

# A Randomized Controlled Trial of Culturally Tailored Dance and Reducing Screen Time to Prevent Weight Gain in Low-Income African American Girls

Stanford GEMS

Thomas N. Robinson, MD, MPH; Donna M. Matheson, PhD; Helena C. Kraemer, PhD; Darrell M. Wilson, MD; Eva Obarzanek, PhD, RD; Nikko S. Thompson, MPhil; Sofiya Alhassan, PhD; Tirzah R. Spencer, PhD, MPH; K. Farish Haydel, BA; Michelle Fujimoto, RD; Ann Varady, MS; Joel D. Killen, PhD

**Objective:** To test a 2-year community- and family-based obesity prevention program for low-income African American girls: Stanford GEMS (Girls' health Enrichment Multi-site Studies).

**Design:** Randomized controlled trial with follow-up measures scheduled at 6, 12, 18, and 24 months.

**Setting:** Low-income areas of Oakland, California.

**Participants:** African American girls aged 8 to 10 years (N=261) and their parents or guardians.

**Interventions:** Families were randomized to one of two 2-year, culturally tailored interventions: (1) after-school hip-hop, African, and step dance classes and a home/family-based intervention to reduce screen media use or (2) information-based health education.

**Main Outcome Measure:** Changes in body mass index (BMI).

**Results:** Changes in BMI did not differ between groups (adjusted mean difference [95% confidence interval]=0.04 [-0.18 to 0.27] per year). Among secondary outcomes, fasting total cholesterol level (adjusted mean

difference, -3.49 [95% confidence interval, -5.28 to -1.70] mg/dL per year), low-density lipoprotein cholesterol level (-3.02 [-4.74 to -1.31] mg/dL per year), incidence of hyperinsulinemia (relative risk, 0.35 [0.13 to 0.93]), and depressive symptoms (-0.21 [-0.42 to -0.001] per year) decreased more among girls in the dance and screen time reduction intervention. In exploratory moderator analysis, the dance and screen time reduction intervention slowed BMI gain more than health education among girls who watched more television at baseline ( $P=.02$ ) and/or those whose parents or guardians were unmarried ( $P=.01$ ).

**Conclusions:** A culturally tailored after-school dance and screen time reduction intervention for low-income, pre-adolescent African American girls did not significantly reduce BMI gain compared with health education but did produce potentially clinically important reductions in lipid levels, hyperinsulinemia, and depressive symptoms. There was also evidence for greater effectiveness in high-risk subgroups of girls.

**Trial Registration:** clinicaltrials.gov Identifier: NCT00000615

*Arch Pediatr Adolesc Med.* 2010;164(11):995-1004

**C**HILD AND ADOLESCENT obesity have more than tripled among African American girls since the 1960s, with the greatest increases since 1980.<sup>1-3</sup> Body mass index (BMI) differences between white and black girls are present before age 6 years, significantly widen in older age groups, and

adolescents suggest that body weight may be more difficult to change than other risk factors.<sup>5-7</sup> Few studies have tested intervention strategies specifically designed for African American girls and their families.<sup>8-13</sup>

Girls' health Enrichment Multi-site Studies (GEMS) was a National Heart, Lung, and Blood Institute (NHLBI)-sponsored collaborative effort to develop and test interventions to reduce weight gain in African American preadolescent girls.<sup>8-13</sup> This article describes the outcomes of the Stanford GEMS trial, a 2-arm, parallel-group, randomized controlled trial to test the efficacy of a culturally tailored

See also pages 1007  
and 1067

are independent of socioeconomic status.<sup>4</sup> Reviews of cardiovascular disease and cancer risk reduction studies in children and

Author Affiliations are listed at the end of this article.

after-school dance program and a family-based intervention to reduce television, videotape, and video game and computer use to prevent BMI gain among lower-socioeconomic status African American preadolescent girls. Participants were randomized to either the dance and screen time reduction intervention or an information-based health education intervention for 2 years.

## METHODS

The design, methods, and baseline sample characteristics of this study were previously described in detail.<sup>14</sup> Community members were extensively involved in designing the study. The study and protocols were approved by the Stanford University Administrative Panel on Human Subjects in Medical Research and the NHLBI. A 6-member independent data and safety monitoring board was selected by the NHLBI and met 1 to 2 times per year to approve the protocol and review trial progress and safety.

### PARTICIPANT RECRUITMENT

To enroll a representative sample of lower-socioeconomic status African American girls, we recruited from schools, community centers, churches, and community events in low-income, predominantly African American neighborhoods in Oakland, California. We performed all assessments in the participants' homes, eliminating the need for families to come to a clinical research center.

### ELIGIBILITY CRITERIA, EXCLUSIONS, AND RANDOMIZATION

Eligible girls were identified as "African American or black" by their parent or guardian and were aged 8, 9, or 10 years on the date of randomization. To select a community-based group at higher risk, girls were required to have a BMI (calculated as weight in kilograms divided by height in meters squared) at or higher than the 25th percentile for age and/or at least 1 overweight parent/guardian (BMI  $\geq 25$ ).<sup>15</sup> Girls were excluded if they had a BMI higher than 35, had been diagnosed as having a medical condition or were taking medications affecting their growth, had a condition limiting their participation in the interventions or assessments, were unable to understand or complete the informed consent document, planned to move from the area, were homeless, or had no television.<sup>14</sup>

After completing the baseline measures, families and households were randomized by computer using the biased coin randomization procedure developed by Efron<sup>16</sup> to produce similar sample sizes in each group.

### INTERVENTIONS

The background and conceptual models for the treatment and active-placebo comparison interventions were described previously<sup>12,14</sup> and were shaped by extensive formative research and the Stanford GEMS pilot study.<sup>12,17</sup>

The dance and screen time reduction treatment intervention was created using the social cognitive model developed by Bandura.<sup>12,14,18,19</sup> To incorporate African American culture into our intervention, we emphasized elements to address both surface structure (eg, culturally matched models, music, and language) and deep structure (eg, values as well as social and historical influences).<sup>20</sup>

The GEMS Jewels after-school dance intervention was offered 5 days per week, 12 months per year (excluding school holi-

days), at community centers in selected neighborhoods. Daily sessions lasted up to 2½ hours and started with a 1-hour homework period and small snack followed by 45 to 60 minutes of learning and practicing dance routines. Three styles of dance were taught: traditional African dance, hip-hop, and step. Additional activities to maintain motivation included GEMS Jamboree dance performances approximately every 8 weeks for families and friends, including awards for each girl based on Kwanzaa principles; videotaped feedback allowing girls to teach each other and choreograph routines; opportunities for participant choice and control; and performances at public events. Dance classes were led by female African American college students and/or recent graduates from the local community when possible to serve as role models for dance, to maintain cultural identity, and to inspire educational achievement. Although individual girls were the unit of study, the dance intervention was considered an environmental intervention, with girls attending as often as they wished.

Sisters Taking Action to Reduce Television (START) is a home-based screen time reduction intervention designed to incorporate African or African American history and culture,<sup>12</sup> including up to 24 lessons during 2 years. Young adult, female, African American START mentors met with families in their homes to deliver each lesson, following the screen time reduction model developed in several prior studies.<sup>12,21,22</sup>

The active-placebo<sup>23,24</sup> health education comparison intervention was selected to address the possibility of resentful demoralization and/or compensatory rivalry.<sup>14,25</sup> It consisted of state-of-the-art, culturally tailored, authoritative, information-based health education on nutrition, physical activity, and reducing cardiovascular and cancer risk. It included 24 monthly newsletters for the girls ("Felicia's Healthy News Flash") and their parents/guardians ("Stanford GEMS Health Report") and quarterly community center health lectures ("Family Fun Nights"). We used the same monitoring and incentive schedules included in our experimental treatment condition.<sup>14</sup>

### ASSESSMENTS AND MEASURES

Data collection was scheduled every 6 months in the participants' homes by trained, female, African American research assistants masked to experimental assignment.<sup>14</sup> For test-retest reliability, a duplicate set of physical measures was prompted randomly for approximately 10% of participants throughout the study.

#### Primary Outcome Measure

We chose BMI as the primary outcome measure for its accessibility, reliability, measurement validity, and clinical validity.<sup>26,27</sup> Weight and height were measured indoors in lightweight clothing without shoes.<sup>14</sup> Test-retest reliability was 1.00 for weight and 0.99 for height.

#### Secondary Outcome Measures

Waist circumference was measured to the nearest millimeter using a nonelastic metric tape at end expiration, with the umbilicus as a landmark.<sup>14</sup> Test-retest reliability was 0.99. Triceps skinfold thickness was measured on the right arm.<sup>14,28</sup> Test-retest reliability was 0.99. Resting blood pressure and resting heart rate were measured according to established protocols.<sup>14</sup>

Fasting serum insulin, glucose, and lipid levels were measured at baseline and at the final follow-up visit after an overnight fast of at least 8 hours.<sup>14</sup> Assays were conducted by the Stanford University Hospital Clinical Laboratory, a participant in the Centers for Disease Control – NHLBI Lipid Standardization Program (with  $\leq 5\%$  intra-assay precision and  $\leq 6\%$  interassay precision).

We also evaluated additional secondary outcome measures and potential moderators and/or mediators of intervention effects. Physical activity was assessed annually on 3 consecutive days, including a weekend day, using an accelerometer (Actigraph; Manufacturing Technologies Inc [formerly, Computer Sciences and Applications], Pensacola, Florida) secured at the hip with an elastic belt.<sup>14</sup> We used previously validated methods to clean the data and estimate mean counts per minute and minutes of moderate to vigorous physical activity,<sup>29</sup> using published count thresholds in adolescent girls ( $\geq 3000$  counts per minute).<sup>30</sup> Physical activity preferences were assessed annually.<sup>12,31</sup>

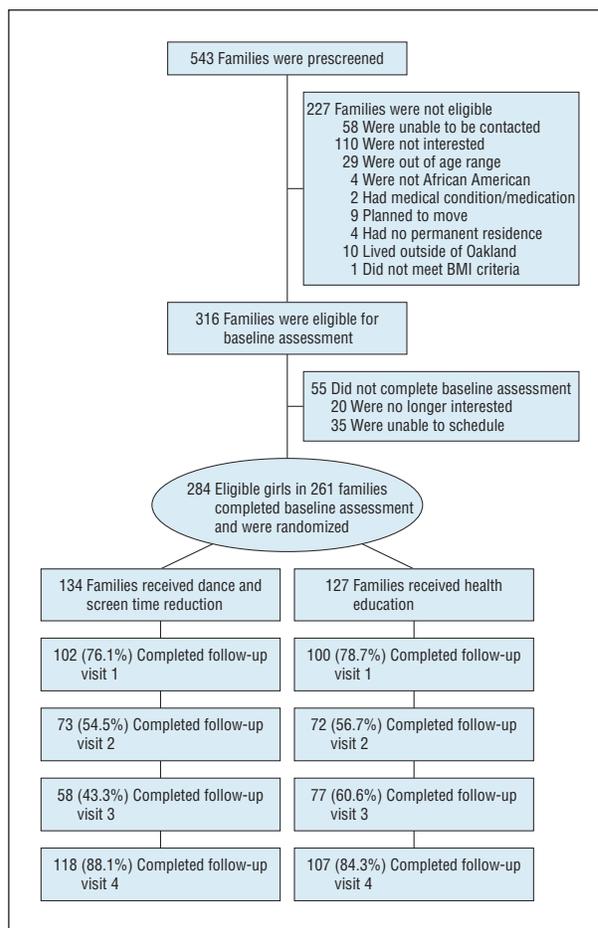
Television viewing, videotape viewing, video game use, and computer use were measured with a self-report instrument proved sensitive to change.<sup>12,21</sup> Parents/guardians reported overall household television viewing.<sup>21,32</sup> Frequency of eating meals with the television on was reported by the girls using items previously validated<sup>33</sup> and sensitive to change.<sup>12,21</sup> Dietary intake was assessed annually by 24-hour recall on 3 nonconsecutive days, including 1 weekend day and 2 weekdays, using the University of Minnesota Nutrition Coordinating Center Nutrition Data System for Research.<sup>14</sup> Data collectors were trained and certified in these protocols.<sup>34</sup>

Self-reported psychosocial measures were assessed annually, including overconcern with weight and shape, using the McKnight Risk Factor Survey<sup>35,36</sup>; self-perceived body shape and body shape dissatisfaction, using female African American pre-adolescent body figure silhouettes<sup>36</sup>; depressive symptoms, using the 10-item short form of the Children's Depression Inventory<sup>37</sup>; self-esteem, using the 10-item Rosenberg Self-Esteem scale<sup>38,39</sup>; and school performance.<sup>12</sup>

To assess African American ethnic/cultural identity,<sup>40</sup> parents/guardians completed measures of African American family practices and values, preferences for things African American, racial segregation,<sup>41</sup> and participation in African American activities,<sup>42</sup> at baseline and at the final follow-up visit. Sexual maturation was self-reported at every visit using drawings and descriptions of the pubertal stages<sup>43</sup> and age at menarche. At baseline, parents/guardians reported the girl's race, ethnicity, date of birth, and household membership; parent/guardian educational level; and total household income.

## STATISTICAL ANALYSIS

Baseline treatment and comparison group differences and baseline differences between those with and without follow-up data were assessed using Wilcoxon rank sum tests–Mann-Whitney tests for scaled variables and  $\chi^2$  tests for categorical variables. To use all the prospective data collected, BMI measures (up to 5 per participant) defined individual trajectories of change during the entire 2-year trial.<sup>14</sup> Using random regression models,<sup>44</sup> trajectories of change in BMI were regressed on intervention group assignment (centered), with the baseline value of BMI (centered at its mean) and the intervention  $\times$  baseline BMI interaction as covariates.<sup>45-49</sup> Random regression models have advantages compared with other repeated-measures analysis methods, accommodating differential lengths of follow-up, irregular measurement intervals, and missing data.<sup>44,50</sup> Analyses followed intention-to-treat principles. For 18 girls with no follow-up data, BMI trajectories were imputed using a multivariate linear regression model predicting BMI change from baseline measures for each group. The same random regression models and imputation approaches were used for secondary outcome variables. The results did not change materially when the analysis was repeated including only girls with measures for follow-up visit 4 (completers analysis), so only the primary intention-to-treat analysis results are reported. We explored potential moderators of treatment effects defined a priori using the methods of Kraemer et al.<sup>51,52</sup>



**Figure 1.** Participant recruitment and enrollment flowchart. From October 2002 through February 2004, we recruited, enrolled, and randomized 261 families or households with 284 eligible girls. In families/households with more than 1 eligible girl, 1 girl was randomly chosen for the analysis sample of 261 girls. The only statistically significant difference in the follow-up rate between groups was at follow-up visit 3 ( $P=.005$ ). Sixteen (11.9%), 27 (20.2%), 51 (38.1%), and 32 (23.9%) girls in the treatment group and 15 (11.8%), 14 (11.0%), 39 (30.7%), and 49 (38.6%) girls in the comparison group completed a total of 1, 2, 3, or all 4 of the follow-up visits, respectively ( $P=.053$ ). Personnel difficulties with data collectors resulted in larger rates of missing data at follow-up visits 2 and 3. BMI indicates body mass index (calculated as weight in kilograms divided by height in meters squared).

For a 2-sided test at  $\alpha=.05$ , the planned sample size of 130 girls per group provided approximately 90% power to detect an intervention effect (Cohen  $d \geq 0.4$ ),<sup>53,54</sup> equivalent to a difference of about 1  $\text{kg}/\text{m}^2$  at 24 months for a 5.5 SD in BMI and an estimated 0.90 correlation between the BMI at baseline and the 24-month follow-up visit.<sup>14</sup>

## RESULTS

Participant recruitment, enrollment, and flow are displayed in **Figure 1**. Baseline characteristics and comparisons are reported in **Table 1** and **Table 2**. Only 18 girls were unavailable for follow-up after baseline; 126 girls (94.0%) in the dance and screen time reduction treatment group and 117 girls (92.1%) in the health education comparison group completed at least 1 follow-up assessment ( $P=.54$ ). Of all baseline measures, the 18 girls who dropped out of the study had lower waist circumference (mean [SD], 63.3 [10.0] cm vs 69.5 [12.8] cm;  $P=.03$ ), triceps

**Table 1. Baseline Demographic Characteristics and Follow-up Participation Rates<sup>a</sup>**

Characteristic	All	Dance and Screen Time Reduction	Health Education
No. of participants	<b>261</b>	134	127
Age, mean (SD), y	9.4 (0.9)	9.5 (0.9)	9.4 (0.8)
No. of adults living in the household, mean (SD)	1.9 (0.9)	1.9 (1.0)	1.9 (0.8)
No. of children living in the household, mean (SD)	2.9 (1.5)	2.9 (1.6)	2.9 (1.4)
Families who own their own home	<b>61</b> (23.4)	29 (21.6)	32 (25.2)
Parent/guardian marital status			
Single, never married	<b>122</b> (46.7)	64 (47.8)	58 (45.7)
Divorced/separated or widowed	<b>62</b> (23.8)	30 (22.4)	32 (25.2)
Married	<b>74</b> (28.4)	38 (28.4)	36 (28.3)
Maximum household educational level			
≤High school graduate	<b>71</b> (27.2)	38 (28.4)	33 (26.0)
Some college/technical school	<b>122</b> (46.7)	66 (49.3)	56 (44.1)
College graduate	<b>68</b> (26.1)	30 (22.4)	38 (29.9)
Annual total household income, \$			
Refused to respond	<b>4</b> (1.5)	2 (1.5)	2 (1.6)
<20 000	<b>107</b> (41.0)	50 (37.3)	57 (44.9)
20 000-39 999	<b>73</b> (28.0)	38 (28.4)	35 (27.6)
40 000-59 999	<b>48</b> (18.4)	28 (20.9)	20 (15.7)
60 000-79 999	<b>12</b> (4.6)	7 (5.2)	5 (3.9)
≥80 000	<b>17</b> (6.5)	9 (6.7)	8 (6.3)
Television in the girl's bedroom	<b>202</b> (77.4)	101 (75.4)	101 (79.5)
Self-assessed breast maturation			
Refused	<b>3</b> (1.1)	2 (1.5)	1 (0.8)
Stage 1	<b>82</b> (31.4)	43 (32.1)	39 (30.7)
Stage 2	<b>86</b> (33.0)	43 (32.1)	43 (33.9)
Stage 3	<b>78</b> (29.9)	37 (27.6)	41 (32.3)
Stage 4	<b>9</b> (3.4)	6 (4.5)	3 (2.4)
Stage 5	<b>3</b> (1.1)	3 (2.2)	0
Self-assessed pubic hair maturation			
Refused	<b>2</b> (0.8)	2 (1.5)	0
Stage 1	<b>111</b> (42.5)	59 (44.0)	52 (40.9)
Stage 2	<b>80</b> (30.7)	41 (30.6)	39 (30.7)
Stage 3	<b>40</b> (15.3)	18 (13.4)	22 (17.3)
Stage 4	<b>25</b> (9.6)	12 (9.0)	13 (10.2)
Stage 5	<b>3</b> (1.1)	2 (1.5)	1 (0.8)
Entered puberty (≥stage 2 for breast and/or pubic hair)	<b>201</b> (77.0)	101 (75.4)	100 (78.7)
Menarche	<b>8</b> (3.1)	4 (3.0)	4 (3.1)
BMI percentile distribution <sup>b</sup>			
0-24th percentile	<b>18</b> (6.9)	8 (6.0)	10 (7.9)
25th-49th percentile	<b>34</b> (13.0)	21 (15.7)	13 (10.2)
50th-74th percentile	<b>50</b> (19.2)	27 (20.1)	23 (18.1)
75th-84th percentile	<b>25</b> (9.6)	12 (9.0)	13 (10.2)
85th-94th percentile	<b>47</b> (18.0)	22 (16.4)	25 (19.7)
≥95th percentile	<b>87</b> (33.3)	44 (32.8)	43 (33.9)
Reason for missing follow-up visit 1			
Unable to be contacted	<b>48</b> (18.4)	25 (18.7)	23 (18.1)
Moved out of area	<b>1</b> (0.4)	1 (0.7)	0
Unable to schedule within the desired time interval	<b>1</b> (0.4)	1 (0.7)	0
Refused assessments	<b>9</b> (3.4)	5 (3.7)	4 (3.1)
Reason for missing follow-up visit 2			
Unable to be contacted	<b>64</b> (24.5)	33 (24.6)	31 (24.4)
Moved out of area	<b>3</b> (1.1)	2 (1.5)	1 (0.8)
Unable to schedule within the desired time interval	<b>38</b> (14.6)	22 (16.4)	16 (12.6)
Refused assessments	<b>11</b> (4.2)	4 (2.9)	7 (5.5)
Reason for missing follow-up visit 3			
Unable to be contacted	<b>56</b> (21.5)	33 (24.6)	23 (18.1)
Moved out of area	<b>1</b> (0.4)	0	1 (0.8)
Unable to schedule within the desired time interval	<b>63</b> (24.1)	40 (29.9)	23 (18.1)
Refused assessments	<b>6</b> (2.3)	3 (2.2)	3 (2.4)
Reason for missing follow-up visit 4			
Unable to be contacted	<b>21</b> (8.0)	9 (6.7)	12 (9.4)
Moved out of area	<b>9</b> (3.4)	3 (2.2)	6 (4.7)
Unable to schedule within the desired time interval	<b>0</b>	0	0
Refused assessments	<b>1</b> (0.4)	1 (0.7)	0
Withdrew from study	<b>5</b> (1.9)	3 (2.2)	2 (1.6)

Abbreviation: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared).

<sup>a</sup>Data are presented as number (percentage) unless otherwise indicated. Percentages may not total 100 due to rounding.

<sup>b</sup>Percentiles based on 2000 Centers for Disease Control and Prevention BMI standards (<http://www.cdc.gov/growthcharts/>).

**Table 2. Changes in Primary and Secondary Outcome Measures and Group Differences**

Measure	Baseline, Mean (SD)		Change per Year, Mean (SD)		Adjusted Difference in Change per Year (95% CI) <sup>a</sup>
	Dance and Screen Time Reduction	Health Education	Dance and Screen Time Reduction	Health Education	
BMI	20.70 (4.95)	20.68 (4.82)	1.28 (0.90)	1.24 (1.01)	0.04 (-0.18 to 0.27)
BMI z score	0.94 (1.07)	0.98 (1.07)	0.26 (0.19)	0.24 (0.19)	0.02 (-0.02 to 0.06)
Waist circumference, cm	69.28 (13.23)	68.82 (12.27)	4.15 (2.21)	4.25 (2.54)	-0.11 (-0.69 to 0.47)
Triceps skinfold, mm	17.20 (8.36)	17.75 (8.07)	1.49 (3.01)	1.93 (2.74)	-0.52 (-1.16 to 0.13)
Systolic blood pressure, mmHg	98.09 (9.30)	98.31 (10.62)	1.24 (4.74)	1.03 (4.71)	0.15 (-0.77 to 1.06)
Diastolic blood pressure, mmHg	55.95 (6.02)	56.19 (7.06)	-0.15 (3.43)	0.12 (2.76)	-0.33 (-0.98 to 0.33)
Total cholesterol, mg/dL <sup>b</sup>	171.49 (30.50)	175.85 (31.17)	-7.35 (6.97)	-4.18 (6.88)	-3.49 (-5.28 to -1.70) <sup>c</sup>
HDL cholesterol, mg/dL <sup>b</sup>	54.15 (11.73)	57.05 (13.56)	-3.26 (3.21)	-3.28 (3.32)	-0.34 (-1.13 to 0.45)
LDL cholesterol, mg/dL <sup>b</sup>	103.94 (26.23)	106.42 (28.44)	-3.90 (7.20)	-1.06 (5.81)	-3.02 (-4.74 to -1.31) <sup>c</sup>
Triglycerides, mg/dL <sup>b</sup>	66.93 (37.06)	61.82 (25.40)	-1.73 (20.68)	1.01 (10.14)	-1.97 (-6.30 to 2.37)
Glucose, mg/dL <sup>b</sup>	84.99 (7.42)	84.88 (6.60)	1.81 (3.80)	1.53 (3.96)	0.32 (-0.62 to 1.26)
Insulin, $\mu$ IU/mL <sup>b</sup>	10.97 (11.17)	9.77 (6.95)	1.61 (5.01)	2.83 (4.92)	-0.94 (-2.12 to 0.24)
Resting heart rate, bpm	79.81 (9.97) <sup>d</sup>	82.49 (9.81)	-0.79 (4.55)	-1.49 (4.38)	0.13 (-0.84 to 1.10)
Weekday accelerometer counts per min	630.01 (174.21)	597.33 (184.20)	-58.15 (73.08)	-53.91 (71.47)	3.18 (-11.56 to 17.92)
Weekend accelerometer counts per min	702.28 (287.72)	694.17 (292.74)	-64.06 (113.56)	-66.96 (114.70)	4.54 (-19.37 to 28.45)
Weekday moderate to vigorous physical activity (>3000 counts per min), min/d	38.59 (22.15)	33.04 (21.13)	-5.78 (9.30)	-4.88 (7.71)	0.41 (-1.26 to 2.07)
Weekend moderate to vigorous physical activity (>3000 counts per min), min/d	28.55 (23.76)	26.19 (23.34)	-4.54 (10.25)	-4.43 (9.78)	0.51 (-1.42 to 2.44)
After-school accelerometer counts per min	861.48 (371.53)	793.00 (355.90)	-87.68 (183.15)	-77.56 (155.64)	10.22 (-21.48 to 41.92)
After-school moderate to vigorous physical activity, min	11.37 (9.80)	8.80 (8.46)	-1.91 (4.45)	-1.21 (3.49)	0.04 (-0.67 to 0.75)
Weekly total screen time, h	18.88 (12.75)	22.69 (15.79)	-0.02 (10.92)	1.15 (13.98)	-2.65 (-5.42 to 0.13)
Weekly television viewing, h	13.15 (10.26) <sup>d</sup>	16.85 (12.45)	0.79 (8.26)	1.30 (8.18)	-1.64 (-3.49 to 0.21)
Weekly VCR/DVD viewing, h	4.70 (6.41)	4.84 (6.85)	-0.81 (6.96)	-0.13 (5.54)	-0.73 (-2.10 to 0.63)
Weekly video game playing, h	1.022 (2.847)	1.002 (3.101)	-0.003 (1.667)	-0.001 (4.434)	0.012 (-0.580 to 0.603)
Weekly computer use, h	0.901 (2.466)	0.774 (2.062)	0.316 (1.711)	0.327 (1.642)	0.023 (-0.360 to 0.406)
Total household television use (0-4)	2.47 (1.02)	2.48 (1.15)	-0.09 (0.45)	-0.04 (0.45)	-0.06 (-0.15 to 0.04)
Ate breakfast with the television on, d/wk	1.49 (2.28) <sup>d</sup>	2.17 (2.71)	0.02 (1.53)	-0.37 (1.74)	0.15 (-0.20 to 0.50)
Ate dinner with the television on, d/wk	2.66 (2.80)	3.22 (2.93)	0.18 (1.50)	0.22 (1.69)	-0.21 (-0.53 to 0.12)
Mean total daily energy intake, kcal	1353.68 (459.98)	1360.11 (432.30)	-3.44 (239.27)	21.80 (209.14)	-27.31 (-69.62 to 15.00)
Mean percentage of dietary energy from fat	35.44 (5.29)	35.44 (5.65)	0.29 (2.87)	0.42 (3.12)	-0.13 (-0.67 to 0.40)
Physical activity preferences	1.52 (0.25)	1.52 (0.25)	-0.07 (0.12)	-0.10 (0.14)	0.01 (-0.02 to 0.04)
Overconcern with weight and shape (0-100)	29.92 (27.43)	29.21 (27.85)	-1.58 (11.46)	-1.70 (11.38)	0.26 (-2.18 to 2.71)
Body shape dissatisfaction	1.23 (1.85)	1.11 (1.78)	-0.22 (0.66)	-0.16 (0.62)	-0.04 (-0.15 to 0.08)
School performance (9=mostly A's to 1=mostly F's)	7.69 (1.26)	7.55 (1.47)	-0.38 (0.96)	-0.22 (1.28)	-0.10 (-0.35 to 0.15)
Depressive symptoms (0-20)	1.96 (2.74)	2.09 (2.74)	-0.49 (1.10)	-0.26 (1.38)	-0.21 (-0.42 to -0.001) <sup>d</sup>
Self-esteem (high=10 to low=40)	19.16 (3.87)	19.27 (4.00)	-0.90 (2.04)	-0.70 (2.16)	-0.22 (-0.66 to 0.21)
Preferences for things African American (1-7)	4.13 (1.31)	4.22 (1.42)	0.07 (0.54)	-0.06 (0.45)	0.11 (0.01 to 0.22) <sup>d</sup>
African American family practices and values (1-7)	5.55 (1.28)	5.61 (1.30)	0.08 (0.58)	0.02 (0.58)	0.04 (-0.07 to 0.16)
Racial segregation (1-7)	4.66 (1.59)	4.67 (1.73)	-0.16 (0.65)	-0.04 (0.69)	-0.12 (-0.26 to 0.03)
African American ethnic identity	4.73 (1.37)	4.75 (1.50)	0.11 (0.56)	0.01 (0.63)	0.09 (-0.03 to 0.22)

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); CI, confidence interval; HDL, high-density lipoprotein; LDL, low-density lipoprotein.

SI conversion factors: To convert total, HDL, and LDL cholesterol to millimoles per liter, multiply by 0.0259; triglycerides to millimoles per liter, multiply by 0.0113; glucose to millimoles per liter, multiply by 0.0555; and insulin to picomoles per liter, multiply by 6.945.

<sup>a</sup>Adjusted mean difference and 95% CI between the dance and screen time reduction treatment group and the health education comparison group per year (treatment minus control).

<sup>b</sup>Fasting blood test results were obtained from 208 girls at baseline (107 [79.9%] in the treatment group and 101 [79.5%] in the comparison group), 211 girls at follow-up visit 4 (112 [83.6%] in the treatment group and 99 [78.0%] in the comparison group), and 170 girls at both baseline and follow-up visit 4 (90 [67.2%] in the treatment group and 80 [63.0%] in the comparison group). Girls with fasting blood test results at baseline had statistically significantly shorter heights than girls without blood test results ( $P=.04$ ), and girls with fasting blood test results at follow-up visit 4 and at both baseline and follow-up visit 4 were more likely to be from a family that owned its own home ( $P=.03$  and  $P=.03$ , respectively). Girls with and without blood test results were not statistically significantly different on any other baseline measures.

<sup>c</sup> $P<.001$  between group differences.

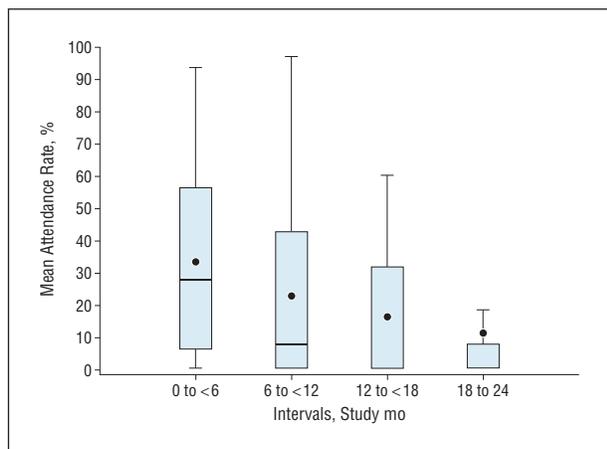
<sup>d</sup> $P=.02$  between group differences.

skinfold thickness (12.8 [5.1] mm vs 17.8 [8.3] mm;  $P=.01$ ), and triglyceride levels (13 vs 195; 48.2 [17.0] mg/dL vs 65.5 [32.5] mg/dL [to convert to millimoles per liter, multiply by 0.0113];  $P=.02$ ) than the 243 girls with follow-up data, but there were no other statistically significant differences. The mean (SD) length of follow-up was 25.7 (8.5) months (median, 27.0 months; maximum, 40.6 months) for girls in the treatment group and 25.2 (9.6) months (me-

dian, 27.0 months; maximum, 38.9 months) for girls in the comparison group ( $P=.82$ ).

#### INTERVENTION IMPLEMENTATION AND PROCESS OUTCOMES

The a priori goal for mean attendance rate at dance classes was 0.6 or higher (an average of 3 d/wk). However, the



**Figure 2.** Dance class attendance rates by 6-month time intervals of study participation. Attendance dropped substantially during the study. Box-and-whisker plots show the girls' percentages of attendance of all possible dance classes during their first, second, third, and fourth 6-month intervals of study participation. Dots indicate means; central horizontal lines, medians; boxes, 25th and 75th percentiles; and whiskers, 1.5 interquartile ranges beyond the 25th and 75th percentiles. In the third and fourth 6-month intervals, the median and 25th percentile overlap with a value of 0.

mean (SD) attendance rate for girls in the treatment group was only 0.21 (0.22) (median, 0.12; interquartile range, 0.02-0.34; minimum, 0; maximum, 0.81) for possible dance classes, from randomization to their last assessment. In addition, 9 (6.7%), 73 (54.5%), 25 (18.7%), 17 (12.7%), and 10 (7.5%) girls attended classes a mean of 0, greater than 0 to less than 1, 1, 2, and 3 or more days per week, respectively. Attendance rates decreased during the study (**Figure 2**). Two main challenges affected dance class attendance. First, changes in community center leadership or episodes of violent crime at or near the community centers where dance classes were held necessitated changing intervention sites 6 times. Second, the local transportation vendor abruptly ended service early in the study. We eventually provided our own vans and drivers, but attendance rates never fully recovered. At follow-up visit 4, girls reported practicing dance outside of class a mean (SD) of 2.7 (2.6) d/wk (45.1% on  $\geq 3$  d/wk) for a mean (SD) of 0.83 (0.50) hours (37.2% for  $\geq 1$  hour), confirming the motivating aspect of the intervention.

We were able to deliver a mean (SD) of 12.4 (6.3) START lessons (median, 13 lessons; interquartile range, 7-18 lessons) of 25 possible lessons. Of the families, 70.1% received at least the first 7 lessons, defined as the basic skills portion of the intervention; 29.1% received 7 to 14 lessons; 34.3% received 15 to 20 lessons; and 6.7% received 21 or more. In addition, 76.9% hooked up at least 1 electronic television time manager (TV Allowance; Mindmaster Inc, Miami, Florida) and 11.9% hooked up 2 or more. The mean (SD) reported weekly screen time budget goal was 10.0 (2.4) hours (median, 10.0; interquartile range, 7.5-12.0).

All 24 educational newsletters were sent to valid addresses for 93.7% of girls in the active-placebo health education group and their parents/guardians, and 86.9% of the girls reported reading at least half of the "Felicia's Healthy News Flash" newsletters (66.4% read all or al-

most all the newsletters). Families attended a mean (SD) of 1.1 (1.4) (median, 1; interquartile range, 0-2) of 8 possible evening health education events. Additional Saturday summer health education fairs were attended by 29 of 94 families (30.9%) enrolled by the summer of the first year and 18 of 127 families (14.2%) in the second summer of the study. Also, 80.4% of parents/guardians reported reading at least half of the "Stanford GEMS Health Report" newsletters (54.2% read all or almost all the newsletters). All elements of the treatment and comparison interventions were rated highly for fun and helpfulness by girls and their parents/guardians.

## PRIMARY AND SECONDARY OUTCOMES

Outcomes are reported in Table 2. There was no statistically significant difference between groups for change in BMI (the primary outcome measure). Among prespecified secondary outcome measures, fasting total cholesterol level, low-density lipoprotein (LDL) cholesterol level, and depressive symptoms decreased statistically significantly more among girls in the treatment group. Parents/guardians in the treatment group also reported significantly increased preferences for things African American compared with parents in the comparison group. Differences between groups were in the expected direction for most other secondary outcome measures but were not statistically significant. Incidence based on high-risk thresholds of categorical outcomes are reported in **Table 3**. These results suggest a significant treatment group benefit in the incidence of marked hyperinsulinemia ( $\geq 30$   $\mu\text{IU/mL}$  [to convert to picomoles per liter, multiply by 6.945]) (**Figure 3**).

## MODERATOR ANALYSIS

We explored a priori-defined baseline (prerandomization) measures as potential moderators of treatment effects on the primary outcome measure (ie, BMI) to identify subgroups that may have responded more or less to the intervention.<sup>51,52</sup> Parent/guardian marital status ( $P=.01$ ) and baseline hours of television viewing ( $P=.02$ ) were statistically significant moderators of intervention effects (**Figure 4**).

## SAFETY MONITORING

Systematic monitoring of all injuries and other medical problems requiring a visit to a medical professional, height growth velocity, and excessive BMI or weight loss<sup>14</sup> suggested no increased risk associated with participation in the study as a whole or between intervention groups ( $P \geq .20$  for all). No injuries or illnesses were judged to be probably or definitely related to study participation.

## COMMENT

A culturally tailored, after-school, ethnic dance program and a home/family-based intervention to reduce screen time among low-income African American pre-adolescent girls did not reduce BMI gain compared with

**Table 3. Prevalence and Incidence of Categorical Outcome Measures and Group Differences<sup>a</sup>**

Measure	Total Sample		Dance and Screen Time Reduction		Health Education		Relative Risk (95% CI) <sup>c</sup>	NNT <sup>d</sup>
	Baseline Prevalence	Follow-up Incidence <sup>b</sup>	Baseline Prevalence	Follow-up Incidence <sup>b</sup>	Baseline Prevalence	Follow-up Incidence <sup>b</sup>		
BMI ≥95th percentile	86 (33.0)	14 (8.8)	44 (32.8)	6 (7.2)	42 (33.1)	8 (10.5)	0.69 (0.25 to 1.89)	30
Systolic BP ≥95th percentile	5 (1.9)	1 (0.5)	2 (1.5)	0	3 (2.4)	1 (1.0)	NA	NA
Diastolic BP ≥95th percentile	0	1 (0.4)	0	1 (0.8)	0	0	NA	NA
Total cholesterol ≥200 mg/dL	41 (19.7)	7 (5.2)	18 (16.8)	2 (2.7)	23 (22.8)	5 (8.1)	0.34 (0.07 to 1.67)	19
LDL cholesterol ≥130 mg/dL	38 (18.3)	7 (5.1)	14 (13.1)	4 (5.2)	24 (23.8)	3 (4.9)	1.06 (0.25 to 4.54)	-361
HDL cholesterol <35 mg/dL	5 (2.4)	11 (6.7)	2 (1.9)	6 (6.8)	3 (3.0)	5 (6.5)	1.05 (0.33 to 3.31)	-308
Triglycerides ≥135 mg/dL	10 (4.8)	3 (1.9)	8 (7.5)	1 (1.2)	2 (2.0)	2 (2.6)	0.47 (0.04 to 5.08)	74
Glucose ≥126 mg/dL	0	2 (1.2)	0	1 (1.1)	0	1 (1.3)	0.89 (0.06 to 13.98)	720
Insulin ≥30 µIU/mL	10 (4.8)	18 (11.1)	6 (5.6)	5 (5.9)	4 (4.0)	13 (16.9)	0.35 (0.13 to 0.93)	9

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); BP, blood pressure; CI, confidence interval; HDL, high-density lipoprotein; LDL, low-density lipoprotein; NA, not applicable because incidence rates were too small; NNT, number needed to treat.

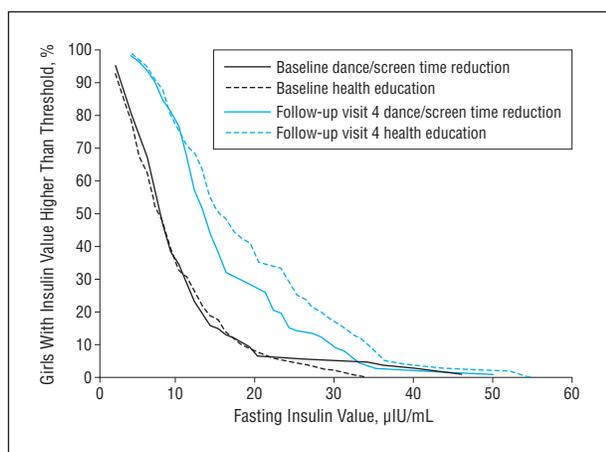
SI conversion factors: To convert total, HDL, and LDL cholesterol to millimoles per liter, multiply by 0.0259; triglycerides to millimoles per liter, multiply by 0.0113; glucose to millimoles per liter, multiply by 0.0555; and insulin to picomoles per liter, multiply by 6.945.

<sup>a</sup>Data are presented as number (percentage) unless otherwise noted.

<sup>b</sup>New clinical abnormalities identified during the follow-up period (not identified at baseline).

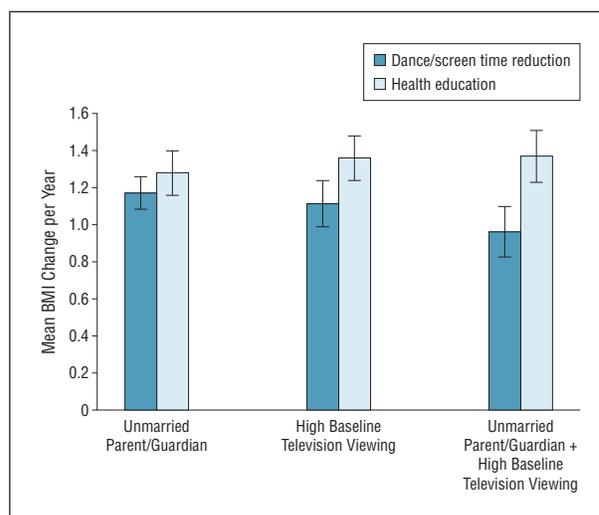
<sup>c</sup>Ratio of incidence rates in the treatment and health education comparison groups and 95% CI during the follow-up period.

<sup>d</sup>The number of girls one would expect to treat with the treatment intervention to produce 1 more success (to prevent 1 less clinical abnormality) than if the same number of girls were treated with the comparison intervention.



**Figure 3.** Sample distributions of fasting insulin by intervention group at baseline and follow-up. Percentages of the dance and screen time reduction sample and the health education sample with fasting insulin levels higher than the corresponding threshold level on the horizontal axis are shown (to convert to picomoles, multiply by 6.945). From baseline to follow-up visit 4, the distribution of fasting insulin levels shifted further to the right (greater fasting insulin levels) among girls in the health education group compared with the girls in the dance and screen time reduction group.

health education. However, girls randomized to ethnic dance and screen time reduction significantly lowered their fasting total cholesterol and LDL cholesterol levels, depressive symptoms, and incidence of elevated fasting insulin levels compared with girls randomized to health education. Changes in most other prespecified secondary outcome measures also favored the ethnic dance and screen time reduction intervention, with small to medium effect sizes,<sup>33</sup> but were not statistically significant. Consistent with the cultural orientation of the intervention, treatment group parents/guardians significantly increased their preferences for African American culture and activities. Exploratory moderator analysis indicated that the experimental intervention reduced BMI gain more



**Figure 4.** Baseline parent or guardian marital status and girls' television viewing time as moderators of intervention effects on body mass index (BMI; calculated as weight in kilograms divided by height in meters squared). In the exploratory moderator analysis, the dance and screen time reduction intervention was significantly more effective than health education among girls with an unmarried parent/guardian and those who watched more than the mean amount of television at baseline. Figure illustrates the differences between intervention groups in mean (SE) change in BMI for the subgroups of girls with an unmarried parent/guardian, girls who watched more than the mean amount of television at baseline, and girls with both an unmarried parent/guardian and high baseline television viewing.

than health education among the subgroups of girls who had unmarried parents/guardians and/or watched more television at the start of the study.

The effects on total cholesterol and LDL cholesterol levels, depressive symptoms, and incidence of elevated fasting insulin level may represent reduced risks of future cardiovascular disease, diabetes mellitus, and psychosocial problems. Changes in these important clinical measures have rarely been achieved through population-based interventions for children.<sup>55,56</sup> Total cho-

lesterol and LDL cholesterol levels decreased a mean of about 3.5 and 3.0 mg/dL more per year, respectively (or about 7.0 and 6.0 mg/dL during the 2-year study [to convert to millimoles per liter, multiply by 0.555]), among girls randomized to ethnic dance and screen time reduction than to health education. The incidence of a fasting insulin level of 30  $\mu$ IU/mL or higher was about 65% lower in the dance and screen time reduction group during the study, representing a relatively small number needed to treat of 9. We believe that these differences would be of clinical and policy-making significance when applied across the population. In addition, the results of the exploratory moderator analysis<sup>51,57</sup> suggest that the intervention might more effectively reduce BMI gain if targeted toward particular high-risk samples. We found no evidence of increased weight concerns or body dissatisfaction, consistent with prior findings<sup>12</sup> that interventions designed to prevent obesity have not put girls at higher risk for disordered eating problems.

It is possible that the overall BMI results indicate a failure of this intervention approach for obesity prevention. We do not believe that is necessarily the case. Previous clinical trials demonstrating the effects of reducing screen time on BMI<sup>12,21,58,59</sup> and favorable trends in many of the measures of screen time, physical activity, and energy intake behaviors argue against a failure of the intervention model. Instead, we believe that difficulties experienced in implementation, resulting in lower-than-projected intervention doses, represent the most likely explanation. Median attendance rates at dance classes were only 11.6%, one-fifth of the goal rate, and the mean difference between groups in change in screen time was 22 minutes per year, substantially less than prior studies<sup>12,21,58,59</sup>; age- and sex-standardized BMI change during the study was weakly inversely associated with dance class attendance ( $r = -0.04$ ) and number of START lessons completed ( $r = -0.12$ ) among girls in the treatment group. Another potential explanation is that the active-placebo health education comparison intervention produced greater effects than anticipated. The active-placebo intervention has many important practical and conceptual benefits, but if it produces behavior change it could make it more difficult to detect treatment intervention effects. It is impossible to determine whether this occurred, but the rate of increase in BMI in our health education group was substantially less than that observed in some other contemporary cohorts of African American girls, including the control cohorts in the Memphis GEMS trial<sup>60</sup> and the GEMS pilot studies,<sup>10-12</sup> among others.<sup>61</sup> We still believe that the advantages of the active-placebo comparison outweigh the potential risks in this study setting, but it is important to balance these possibilities carefully when designing comparison conditions for future studies.

Other findings also deserve attention. We observed particularly high rates of cardiovascular disease and diabetes risk factors. At study entry, when girls were only 8 through 10 years of age, nearly 1 in 5 girls in the sample had elevated levels of fasting cholesterol ( $\geq 200$  mg/dL) and LDL cholesterol ( $\geq 130$  mg/dL) and 4.8% had markedly elevated fasting insulin levels ( $\geq 30$   $\mu$ IU/mL). During the subsequent 2 years, we observed an additional

new onset of elevated total cholesterol, elevated LDL cholesterol, low high-density lipoprotein cholesterol, and elevated insulin levels of about 5.2%, 5.1%, 6.7%, and 11.1%, respectively, and about a 1.2% incidence of diabetes mellitus (fasting glucose level  $\geq 126$  mg/dL [to convert to millimoles per liter, multiply by 0.0555]). Accelerometer measures indicated only about one-half hour of moderate to vigorous physical activity per day at baseline, which decreased rapidly at a mean rate of about 5 minutes per day per year during the 2 years of the study. Nearly 4 of 5 girls reported having a television in her bedroom, exceeding the national average for girls this age.<sup>62</sup> Girls ate about 2 breakfasts and 3 dinners per week in front of the television and consumed about 35% of their energy intake from fat. These findings indicate a particularly high-risk population and reinforce the critical importance of additional research to find effective interventions to meet their needs.

Although we experienced several implementation barriers, it should not deter others from performing research, particularly randomized controlled trials, in this or similarly low-socioeconomic status populations and settings. By involving community members in designing the study and formulating methods to address anticipated barriers, we still successfully recruited and retained a particularly high-risk sample. Less than 7% of the sample was unavailable for follow-up, and more than 86% completed their final follow-up visit after 2 years of participation.

Few previous diet and physical activity interventions have reduced body fat and weight gain,<sup>5,63</sup> and few studies have tested obesity prevention programs specifically designed to meet the needs of preadolescent African American girls and their families, despite their increased rates of obesity and associated morbidities. Stanford GEMS was designed with particular attention to applying theory and experience to help address the paucity of research in this area. Notwithstanding implementation difficulties, an intervention applying the social cognitive model<sup>12,14,18,19</sup> to a community-based urban setting with low-income African American girls and their families produced potentially clinically important changes in lipid levels, insulin levels, and depressive symptoms compared with health education. Although there was no significant difference between groups in BMI (the primary outcome measure), there was evidence of effects on BMI in subsets of higher-risk girls with unmarried parents/guardians and/or high baseline television viewing. These results are promising and suggest a need for continued solution-oriented research<sup>64</sup> to identify approaches and methods that produce greater effects in population-based samples of children.

**Accepted for Publication:** April 26, 2010.

**Author Affiliations:** Divisions of General Pediatrics (Dr Robinson) and Pediatric Endocrinology (Dr Wilson), Department of Pediatrics; Division of Biostatistics, Department of Psychiatry and Behavioral Medicine (Dr Kraemer); and the Stanford Prevention Research Center, Department of Medicine (Drs Robinson, Matheson, Alhassan, Spencer, and Killen and Mss Thompson, Haydel, Fujimoto, and Varady), Stanford University School of

Medicine, Stanford, California; and Division of Cardiovascular Sciences, National Heart, Lung, and Blood Institute, Bethesda, Maryland (Dr Obarzanek). Ms Thompson is now with Unification of Cultural Arts, Los Banos, California. Dr Alhassan is now with the Department of Kinesiology, University of Massachusetts, Amherst. Dr Spencer is now with the John S. Watson Institute for Public Policy, Trenton, New Jersey.

**Correspondence:** Thomas N. Robinson, MD, MPH, Division of General Pediatrics and Stanford Prevention Research Center, Stanford University School of Medicine, 1070 Arastradero Rd, Ste 300, Palo Alto, CA 94304 (tom.robinson@stanford.edu).

**Author Contributions:** Dr Robinson (principal investigator) 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. *Study concept and design:* Robinson, Matheson, Kraemer, Wilson, Obarzanek, and Killen. *Acquisition of data:* Matheson, Wilson, Thompson, Alhassan, Spencer, and Fujimoto. *Analysis and interpretation of data:* Robinson, Matheson, Kraemer, Obarzanek, Haydel, Fujimoto, and Varady. *Drafting of the manuscript:* Robinson. *Critical revision of the manuscript for important intellectual content:* Robinson, Matheson, Kraemer, Wilson, Obarzanek, Thompson, Alhassan, Spencer, Haydel, Fujimoto, Varady, and Killen. *Statistical analysis:* Kraemer, Haydel, and Varady. *Obtained funding:* Robinson and Killen. *Administrative, technical, and material support:* Obarzanek, Thompson, Spencer, Fujimoto, and Killen. *Study supervision:* Robinson, Matheson, Wilson, and Killen. *Project coordination:* Thompson.

**Financial Disclosure:** None reported.

**Funding/Support:** This research was funded by cooperative agreement UO1 HL62663 from the NHLBI, National Institutes of Health.

**Role of the Sponsor:** An NHLBI program officer (Dr Obarzanek) was a member of the cooperative agreement steering committee and, as a coauthor on the manuscript, participated in interpretation of the data and preparation of the manuscript. The NHLBI program officer and other NHLBI scientific staff provided input on design and conduct of the study but were not involved in collection, management, or analysis of the data. The manuscript was reviewed and approved by the NHLBI before submission.

**Additional Contributions:** We thank the Stanford GEMS participants and their families, our Stanford GEMS field staff, and the many community members and community centers that made this study possible. We also thank Charlotte Pratt, MS, PhD, RD, from the NHLBI, the members of the data and safety monitoring board, and the Memphis GEMS investigators for their valuable input and collaboration.

## REFERENCES

1. Troiano RP, Flegal KM. Overweight children and adolescents: description, epidemiology, and demographics. *Pediatrics*. 1998;101(3, pt 2):497-504.
2. Hedley AA, Ogden CL, Johnson CL, Carroll MD, Curtin LR, Flegal KM. Prevalence of overweight and obesity among US children, adolescents, and adults, 1999-2002. *JAMA*. 2004;291(23):2847-2850.
3. Ogden CL, Carroll MD, Flegal KM. High body mass index for age among US children and adolescents, 2003-2006. *JAMA*. 2008;299(20):2401-2405.
4. Winkleby MA, Robinson TN, Sundquist J, Kraemer HC. Ethnic variation in cardiovascular disease risk factors among children and young adults: findings from the Third National Health and Nutrition Examination Survey, 1988-1994. *JAMA*. 1999;281(11):1006-1013.
5. Resnicow K, Robinson TN. School-based cardiovascular disease prevention studies: review and synthesis. *Ann Epidemiol*. 1997;7(S7):S14-S31.
6. Robinson TN, Killen JD. Obesity prevention for children and adolescents. In: Thompson JK, Smolak L, eds. *Body Image, Eating Disorders, and Obesity in Children and Adolescents: Assessment, Prevention, and Treatment*. Washington, DC: American Psychological Association; 2001:261-292.
7. Robinson TN. Population-based obesity prevention for children and adolescents. In: Johnston FE, Foster GD, eds. *Obesity, Growth and Development*. Vol 3. London, England: Smith-Gordon and Co Ltd; 2001:129-141.
8. Obarzanek E, Pratt CA. Girls health Enrichment Multi-site Studies (GEMS): new approaches to obesity prevention among young African-American girls. *Ethn Dis*. 2003;13(1)(suppl 1):S1-S5.
9. Baranowski T, Baranowski JC, Cullen KW, et al. The Fun, Food, and Fitness Project (FFFP): the Baylor GEMS pilot study. *Ethn Dis*. 2003;13(1)(suppl 1):S30-S39.
10. Beech BM, Klesges RC, Kumanyika SK, et al. Child- and parent-targeted interventions: the Memphis GEMS pilot study. *Ethn Dis*. 2003;13(1)(suppl 1):S40-S53.
11. Story M, Sherwood NE, Himes JH, et al. An after-school obesity prevention program for African-American girls: the Minnesota GEMS pilot study. *Ethn Dis*. 2003;13(1)(suppl 1):S54-S64.
12. Robinson TN, Killen JD, Kraemer HC, et al. Dance and reducing television viewing to prevent weight gain in African-American girls: the Stanford GEMS pilot study. *Ethn Dis*. 2003;13(1)(suppl 1):S65-S77.
13. Kumanyika S, Obarzanek E, Robinson TN, Beech BM. Phase 1 of the Girls health Enrichment Multi-site Studies (GEMS): conclusion. *Ethn Dis*. 2003;13(1)(suppl 1):S88-S91.
14. Robinson TN, Kraemer HC, Matheson DM, et al. Stanford GEMS phase 2 obesity prevention trial for low-income African-American girls: design and sample baseline characteristics. *Contemp Clin Trials*. 2008;29(1):56-69.
15. Expert NIH Panel on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults*. Bethesda, Maryland: Obesity Education Initiative, National Heart, Lung, and Blood Institute, National Institutes of Health; 1998. Publication 98-4083.
16. Efron B. Forcing a sequential experiment to be balanced. *Biometrika*. 1971;58(3):403-417.
17. Kumanyika SK, Story M, Beech BM, et al. Collaborative planning for formative assessment and cultural appropriateness in the Girls health Enrichment Multi-site Studies (GEMS): a retrospection. *Ethn Dis*. 2003;13(1)(suppl 1):S15-S29.
18. Bandura A. *Social Foundations of Thought and Action*. Englewood Cliffs, NJ: Prentice-Hall; 1986.
19. Bandura A. *Self-Efficacy: The Exercise of Control*. New York, NY: WH Freeman and Co; 1997.
20. Resnicow K, Baranowski T, Ahluwalia JS, Braithwaite RL. Cultural sensitivity in public health: defined and demystified. *Ethn Dis*. 1999;9(1):10-21.
21. Robinson TN. Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA*. 1999;282(16):1561-1567.
22. Ford BS, McDonald TE, Owens AS, Robinson TN. Primary care interventions to reduce television viewing in African-American children. *Am J Prev Med*. 2002;22(2):106-109.
23. Kazdin AE, Wilcoxon LA. Systematic desensitization and nonspecific treatment effects: a methodological evaluation. *Psychol Bull*. 1976;83(5):729-758.
24. Shapiro AK, Morris LA. The placebo effect in medical and psychological therapies. In: Garfield SL, Bergin AE, eds. *Handbook of Psychotherapy and Behavior Change*. New York, NY: John Wiley & Sons; 1978:369-410.
25. Cook TD, Campbell DT. *Quasi-Experimentation: Design and Analysis Issues for Field Settings*. Boston, Mass: Houghton Mifflin Co; 1979.
26. Dietz WH, Robinson TN. Use of the body mass index (BMI) as a measure of overweight in children and adolescents. *J Pediatr*. 1998;132(2):191-193.
27. Kraemer HC, Berkowitz RI, Hammer LD. Methodological difficulties in studies of obesity, I: measurement issues. *Ann Behav Med*. 1990;12(3):112-118.
28. Lohman TG, Roche AF, Martorell R. *Anthropometric Standardization Reference Manual*. Champaign, IL: Human Kinetics Publishers; 1988.
29. Alhassan S, Sirard JR, Spencer TR, Varady A, Robinson TN. Estimating physical activity from incomplete accelerometer data in field studies. *J Phys Act Health*. 2008;5(suppl 1):S112-S125.
30. Treuth MS, Schmitz K, Catellier DJ, et al. Defining accelerometer thresholds for activity intensities in adolescent girls. *Med Sci Sports Exerc*. 2004;36(7):1259-1266.
31. Sherwood NE, Taylor WC, Treuth M, et al. Measurement characteristics of activity-related psychosocial measures in 8- to 10-year-old African-American girls in the Girls health Enrichment Multisite Study (GEMS). *Prev Med*. 2004;38(suppl):S60-S68.

32. Medrich EA. Constant television: a background to daily life. *J Commun.* 1979;29(3):171-176.
33. Borzekowski DLG, Robinson TN. Viewing the viewers: 10 video case studies of children's television viewing behaviors. *J Broadcast Electron Media.* 1999;43(4):506-528.
34. Cullen KW, Watson K, Himes JH, et al. Evaluation of quality control procedures for 24-h dietary recalls: results from the Girls health Enrichment Multisite Studies. *Prev Med.* 2004;38(suppl):S14-S23.
35. Shisslak CM, Renger R, Sharpe T, et al. Development and evaluation of the McKnight Risk Factor Survey for assessing potential risk and protective factors for disordered eating in preadolescent and adolescent girls. *Int J Eat Disord.* 1999;25(2):195-214.
36. Sherwood NE, Beech BM, Klesges LM, et al. Measurement characteristics of weight concern and dieting measures in 8-10-year-old African-American girls from GEMS pilot studies. *Prev Med.* 2004;38(suppl):S50-S59.
37. Kovacs M. *The Children's Depression Inventory (CDI) Manual.* Toronto, Ontario: Multi-Health Systems, Inc; 1992.
38. Rosenberg M. *Society and the Adolescent Self-image.* Princeton, NJ: Princeton University Press; 1965.
39. Rosenberg M. *Conceiving the Self.* New York, NY: Basic Books; 1979.
40. Beech BM, Kumanyika SK, Baranowski T, et al. Parental cultural perspectives in relation to weight-related behaviors and concerns of African-American girls. *Obes Res.* 2004;12(suppl):7S-19S.
41. Klonoff EA, Landrine H. Revising and improving the African American acculturation scale. *J Black Psychol.* 2000;26(2):235-261.
42. Phinney JS. The multigroup ethnic identity measure: a new scale for use with diverse groups. *J Adolesc Res.* 1992;7(2):156-176.
43. Morris NM, Udry JR. Validation of a self-administered instrument to assess stage of adolescent development. *J Youth Adolesc.* 1980;9(3):271-280.
44. Gibbons RD, Hedeker D, Elkin I, et al. Some conceptual and statistical issues in analysis of longitudinal psychiatric data: application to the NIMH treatment of Depression Collaborative Research Program dataset. *Arch Gen Psychiatry.* 1993;50(9):739-750.
45. Cronbach LJ, Snow RE. *Aptitudes and Instructional Methods: A Handbook for Research on Interactions.* New York, NY: Irvington; 1977.
46. Finney JW, Mitchell RE, Cronkite RC, Moos RH. Methodological issues in estimating main and interactive effects: examples from coping/social support and stress field. *J Health Soc Behav.* 1984;25(1):85-98.
47. Overall JE, Lee DM, Hornick CW. Comparison of two strategies for analysis of variance in nonorthogonal designs. *Psychol Bull.* 1981;90(2):367-375.
48. Rogosa D. Comparing nonparallel regression lines. *Psychol Bull.* 1980;88(2):307-321.
49. Kraemer HC, Blasey CM. Centring in regression analyses: a strategy to prevent errors in statistical inference. *Int J Methods Psychiatr Res.* 2004;13(3):141-151.
50. Hedeker D, Rose JS. The natural history of smoking: a pattern-mixture random-effects regression model. In: Rose JS, Chassin L, Presson CC, eds. *Multivariate Applications in Substance Use Research: New Methods for New Questions.* Mahwah, NJ: Lawrence Erlbaum Associates; 2000:79-112.
51. Kraemer HC, Wilson GT, Fairburn CG, Agras WS. Mediators and moderators of treatment effects in randomized clinical trials. *Arch Gen Psychiatry.* 2002;59(10):877-883.
52. Kraemer HC, Stice E, Kazdin A, Offord D, Kupfer D. How do risk factors work together? mediators, moderators, and independent, overlapping, and proxy risk factors. *Am J Psychiatry.* 2001;158(6):848-856.
53. Cohen J. *Statistical Power Analysis for the Behavioral Sciences.* 2nd ed. Hillsdale, NJ: Lawrence Erlbaum Associates; 1988.
54. Kraemer HC, Thieman S. *How Many Subjects? Statistical Power Analysis in Research.* Newberry Park, CA: Sage Publications; 1987.
55. Luepker RV, Perry CL, McKinlay SM, et al; CATCH Collaborative Group. Outcomes of a field trial to improve children's dietary patterns and physical activity: the Child and Adolescent Trial for Cardiovascular Health (CATCH). *JAMA.* 1996;275(10):768-776.
56. Dobbins M, De Corby K, Robeson P, Husson H, Tirilis D. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6-18. *Cochrane Database Syst Rev.* 2009;(1):CD007651. doi:10.1002/14651858.CD007651.
57. Kraemer HC, Frank E, Kupfer DJ. Moderators of treatment outcomes: clinical, research, and policy importance. *JAMA.* 2006;296(10):1286-1289.
58. Epstein LH, Roemmich JN, Robinson JL, et al. A randomized trial of the effects of reducing television viewing and computer use on body mass index in young children. *Arch Pediatr Adolesc Med.* 2008;162(3):239-245.
59. Gortmaker SL, Peterson K, Wiecha J, et al. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med.* 1999;153(4):409-418.
60. Klesges RC, Obarzanek E, Kumanyika S, et al. The Memphis Girls health Enrichment Multi-site Studies (GEMS): an evaluation of the efficacy of a 2-year obesity prevention program in African American girls. 2010;164(11):1007-1014.
61. Bray GA, DeLany JP, Harsha DW, Volaufova J, Champagne CC. Evaluation of body fat in fatter and leaner 10-y-old African American and white children: the Baton Rouge Children's Study. *Am J Clin Nutr.* 2001;73(4):687-702.
62. Roberts DF, Foehr UG, Rideout VJ, Brodie M. *Kids and Media in America.* Cambridge, England: Cambridge University Press; 2003.
63. Summerbell CD, Waters E, Edmunds L, Kelly SAM, Brown T, Campbell KJ. Interventions for preventing obesity in children. *Cochrane Database Syst Rev.* 2005;(3):CD001871. doi:10.1002/14651858.CD001871.pub2.
64. Robinson TN, Sirard JR. Preventing childhood obesity: a solution-oriented research paradigm. *Am J Prev Med.* 2005;28(2)(suppl 2):194-201.

### Call for Papers

*Archives of Pediatrics & Adolescent Medicine* will devote the May 2011 issue to the topic of quality of care. We are interested in the broad range of issues related to quality, both in the inpatient and ambulatory settings, that are tested using rigorous experimental designs. We welcome original research, review articles, and commentaries. Manuscripts submitted before September 15, 2010, will have the best chance of being included in the theme issue. Please consult [www.archpediatrics.com](http://www.archpediatrics.com) for more information on manuscript preparation and submission.