HFZ, approximately one third of U.S. youths aged 12–19 years failed "to meet the levels of cardiorespiratory fitness deemed appropriate by experts."⁹ Although one third is an unsettlingly high failure rate, the failure rate (52%) on the PACER for fifth- and seventh-grade students in Georgia was even higher.

Since 2003, the height and weight of all students in Arkansas from prekindergarten through high school have been monitored (www.achi.net). During school year 2005–2006, data were available to calculate the

Table 2. Percentages (with 95% CIs) of students below the HFZ or reporting insufficient physical activity, Georgia, 2006

	BMI	PACER	Failed 2+ tests of MSEF	Modified pull-up	Curl-up	Trunk lift	Back-saver sit and reach	MVPA
GRADES 5 AND 7								
Total	29.5 (27.3, 31.7)	51.8 (47.0, 56.7)	22.6 (19.1, 26.2)	20.5 (17.5, 23.4)	12.9 (10.3, 15.6)	38.3 (30.7, 45.9)	21.3 (18.2, 24.3)	21.8 (18.9, 24.7)
Male	35.0 (32.3, 37.7)	70.0 (64.1, 76.0)	22.6 (18.9, 26.3)	19.4 (16.4, 22.4)	13.1 (10.1, 16.0)	37.0 (29.5, 44.4)	22.8 (19.2, 26.5)	19.8 (16.5, 23.1)
Female	23.7 (20.8, 26.5)	32.2 (27.7, 36.7)	22.7 (18.3, 27.1)	21.6 (16.6, 26.7)	12.8 (9.8, 15.7)	39.8 (31.6, 47.9)	19.6 (16.0, 23.2)	23.8 (20.4, 27.1)
Black	32.1^a (29.3, 35.0)	55.0 (47.6, 62.5)	27.5^a (22.6, 32.3)	20.5 (16.1, 24.9)	13.0 (10.2, 15.9)	49.2^b (41.3, 57)	23.4 (19.9, 26.9)	28.6^c (24.6, 32.6)
Hispanic	35.5^a (30.1, 40.9)	54.2 (47.9, 60.6)	31.5^a (26.1, 36.9)	28.4^c (22.1, 34.7)	21.6^c (16.1, 27.0)	36.6 (28.5, 44.6)	27.8^d (22.9, 32.7)	25.4^a (21.0, 29.9)
White	27.1 (23.8, 30.3)	49.5 (43.4, 55.7)	17.8 (13.6, 22.1)	19.1 (15.9, 22.2)	11.8 (8.2, 15.4)	30.8 (21.8, 39.9)	18.8 (15.0, 22.6)	16.5 (13.0, 19.9)
Urban	28.8 (25.7, 31.8)	44.7 (37.1, 52.4)	22.6 (17.9, 27.3)	19.6 (13.8, 25.3)	11.3 (8.3, 14.2)	36.2 (26.8, 45.5)	23.7 (19.3, 28.2)	25.5 (21.8, 29.2)
Rural	30.0 (26.9, 33.1)	56.7 (50.5, 63.0)	22.7 (17.6, 27.8)	21.1 (18.0, 24.2)	14.0 (10.0, 18.0)	39.8 (28.6, 51.1)	19.5 (15.8, 23.2)	19.2 (15.1, 23.3)
Grade 5	28.9 (25.6, 32.1)	41.1 (35.5, 46.6)	21.4 (17.7, 25.1)	19.7 (17.3, 22.2)	14.8 (10.2, 19.3)	36.6 (25.6, 47.7)	19.6 (15.7, 23.5)	18.9 (15.8, 22.0)
Grade 7	30.1 (27.1, 33.1)	62.2 (54.4, 70.0)	23.8 (17.6, 30.0)	21.2 (15.8, 26.6)	11.0 (8.1, 13.9)	40.0 (29.2, 50.8)	22.9 (18.0, 27.8)	24.4 (19.6, 29.1)
GRADE 5								
Total	28.9 (25.6, 32.1)	41.1 (35.5, 46.6)	21.4 (17.7, 25.1)	19.7 (17.3, 22.2)	14.8 (10.2, 19.3)	36.6 (25.6, 47.7)	19.6 (15.7, 23.5)	18.9 (15.8, 22.0)
Male	35.0 (30.6, 39.3)	66.2 (58.2, 74.2)	21.0 (16.8, 25.2)	18.3 (15.0, 21.6)	15.2 (10.0, 20.4)	36.1 (25.2, 47.0)	20.2 (16.1, 24.3)	18.4 (14.4, 22.3)
Female	22.4 (18.2, 26.6)	14.2 (10.3, 18.1)	21.8 (17.1, 26.6)	21.3 (17.3, 25.3)	14.3 (9.8, 18.8)	37.2 (25.2, 49.2)	19.0 (14.2, 23.7)	19.4 (15.3, 23.5)
Black	30.5 (26.8, 34.2)	43.9 (37.6, 50.2)	24.0 (17.4, 30.6)	17.1 (14.2, 20.0)	12.8 (8.8, 16.8)	46.1 (34.2, 57.9)	23.2^a (18.0, 28.4)	25.1^a (20.0, 30.2)
Hispanic	33.6 (25.2, 42.0)	43.3 (35.9, 50.8)	32.2^d (24.5, 39.8)	27.8^c (19.7, 35.9)	24.7^c (16.6, 32.7)	33.5 (21.8, 45.2)	26.6^a (18.8, 34.5)	24.1^a (17.4, 30.7)
White	27.5 (22.4, 32.6)	39.5 (32.6, 46.4)	18.0 (14.0, 21.9)	20.4 (17.0, 23.8)	15.1 (8.8, 21.5)	30.2 (17.4, 42.9)	16.3 (11.6, 20.9)	14.7 (11.7, 17.7)
Urban	28.4 (25.4, 31.4)	38.6 (31.5, 45.8)	21.7 (15.5, 27.8)	17.0 (13.5, 20.5)	12.4 (8.1, 16.8)	34.1 (21.1, 47.1)	24.6 (17.4, 31.8)	21.1 (15.5, 26.7)
Rural	29.2 (23.7, 34.7)	42.9 (34.5, 51.2)	21.2 (16.3, 26.0)	21.9 (18.5, 25.3)	16.6 (9.0, 24.2)	38.9 (20.9, 56.8)	15.6 (11.8, 19.4)	17.2 (13.6, 20.8)
GRADE 7								
Total	30.1 (27.1, 33.1)	62.2 (54.4, 70.0)	23.8 (17.6, 30.0)	21.2 (15.8, 26.6)	11.0 (8.1, 13.9)	40.0 (29.2, 50.8)	22.9 (18.0, 27.8)	24.4 (19.6, 29.1)
Male	35.0 (31.7, 38.3)	73.7 (64.7, 82.8)	24.1 (18.0, 30.3)	20.5 (15.4, 25.5)	10.9 (7.9, 13.9)	37.8 (27.3, 48.4)	25.4 (19.5, 31.3)	21.1 (15.8, 26.3)
Female	24.8 (20.8, 28.9)	49.7 (42.2, 57.2)	23.5 (15.9, 31.1)	22.0 (12.6, 31.3)	11.1 (7.2, 15.1)	42.3 (30.8, 53.7)	20.2 (14.7, 25.8)	27.7 (22.4, 33.0)
Black	33.6^a (29.5, 37.7)	64.9 (51.6, 78.3)	30.8^a (23.2, 38.3)	23.6 (16.0, 31.3)	13.2 (8.9, 17.5)	52.2^b (41.0, 63.4)	23.6 (18.8, 28.4)	31.4^a (25.0, 37.8)
Hispanic	37.6^a (30.5, 44.6)	65.2 (53.6, 76.8)	30.7^a (22.8, 38.6)	29.1^d (18.9, 39.2)	17.8^d (10.3, 25.4)	40.3 (28.3, 52.2)	29.1 (22.8, 35.3)	26.9^a (20.8, 32.9)
White	26.7 (22.4, 31)	59.6 (49.5, 69.6)	17.7 (10.2, 25.3)	17.8 (12.3, 23.2)	8.4 (5.2, 11.5)	31.5 (18.1, 44.8)	21.3 (15.4, 27.2)	18.1 (11.9, 24.2)
Urban	29.2 (23.5, 34.8)	51.1 (36.9, 65.3)	23.7 (15.9, 31.4)	22.4 (10.7, 34.1)	9.8 (5.5, 14.1)	38.8 (24.3, 53.3)	22.8 (17.5, 28.0)	29.7 (24.2, 35.2)
Rural	30.7 (27.2, 34.2)	69.5 (60.5, 78.6)	24.0 (15.1, 32.8)	20.4 (15.2, 25.7)	11.7 (7.6, 15.7)	40.7 (25.3, 56.0)	23.0 (16.7, 29.2)	20.9 (13.7, 28.0)

Note: Boldface values are significantly higher than one or more of the compared groups.

^aBlacks and Hispanics>whites

^bBlacks>Hispanics and whites

^cHispanics>blacks and whites

^dHispanics>whites

^eHispanics>blacks

HFZ, healthy fitness zone; MSEF, muscular strength, endurance, and flexibility; MVPA, moderate to vigorous physical activity; PACER, progressive aerobic cardiovascular endurance run

BMI of 77% of students. In that year, 23% of fifth- and seventh-grade students were \geq 95th percentile, and 18% were from the 85th to $<$ 95th percentile. These percentages are similar to the 20% of Georgia fifth- and seventh-grade students who were in each category.

California and Missouri have implemented fitness testing among selected grades (www.cde.ca.gov, www.dese.mo.gov). All students are to be tested by district and local school staff. For some dimensions of fitness, more than one test method is available and schools decide which method to use. For example, whereas upper body strength of all participants in the GYFA was assessed with the modified pull-up, students in Missouri could be tested with the push-up, pull-up, modified pull-up, or flexed-arm hang. Even though all tests are scaled to provide equivalent results, variation may arise from differences in the tests used. Differences in the training and skill of the test givers may also vary, as may student participation rates. The interstate variation in failure rate is substantial for several categories (Figure 2). Given the large number of students involved, many of the differences would meet statistical criteria for significance. It is probably premature to place much confidence in the interstate differences given the methodologic differences among states.

Surveillance via state-mandated systems, such as those in Arkansas, California, and Missouri, and by scientifically designed surveys such as the GYFA and the NHANES have advantages and disadvantages. The state-mandated systems generate locally useful data but generally lack the safeguards needed for intra- or inter-state comparisons to be made with confidence either at one point in time or over time. The scientifically designed surveys provide more accurate and reliable data but provide no local estimates to stimulate and guide local action. The cost of

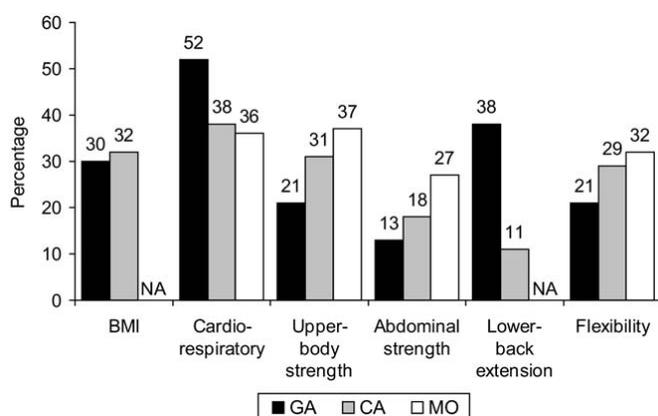


Figure 2. Percentage of fifth- and seventh-grade students with unhealthy fitness scores by test and state. GA=stratified random sample of fifth- and seventh-grade students. CA=universe of fifth- and seventh-grade students, average of the two grades. MO=universe of fifth-grade students. NA, not available; some students in CA may have had their body composition assessed by measures of skin-fold thickness.

the scientifically designed surveys is more apparent, but it is difficult to say whether they are, in fact, more or less expensive. A combination of the two types would be more useful than either type in isolation.

The 28% of Georgia's seventh-grade girls reporting insufficient physical activity is similar to the 27% of South Carolina's eighth-grade girls also reporting insufficient physical activity.²² Fewer Georgia seventh-grade boys (21%), fifth-grade girls (19%), and fifth-grade boys (18%) reported insufficient physical activity, but no data were found for these gender and age groups for comparison.

Conclusion

Substantial numbers of Georgia's fifth- and seventh-grade students exhibit unhealthy levels of physical fitness. The body composition of 30% of students is unhealthy; the cardiorespiratory fitness of 52% is unhealthy; and 23% have unhealthy scores on at least two of four tests of muscular strength, endurance, and flexibility. These data are consistent with the suggestion that physical inactivity has led to deficient levels of health-related fitness in more areas than just body composition, and that monitoring all components of health-related fitness would provide helpful information about the health of U.S. children and youth.

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