Evaluation of the Relationship between Physical Fitness Indices and FCAT Achievement in Pinellas County Schools

Research and Accountability

Pinellas County Schools

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Prepared in partnership with

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Executive Summary

The primary goal of this evaluation was to begin to understand the relationship between Fitnessgram® physical fitness assessments and FCAT achievement test results among students in Pinellas County. Recent literature reviews suggested that the relationship between physical fitness and academic achievement is not yet well understood. However, prior work had provided promising initial evidence of a relationship between Fitnessgram® assessment results and achievement test scores in California.

An impressive data collection effort among educators in Pinellas County provided a wealth of data from which to evaluate the relationship between assessments of physical fitness and academic achievement. A two-stage process was implemented to evaluate these data. The study first examined the properties of the Fitnessgram® subscales to determine factors that may influence student performance on these scales. We then examined the relationship between Fitnessgram® and FCAT scores cut several different ways to begin to obtain a clearer understanding of the several potential factors influencing this relationship.

Analysis of the six Fitnessgram® subscales yielded concerns regarding their validity in terms of identifying students who may be at risk for negative health outcomes. We advised extreme caution when interpreting Fitnessgram® assessment results for this purpose. Despite these concerns, we determined that the pattern of frequencies in which students were classified as either within or outside the Healthy Fitness Zone (HFZ) range, especially on the BMI assessment of body composition and the three measures of muscular strength and endurance, were sufficient to provide general distinctions between students who were more vs. less physically fit.

Analysis of the relationship between Fitnessgram total HFZ scores and FCAT Reading and Math Achievement Levels indicated a clear, positive relationship between the number of HFZs and student performance on the FCAT. Higher numbers of assessments completed within the HFZ range were associated with higher FCAT achievement levels. While these results were stronger for girls and students not receiving free/reduced lunch relative to boys and those receiving free/reduced lunch, the relationship between Fitnessgram® and FCAT assessments held for all four groups. These data provided an almost exact replication of the previous California study in which Fitnessgram® HFZ scores were examined in relation to achievement test results. The consistency of findings across these two large samples provided strong support for the validity of the relationship between physical fitness assessments and academic achievement assessments.

A second goal was then to begin to understand the complexities of the relationship between Fitnessgram® and FCAT assessment results. Results presented in this study are correlational. Based upon these results we cannot say that being physically fit causes students to perform better academically. Yet this remains a distinct possibility to be supported or refuted through future investigation. It is likely that this relationship is multidetermined and that a number of factors contribute to the relationship between Fitnessgram® and FCAT assessment results, one of which very well may be actual physical fitness. Further analyses provided initial support for the potential role of student motivation to explain part of the relationship between physical fitness and achievement assessment results. Other potential hypotheses concerning factors that may influence this relationship were presented with an understanding that future work incorporating multiple assessment methods is necessary to obtain a clearer understanding of the multiple factors that likely influence the relationship between physical fitness and academic achievement assessment results.

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Evaluation of the Relationship between Physical Fitness Indices and FCAT Achievement in Pinellas County Schools

During the 2007-2008 school year, Pinellas County students were assessed across each of six domains of physical functioning including aerobic capacity, body composition, abdominal strength, trunk strength, upper body strength, and flexibility. Student performance was evaluated in relation to criterions set by the Cooper Institute's Fitnessgram® protocol. Prior research has indicated a significant relationship between Fitnessgram® assessment results and scores obtained on tests of academic achievement in California[1]. Higher levels of assessed physical fitness were associated with higher achievement test scores. The primary goal of the present evaluation is to examine if these relationships between physical fitness and academic achievement exist among students in Pinellas County.

The National Coordinating Committee on School Health and Safety (NCCSHS) recently published a review article in which they concluded that "the relationship between physical activity in children and academic outcomes requires further elucidation"[2]. These authors state that, "research demonstrates that there may be some short term improvements of physical activity (such as on concentration) but that long-term improvement of academic achievement as a result of more vigorous physical activity is not well substantiated". Many of the studies cited in the NCCSHS review had either small samples or design flaws that hindered their ability to adequately examine the relationship among physical activity and academic achievement. Similar inconclusive findings were reported in several articles examining the relationship between physical fitness and academic achievement. Consequently, there is a need for large-scale, systematic studies in this area. Our large, representative sample should provide a solid foundation upon which to begin to understand factors influencing the relationship between physical fitness and academic achievement among Pinellas County students. Our results should also generalize well to inform future work in this area.

Method

Sample

Physical fitness was evaluated for students of all ages throughout Pinellas County. An effort was made to test each Pinellas County student across all six Fitnessgram® measures. Students were included in the present evaluation if they completed each of the six measures on any day in the 2007-2008 school year. For students completing the full assessment battery more than once, data from the most recent completion date was used. Frequencies of students completing all six assessments are presented by age in the Fitness Only column of Table 1. A total of 21,382 girls and 23,855 boys were included in the present study.

Initial demographic analyses included all students from 5 through 18 years of age. Examination of the relationships among Fitnessgram® and FCAT scores were then necessarily restricted to students in grades 3 through 10. Frequencies for students who completed both a full fitness assessment as well as the FCAT assessment are presented in the Fitness and FCAT column of Table 1. A total of 14,668 girls and 16,399 boys completed both assessments in the 2007-2008 school year.

Table 1

Age	Fitness Only			Age	Fitness and FCAT		
	Girls	Boys	Total		Girls	Boys	Total
5	701	753	1454				
6	1613	1701	3314				
7	1941	1927	3868	7	7	5	12
8	2409	2411	4820	8	1177	1061	2238
9	3003	3231	6234	9	2822	2959	5781
10	3465	3667	7132	10	3387	3552	6939
11	2602	2883	5485	11	2540	2811	5351
12	1393	1859	3252	12	1342	1793	3135
13	1403	1680	3083	13	1353	1605	2958
14	1033	1342	2375	14	979	1257	2236
15	727	917	1644	15	689	859	1548
16	579	708	1287	16	351	466	817
17	371	536	907	17	21	31	52
18	142	240	382				
Total	21382	23855	45237	Total	14668	16399	31067

[1] See Appendix A

[2] See Appendix B

Measures

Fitnessgram

During the 2007-2008 school year, Pinellas County students were assessed across each of six domains of physical functioning including aerobic capacity, body composition, abdominal strength, trunk strength, upper body strength, and flexibility[3]. Student performance was evaluated in relation to criterions set by the Cooper Institute's Fitnessgram® protocol. Students meeting the criterion set for their age and gender for each assessment were classified as being within the 'Healthy Fitness Zone' (HFZ). Students could achieve from zero to six scores within the HFZ depending upon their performance across each of the six assessments. Performance levels necessary to be within the Healthy Fitness Zone are presented later in the results section for each scale by age alongside the results of Pinellas students' assessments. This approach was taken to examine the relationships between Fitnessgram cutoffs and Pinellas students' performance more clearly by presenting the two contiguously.

FCAT

In the spring of 2008, students across Pinellas County completed the Florida Comprehensive Achievement Test (FCAT). Students were tested across several domains including Reading and Math. Students' Reading and Math Achievement Level scores were utilized as the dependent variable in the present study. These scores can range from 1 to 5, with higher scores representing higher levels of achievement. FCAT achievement levels are based upon each student's performance relative to his or her grade level.

Design

Demographics and Scale Analysis:

Prior to evaluation of the relationship between students' fitness scores and achievement scores, we examined the degree to which boys and girls achieved scores within the Healthy Fitness Zone on each of the six assessments at each age level. These results are presented alongside the Cooper Institute's Fitnessgram© HFZ cutoff levels. Doing so allowed us to examine the validity of the Fitnessgram® cutoffs in light of the performance of Pinellas County students on the six physical fitness assessment areas.

The frequency of students achieving Total HFZ scores ranging from 0 to 6 were then examined for boys and girls across age levels. Our interpretations of these results are examined in relation to the findings of the prior demographics and scale analysis.

Comparison of Pinellas HFZ data with assessment results reported in California then provided a means with which to evaluate the potential generalizability of the Pinellas County data.

Scale construction issues are then discussed in relation to the goal of comparing fitness data and academic achievement, as well as to provide a clearer understanding of factors influencing student HFZ scores on the Fitnessgram® assessment.

Relationship between Fitnessgram® and FCAT

Students' mean achievement level scores were then examined based upon the number of fitness assessments in which they achieved the Healthy Fitness Zone criterion[4]. Data are presented for the district as a whole and then separately by Grade, Lunch Status, Gender, and Exceptional Education status. Sample sizes (N) are presented in conjunction with the results of each analysis.

[3] See Appendix C for descriptions of the six individual fitness tests

[4] While Fitnessgram HFZs are based upon the child's age and FCAT Achievement Levels are based upon grade level, we were able to compare scores obtained by each child across these two assessments.

Results

Demographics and Scale Analysis

PACER

Table 2

PACER HFZs by Age and Gender							PACER Means and Fitnessgram HFZ Range by Gender/Age					
	GIRLS			BOYS			Girls' Mean	Fitnessgram cutoffs		Boys' Mean	Fitnessgram cutoffs	
Age	YES	NO	TOTAL	YES	NO	TOTAL		Low	High		Low	High
5	701	0	701	753	0	753	8.4	*	*	8.6	*	*
	100%	0%		100%	0%							
6	1613	0	1613	1701	0	1701	10.5	*	*	11.1	*	*
	100%	0%		100%	0%							
7	1941	0	1941	1927	0	1927	13	*	*	14.9	*	*
	100%	0%		100%	0%							
8	2409	0	2409	2411	0	2411	15.8	*	*	19.1	*	*
	100%	0%		100%	0%							
9	3003	0	3003	3231	0	3231	18.5	*	*	22.8	*	*
	100%	0%		100%	0%							
10	3329	136	3465	1787	1880	3667	19.9	7	41	24.7	23	61
	96%	4%		49%	51%							
11	1908	694	2602	1686	1197	2883	22.5	15	41	28.7	23	72
	73%	27%		58%	42%							
12	1053	340	1393	956	903	1859	25.5	15	41	35.1	32	72
	76%	24%		51%	49%							
13	688	715	1403	747	933	1680	25.6	23	51	38.2	41	83
	49%	51%		44%	56%							
14	506	527	1033	640	702	1342	23.8	23	51	39.8	41	83
	49%	51%		48%	52%							
15	222	505	727	345	572	917	24.8	32	51	41.6	51	94
	31%	69%		38%	62%							
16	173	406	579	187	521	708	24.1	32	61	42.1	61	94
	30%	70%		26%	74%							
17	77	294	371	166	370	536	27.1	41	61	45.7	61	106
	21%	79%		31%	69%							
18	26	116	142	38	202	240	26.5	41	72	44.7	72	106
	18%	82%		16%	84%							
Total	17649	3733	21382	16575	7280	23855						
	83%	17%		69%	31%							
Total 10-18	7982	3733	11715	6552	7280	13832						
	68%	32%		47%	53%							

The PACER (Progressive Aerobic Cardiovascular Endurance Run) provides an assessment of students' aerobic capacity. Set to music, the PACER is a paced, 20-minute shuttle run increasing in intensity as time progresses. Fitnessgram® HFZ cutoffs are provided for students ages 10-18. The PACER is difficult to assess reliably among children under age 10 due to variations in the degree to which young children are able to comply with its protocol. The makers of Fitnessgram® regard a child under the age of 10 as being within the HFZ on the PACER as long as they participate. Consequently, 100% of students age 5 through 9 are considered to be within the Healthy Fitness Zone on the PACER.

When examining students' overall Fitnessgram score (ranging from 0-6 tests within the HFZ range) it is important to keep in mind that students age 5 to 9 are essentially given a free pass on the PACER. If total HFZ scores decline with age, a potential reason for this finding may, in part, concern this aspect of the scoring criteria of the PACER.

A second clear finding presented in Table 2 concerns the sharp decline with age in the percentage of students who are assessed to be within the HFZ range on the PACER[5]. Results indicate that 96% of 10yo[6] girls are within the HFZ on the PACER. This percentage then sharply declines until only 18% of 18yo girls are in the HFZ range. Results also indicate that 49% of 10yo boys are within the HFZ on the PACER. This percentage remains steady through early adolescence and then declines sharply in late adolescence until only 16% of 18yo boys are in the HFZ range on the PACER.

Mean scores on the PACER by gender and age presented in Table 2 indicate that 10yo girls in Pinellas average 19.9 laps completed on the PACER. This average increases slightly to 26.5 laps among 18yo girls. Ten-year-old boys average 24.7 laps. This average increases to 44.7 laps among 18yo boys. These increases contrast sharply to Fitnessgram® cutoff scores, which increase at a much faster rate through adolescence.

Without consideration of measurement issues, one would conclude that students' aerobic fitness declines markedly with increasing age. If these results are a true reflection of diminishing physical fitness with age then we would have what amounts to a health crisis in Pinellas. Less than 20% of our 18yo students would have "healthy" aerobic capacity. Similar results have been reported recently using Fitnessgram data in Texas, where local media reports state "Student fitness in bad shape", and "Texas school kids flunk statewide physical fitness assessment"[7]. These reports are exaggerated mainly because they do not take into account that measurement difficulties, especially with regard to the PACER, are likely responsible for the decline in student performance with increasing age. They also assume that a student is not healthy unless he or she achieves a score within the Healthy Fitness Zone on all six fitness assessments. The scientific evidence is not strong enough at this point to make that claim.

A review of the Fitnessgram® Reference Guide[8] indicates that the PACER criterions are derived from an assessment of the relationship between PACER scores and aerobic capacity in a 20-year-old study with a limited sample size. While existing research suggests that students do become less active during adolescence, we lack direct evidence indicating that aerobic capacity declines during this time period. Further research is necessary before we regard the particularly sharp declines seen in the present dataset as valid. Until then, we will exercise extreme caution when interpreting these results.

[5] Although there is an upper limit to the HFZ range, students were still considered to be within the HFZ if their score was higher than the upper limit of the HFZ range. It would be hard to argue that a 10yo boy completing 50 laps was 'healthy' while another 10yo boy completing 70 laps was not.

[6] yo = year-old

[7] See Appendixs D and E

[8] See Appendix F

Body Mass Index (BMI)

Table 3

BMI HFZs by Age and Gender									BMI Means and Fitnessgram® HFZ Range by Gender/Age					
	GIRLS				BOYS				Girls' Mean	Fitnessgram cutoffs		Boys' Mean	Fitnessgram cutoffs	
Age	LOW BMI	IN HFZ	HIGH BMI	TOTAL	LOW BMI	IN HFZ	HIGH BMI	TOTAL		Low	High		Low	High
5	408	250	43	701	153	543	57	753	16.3	16.2	21	16.3	14.7	20
	58%	36%	6%		20%	72%	8%							
6	874	622	117	1613	340	1206	155	1701	16.5	16.2	21	16.6	14.7	20
	54%	39%	7%	100%	20%	71%	9%							
7	861	900	180	1941	334	1326	267	1927	17.3	16.2	22	17.2	14.9	20
	44%	46%	9%		17%	69%	14%							
8	898	1084	427	2409	386	1489	536	2411	18	16.2	22	18.1	15.1	20
	37%	45%	18%		16%	62%	22%							
9	73	2500	430	3003	52	2209	970	3231	18.8	13.5	23	18.9	13.7	20
	2%	83%	14%		2%	68%	30%							
10	62	2778	625	3465	69	2510	1088	3667	19.7	13.7	23.5	19.7	14	21
	2%	80%	18%		2%	68%	30%							
11	53	2023	526	2602	55	1831	997	2883	20.6	14	24	20.3	14.3	21
	2%	78%	20%		2%	64%	35%							
12	34	1050	309	1393	36	1260	563	1859	21.4	14.5	24.5	20.8	14.6	22
	2%	75%	22%		2%	68%	30%							
13	21	1058	324	1403	33	1168	479	1680	21.9	14.9	24.5	21.6	15.1	23
	1%	75%	23%		2%	70%	29%							
14	18	793	222	1033	30	1000	312	1342	22.5	15.4	25	22.2	15.6	24.5
	2%	77%	21%		2%	75%	23%							
15	10	571	146	727	11	681	225	917	22.5	16	25	22.9	16.2	25
	1%	79%	20%		1%	74%	25%							
16	16	429	134	579	5	560	143	708	22.8	16.4	25	23.6	16.6	26.5
	3%	74%	23%		1%	79%	20%							
17	10	285	76	371	13	417	106	536	23.3	16.8	26	23.8	17.3	27
	3%	77%	20%		2%	78%	20%							
18	5	120	17	142	7	188	45	240	22.8	17.2	27.3	24.2	17.8	27.8
	4%	85%	12%		3%	78%	19%							
Total	3343	14463	3576	21382	1524	16388	5943	23855						
	16%	68%	17%		6%	69%	25%							
Total 10-18	229	9107	2379	11715	259	9615	3958	13832						
	2%	78%	20%		2%	70%	29%							

Body Mass Index (BMI) is a body composition measure of weight in relation to height. BMI is calculated as weight in pounds divided by the square of height in inches, multiplied by 703. While studies have indicated that BMI is significantly correlated with total body fat for a majority of individuals, it has limitations in that it can overestimate body fat in individuals who are very muscular.[9]

Results presented in Table 3 indicate that 20-30% of students in Pinellas County are considered to be above the HFZ range according to the Fitnessgram cutoffs. This corresponds loosely to what would be considered the 'overweight' range

[9] See Appendix G

on BMI using the Center for Disease Control standards. These results are consistent with those in the Surgeon General's 2001 report[10]. These results appear to be valid with two caveats. First, the BMI cutoffs for 5-8yo students are set too high, especially for girls. Using the Fitnessgram® cutoffs more than half of the 5 and 6yo girls assessed would be considered underweight. Elevations in percentages below the HFZ range are also seen for 7 and 8yo girls, as well as 5 through 8yo boys relative to older children. This data issue will not affect our examination of the relationship between Fitnessgram® and FCAT scores, as children below 3rd-grade do not take the FCAT. However, this issue is important to keep in mind when considering the meaning of BMI HFZs for young children using Fitnessgram® standards.

Second, 29% of 10-18yo boys were above the HFZ range compared to 20% of 10-18yo girls. This can be due to at least three potential factors. First, there may be a true difference in which adolescent boys are more likely to be overweight relative to adolescent girls. However, differences between boys and girls in the percentage of students within the HFZ range on BMI may be due to adolescent boys having greater muscle mass rather than excess weight. A third possibility is that the method used by Fitnessgram® to determine their BMI cutoffs increased the likelihood that boys would score above the HFZ range relative to girls. Absent a more in-depth examination of the methods used to construct Fitnessgram® BMI cutoffs relative to those provided by the CDC, the relative influence of each of these three factors is uncertain at this time.

Curl Up

Table 4

Curl Up HFZs by Age and Gender							Curl Up Means and Fitnessgram HFZ Range by Gender/Age					
	GIRLS			BOYS			Girls' Mean	Fitnessgram cutoffs		Boys' Mean	Fitnessgram cutoffs	
Age	YES	NO	TOTAL	YES	NO	TOTAL		Low	High		Low	High
5	478	223	701	493	260	753	7.6	2	10	6.7	2	10
	68%	32%		65%	35%							
6	1254	359	1613	1336	365	1701	11.1	2	10	10.9	2	10
	78%	22%		79%	21%							
7	1590	351	1941	1543	384	1927	17.6	4	14	16.2	4	14
	82%	18%		80%	20%							
8	2042	367	2409	2022	389	2411	22.2	6	20	22.7	6	20
	85%	15%		84%	16%							
9	2600	403	3003	2761	470	3231	27	9	22	26.7	9	24
	87%	13%		85%	15%							
10	2919	546	3465	3052	615	3667	29.1	12	26	29.5	12	24
	84%	16%		83%	17%							
11	2157	445	2602	2430	453	2883	33.7	15	29	35.1	15	28
	83%	17%		84%	16%							
12	1160	233	1393	1611	248	1859	38.3	18	32	41.7	18	36
	83%	17%		87%	13%							
13	1170	233	1403	1413	267	1680	40.3	18	32	45.6	21	40
	83%	17%		84%	16%							
14	858	175	1033	1092	250	1342	39.4	18	32	45.4	24	45
	83%	17%		81%	19%							
15	619	108	727	785	132	917	39.5	18	35	46.5	24	47
	85%	15%		86%	14%							
16	469	110	579	610	98	708	39.3	18	35	47.6	24	47
	81%	19%		86%	14%							
17	324	47	371	464	72	536	42.9	18	35	50.1	24	47
	87%	13%		87%	13%							
18	120	22	142	216	24	240	44.2	18	35	53	24	47
	85%	15%		90%	10%							
Total	17760	3622	21382	19828	4027	23855						
	83%	17%		83%	17%							
Total 10-18	9796	1919	11715	11673	2159	13832						
	84%	16%		84%	16%							

[10] See Appendix G

The Curl Up, Push-Up and Trunk Lift comprise the three assessments of muscular strength and endurance in the Fitnessgram assessment battery. A curl up measures abdominal strength and endurance. Students lie down with knees bent and feet unanchored. They lift their upper body using their abdominal muscles to a specified pace up to a maximum of 75 repetitions.

Results presented in Table 4 indicate that approximately 85% of students are within the HFZ range on the Curl Up assessment across levels of gender and age. There is a slight exception to this consistent trend in which five year-old students tend to perform less well, with less than 70% in the HFZ range. However, there do not appear to be any glaring abnormalities in the Curl Up data for students in the 3rd- through 10th-grade age range for the purpose of examining FCAT scores in relation to Fitnessgram® scores.

Investigation of students' mean scores across levels of gender and age indicate that student means fall above the upper cutoff of the Fitnessgram® HFZ for students between 6 and 15 years-old. The only exceptions are among students ages 5, 16, 17, and 18 in which the means fall within the HFZ range. On a criterion referenced test this is not a problem. Most students perform comfortably well on this assessment. Given that the mean score is generally above the upper limit of the HFZ range, we're also more confident that students whose assessments fall below the lower cutoff of the HFZ range are more likely to be significantly weaker in terms of abdominal strength in relation to their age and gender matched peers. Overall, the Curl Up assessment may likely provide good discrimination between students in terms of their physical fitness.

Push-Up

Table 5

Push Up HFZs by Age and Gender							Push Up Means and Fitnessgram HFZ Range by Gender/Age					
	GIRLS			BOYS			Girls' Mean	Fitnessgram cutoffs		Boys' Mean	Fitnessgram cutoffs	
Age	YES	NO	TOTAL	YES	NO	TOTAL		Low	High		Low	High
5	240	461	701	331	422	753	2.6	3	8	3.5	3	8
	34%	66%	100%	44%	56%							
6	859	754	1613	1054	647	1701	4.5	3	8	5.7	3	8
	53%	47%	100%	62%	38%							
7	1085	856	1941	1267	660	1927	6.3	4	10	7.7	4	10
	56%	44%	100%	66%	34%							
8	1367	1042	2409	1655	756	2411	7.7	5	13	10.4	5	13
	57%	43%	100%	69%	31%							
9	1781	1222	3003	2316	915	3231	9.2	6	15	12	6	15
	59%	41%	100%	72%	28%							
10	1917	1548	3465	2567	1100	3667	9.2	7	15	12.7	7	20
	55%	45%	100%	70%	30%							
11	1541	1061	2602	2085	798	2883	9.9	7	15	13.8	8	20
	59%	41%	100%	72%	28%							
12	927	466	1393	1393	466	1859	11.3	7	15	17.1	10	20
	67%	33%	100%	75%	25%							
13	935	468	1403	1199	481	1680	10.9	7	15	17.4	12	25
	67%	33%	100%	71%	29%							
14	657	376	1033	901	441	1342	10.5	7	15	18.7	14	30
	64%	36%	100%	67%	33%							
15	447	280	727	622	295	917	11.6	7	15	21.7	16	35
	61%	39%	100%	68%	32%							
16	383	196	579	515	193	708	11.7	7	15	25.7	18	35
	66%	34%	100%	73%	27%							
17	260	111	371	410	126	536	12.3	7	15	26.8	18	35
	70%	30%	100%	76%	24%							
18	113	29	142	184	56	240	13.5	7	15	30.3	18	35
	80%	20%	100%	77%	23%							
Total	12512	8870	21382	16499	7356	23855						
	59%	41%	100%	69%	31%							
Total 10-18	7180	4535	11715	9876	3956	13832						
	61%	39%	100%	71%	29%							

The second of the three Fitnessgram assessments of muscular strength and endurance is the Push-Up. The push-up measures upper body strength and endurance. Students lower their body to a 90-degree elbow angle and push up for as many repetitions as possible.

Results presented in Table 5 indicate that boys are more likely to be within the HFZ range on the Push-Up assessment relative to girls across age groups. However, the difference between boys and girls narrows from age 12 onward. These results suggest that Fitnessgram® cutoffs on the Push-Up may be set too high for pre-adolescent girls. However, during the 3rd- to the 10th-grade range of the FCAT evaluation, the HFZ percentages appear to be approximately equal for boys and girls.

On a criterion referenced test, the percentages in the HFZ range do not have to be equal across gender, age, or any other demographic. However, existing documentation provided by Fitnessgram®[11] to support the validity of these scales in differentiating future health related outcomes for children with different assessment results is weak. In light of weak supporting validity evidence, any differences in frequencies between groups based upon gender and age can be more of a reflection of the cutoffs chosen by Fitnessgram® creators than any true differences in physical health status between different gender/age groups.

Trunk Lift

Table 6

Trunk Lift HFZs by Age and Gender							Trunk Lift Means and Fitnessgram HFZ Range by Gender/Age					
	GIRLS			BOYS			Girls' Mean	Fitnessgram cutoffs		Boys' Mean	Fitnessgram cutoffs	
Age	YES	NO	TOTAL	YES	NO	TOTAL		Low	High		Low	High
5	555	146	701	576	177	753	7.3	6	12	7.1	6	12
	79%	21%	100%	76%	24%							
6	1395	218	1613	1423	278	1701	7.9	6	12	7.7	6	12
	86%	14%	100%	84%	16%							
7	1824	117	1941	1768	159	1927	8.8	6	12	8.5	6	12
	94%	6%	100%	92%	8%							
8	2320	89	2409	2298	113	2411	9.5	6	12	9.1	6	12
	96%	4%	100%	95%	5%							
9	2950	53	3003	3145	86	3231	10.1	6	12	9.6	6	12
	98%	2%	100%	97%	3%							
10	2896	569	3465	2775	892	3667	10.3	9	12	9.9	9	12
	84%	16%	100%	76%	24%							
11	2252	350	2602	2358	525	2883	10.6	9	12	10.2	9	12
	87%	13%	100%	82%	18%							
12	1259	134	1393	1607	252	1859	10.9	9	12	10.6	9	12
	90%	10%	100%	86%	14%							
13	1257	146	1403	1469	211	1680	11	9	12	10.8	9	12
	90%	10%	100%	87%	13%							
14	908	125	1033	1157	185	1342	10.8	9	12	10.7	9	12
	88%	12%	100%	86%	14%							
15	618	109	727	781	136	917	10.7	9	12	10.5	9	12
	85%	15%	100%	85%	15%							
16	498	81	579	588	120	708	10.8	9	12	10.5	9	12
	86%	14%	100%	83%	17%							
17	351	20	371	489	47	536	11.4	9	12	11	9	12
	95%	5%	100%	91%	9%							
18	137	5	142	218	22	240	11.4	9	12	11.1	9	12
	96%	4%	100%	91%	9%							
Total	19220	2162	21382	20652	3203	23855						
	90%	10%	100%	87%	13%							
Total 10-18	10176	1539	11715	11442	2390	13832						
	87%	13%	100%	83%	17%							

[11] See Appendix F

The third of the three Fitnessgram assessments of muscular strength and endurance is the Trunk Lift. The Trunk Lift measures trunk extensor strength. Students lie face down and slowly raise their upper body long enough for the tester to measure the distance between the floor and the student's chin.

Results presented in Table 6 indicate that 87% of girls and 84% of boys ages 10-18 are within the HFZ range on the Trunk Lift assessment. These percentages are similar to those on the Curl Up assessment in which 84% of both girls and boys performed within the HFZ range. Findings from both the Curl Up and the Trunk Lift are likely to provide strong 'true-positive' assessments of physical fitness in that the minority of students who do not perform within the HFZ range on these assessments are likely to differ significantly from their gender/age matched peers in terms of muscular strength.

Sit and Reach

Table 7

Sit and Reach HFZs by Age and Gender							Sit and Reach Median and Fitnessgram lower cutoff by Gender/Age			
	GIRLS			BOYS			Girls' Median	Fitnessgram Lower Cutoff	Boys' Median	Fitnessgram Lower Cutoff
Age	YES	NO	TOTAL	YES	NO	TOTAL				
5	696	5	701	744	9	753	10	9	9	8
	99%	1%	100%	99%	1%					
6	1605	8	1613	1689	12	1701	10	9	9	8
	100%	0%	100%	99%	1%					
7	1928	13	1941	1902	25	1927	10	9	9	8
	99%	1%	100%	99%	1%					
8	2395	14	2409	2377	34	2411	10	9	9	8
	99%	1%	100%	99%	1%					
9	2987	16	3003	3187	44	3231	10	9	9	8
	99%	1%	100%	99%	1%					
10	3443	22	3465	3605	62	3667	10	9	9	8
	99%	1%	100%	98%	2%					
	YES	NO	TOTAL	YES	NO	TOTAL				
11	2585	17	2602	2847	36	2883	11	10	9	8
	99%	1%	100%	99%	1%					
12	1388	5	1393	1843	16	1859	11.5	10	9	8
	100%	0%	100%	99%	1%					
13	1397	6	1403	1672	8	1680	12	10	10	8
	100%	0%	100%	100%	0%					
14	1022	11	1033	1333	9	1342	12	10	10	8
	99%	1%	100%	99%	1%					
15	712	15	727	907	10	917	12	12	11	8
	98%	2%	100%	99%	1%					
16	573	6	579	695	13	708	12	12	11	8
	99%	1%	100%	98%	2%					
17	370	1	371	534	2	536	12	12	12	8
	100%	0%	100%	100%	0%					
18	140	2	142	239	1	240	12	12	12	8
	99%	1%	100%	100%	0%					
Total	21241	141	21382	23574	281	23855				
	99%	1%	100%	99%	1%					
Total 10-18	11630	85	11715	13675	157	13832				
	99%	1%	100%	99%	1%					

The Sit and Reach is included as the one assessment of flexibility in the Fitnessgram® battery. Testing one leg at a time, students sit with one knee bent and one leg straight against a box and reach forward. The distance with which they reach forward is measured in inches.

Results presented in Table 7 indicate that almost all students (99%) met the HFZ cutoff on the Sit and Reach. Out of over 1200 17 and 18yo students assessed, only 6 students did not meet the HFZ cutoff. Due to the extremely high 'pass' rates on the Sit and Reach, it is rendered essentially incapable of discriminating between students who are and are not physically fit. One can say that these results indicate that almost all children and adolescents are sufficiently flexible. This then raises the question of why this scale is included at all in a criterion referenced battery intended to discriminate between students in terms of physical fitness levels associated with increased risk for adverse health outcomes.

Total HFZs by Gender and Age

Table 8

GIRLS' TOTAL HFZs by Age									BOYS' TOTAL HFZs by Age								
Age	0	1	2	3	4	5	6	Total	Age	0	1	2	3	4	5	6	Total
5	0	3	31	148	241	221	57	701	5	0	0	27	96	214	254	162	753
	0%	0%	4%	21%	34%	32%	8%			0%	0%	4%	13%	28%	34%	22%	
6	0	1	38	180	504	625	265	1613	6	0	0	20	110	370	647	554	1701
	0%	0%	2%	11%	31%	39%	16%			0%	0%	1%	6%	22%	38%	33%	
7	0	1	13	161	474	890	402	1941	7	0	2	22	123	336	690	754	1927
	0%	0%	1%	8%	24%	46%	21%			0%	0%	1%	6%	17%	36%	39%	
8	0	0	11	191	598	1024	585	2409	8	0	2	19	152	398	876	964	2411
	0%	0%	0%	8%	25%	43%	24%			0%	0%	1%	6%	17%	36%	40%	
9	0	0	4	116	418	997	1468	3003	9	0	0	17	161	504	978	1571	3231
	0%	0%	0%	4%	14%	33%	49%			0%	0%	1%	5%	16%	30%	49%	
10	0	11	66	222	668	1187	1311	3465	10	3	50	246	572	860	1018	918	3667
	0%	0%	2%	6%	19%	34%	38%			0%	1%	7%	16%	23%	28%	25%	
11	1	26	120	266	500	732	957	2602	11	3	51	190	394	522	802	921	2883
	0%	1%	5%	10%	19%	28%	37%			0%	2%	7%	14%	18%	28%	32%	
12	0	10	50	160	221	349	603	1393	12	2	22	113	225	350	535	612	1859
	0%	1%	4%	11%	16%	25%	43%			0%	1%	6%	12%	19%	29%	33%	
13	0	15	78	187	291	383	449	1403	13	1	22	98	217	381	491	470	1680
	0%	1%	6%	13%	21%	27%	32%			0%	1%	6%	13%	23%	29%	28%	
14	0	17	54	126	251	273	312	1033	14	3	22	78	188	288	349	414	1342
	0%	2%	5%	12%	24%	26%	30%			0%	2%	6%	14%	21%	26%	31%	
15	4	9	51	105	192	201	165	727	15	3	14	61	121	188	310	220	917
	1%	1%	7%	14%	26%	28%	23%			0%	2%	7%	13%	21%	34%	24%	
16	3	7	47	91	132	171	128	579	16	2	15	28	97	172	259	135	708
	1%	1%	8%	16%	23%	30%	22%			0%	2%	4%	14%	24%	37%	19%	
17	1	4	15	42	97	153	59	371	17	2	5	17	67	119	192	134	536
	0%	1%	4%	11%	26%	41%	16%			0%	1%	3%	12%	22%	36%	25%	
18	1	1	4	11	35	66	24	142	18	0	3	7	29	59	109	33	240
	1%	1%	3%	8%	25%	46%	17%			0%	1%	3%	12%	25%	45%	14%	
Total	10	105	582	2006	4622	7272	6785	21382	Total	19	208	943	2552	4761	7510	7862	23855
	0%	0%	3%	9%	22%	34%	32%			0%	1%	4%	11%	20%	31%	33%	
Total 10-18	10	100	485	1210	2387	3515	4008	11715	Total 10-18	19	204	838	1910	2939	4065	3857	13832
	0%	1%	4%	10%	20%	30%	34%			0%	1%	6%	14%	21%	29%	28%	

Results presented in Table 8 indicate that 34% of girls and 28% of boys ages 10-18 achieve 6 of 6 scores within the HFZ range. The majority of students (84% of girls / 78% of boys ages 10-18) achieve 4 of 6 HFZs or more. The percentage of

students achieving 6 of 6 HFZs declines with age, with less than 20% of both 18yo girls and boys achieving 6 of 6 HFZs. Most of this effect is driven by students' PACER assessment results. Results presented in Table 2 had indicated that with increasing age students' ability to perform within the HFZ range on the PACER declined sharply.

The validity data upon which the six individual assessments are based do not provide enough confidence to state that students achieving less total HFZs are at an increased risk for any particular poor health outcome relative to students performing more successfully on these assessments. However, the frequency distributions noted in Table 8 indicate that there will be some separation between students who are more physically fit and those who are less physically fit. Given the large sample size this should allow for enough of a difference in the true average performance level between the six groups to compensate for any errors in classification on each of the individual assessments caused by questionable cutoff scores. For example, an 18yo boy with 5 of 6 HFZs because he only completed 45 laps (the 18yo male average) on the PACER is likely less physically fit than the 18yo boy who completed 90 laps (which would be above the lower HFZ cutoff of 71 laps). The boy completing 90 laps may be a student track athlete. However, we're not ready to state that the boy completing 45 laps is at increased risk for later coronary heart failure.

Comparison of Pinellas and California Fitnessgram® HFZ Frequencies

Table 9

		Total HFZs						
		0	1	2	3	4	5	6
Grade 5	Pinellas 2008	0%	1%	5%	12%	20%	29%	32%
	California 2007	1%	4%	8%	14%	20%	26%	27%
Grade 7	Pinellas 2008	0%	1%	6%	13%	20%	27%	33%
	California 2007	1%	3%	7%	13%	19%	26%	31%
Grade 9	Pinellas 2008	0%	1%	5%	13%	21%	29%	30%
	California 2007	3%	3%	6%	12%	19%	27%	30%

Results presented in Table 9 compare the total number of HFZ scores achieved by students in Pinellas to the percentages reported for students assessed in California in 2007. California provided data for students in grades 5, 7, and 9. Pinellas data for these grades is provided for a direct comparison. Results indicate that the data for students in Pinellas County are very similar to those reported for students in California. The equivalence of these results, with slightly better performance among students in Pinellas, supports the generalizability of our Pinellas County data.

Overall Conclusions derived from Demographics and Scale Analysis Results

Overall, the number of HFZs achieved by students in Pinellas County is highly consistent with those found previously in California. This suggests that we should be able to replicate the findings from California in which increasing levels of HFZs achieved were associated with higher academic achievement levels. The similar frequencies across the 6 HFZ levels suggest that the assessments are likely categorizing students in a similar manner in both California and Pinellas. Similarity in the construction of groups on the independent variable of physical fitness should produce a similar separation in academic achievement levels across groups if the relationship between fitness scores and achievement scores is valid.

The interpretations of student performance on the Fitnessgram® assessments in California, as well as recent media accounts of Texas students' performance on the Fitnessgram® assessments would seem to suggest that failure to achieve 6 of 6 scores in the HFZ range is an indication that student health is compromised, with media reports tending to sensationalize this perception considerably[12]. Prior to drawing such strong conclusions, we must clearly understand the potential factors that may influence students' scores on the Fitnessgram® assessments. Review of Pinellas students' performance by age and gender in this section has begun to provide a clearer understanding of these factors.

Analysis presented in this section indicated that results of the PACER test appear to be the most problematic in terms of potential validity concerns. The drastic decrease in the percentage of students within the HFZ range with increasing age strongly suggests that the method used to create the Fitnessgram® cutoff scores on the PACER assessment are of

[12] See Appendixs D, E, & H

questionable validity. True declines in aerobic capacity may in fact exist with increasing age through adolescence. However, the drop from 96% of 10yo girls within the HFZ range to only 18% of 18yo girls presents a bright red flag that these data should be interpreted with caution. Similarly, one cannot accept that only 16% of 18yo boys possess a healthy aerobic capacity without first questioning the validity of the Fitnessgram® PACER cutoffs. Since the PACER is the only assessment in the battery in which student HFZ assessments decline substantially with age, the cutoffs set for this test will likely ensure that students in Pinellas will achieve lower overall HFZs with increasing age similar to results reported in California and Texas.

With the exception of the cutoffs for young children, particularly girls, the BMI HFZs appear consistent with percentiles of overweight children reported in other studies using norms set by the CDC. Aside from inherent limitations of the BMI in which students with high levels of muscle mass may present as overweight, the BMI should prove useful and valid as a means of assessing student physical fitness.

The degree to which scores within and outside the HFZ range on the three muscular strength and endurance assessments are valid predictors of future health outcomes remains an open question. However, the pattern of frequencies across these scales in which a majority of students perform within the HFZ range and there is consistency across levels of gender and age in the percentage of students classified as within the HFZ range, suggest that performance on these measures should provide an adequate separation between students who perform well in terms of physical fitness testing and those who do not. Approximately 15% of students do not perform within the HFZ range on the Curl Up and Trunk Lift. Thirty percent of boys and 40 percent of girls do not perform within the HFZ range on the Push Up assessment. These students are likely to have less strength, on average, than students within the HFZ range on each of these assessments.

Analysis of student performance on the Sit and Reach assessment indicated that this test has minimal utility for making distinctions between students who are and are not physically fit. The near unanimous passing rate on this test essentially adds a constant of 1 HFZ toward the 6 HFZ total.

Caution against Overstating the Implications of Fitnessgram® Assessment Results

For the purpose of providing a reader-friendly evaluation of the relationship between Fitnessgram® and FCAT assessment results, this evaluator has chosen to forego a lengthy discussion of the scientific background and scale development procedures used to create the HFZ cutoffs for the six Fitnessgram® scales. In the opinion of this evaluator, much more evidence is necessary before the makers of Fitnessgram® can claim that their cutoffs represent valid estimates of performance levels based upon what is optimal for good health. A review of their Reference Guide suggests that only the BMI assessment can approach a level of validity support necessary to withstand scientific scrutiny.

To their credit, the makers of Fitnessgram® state in their Reference Guide that "Fitnessgram/Activitygram will always be a work in progress"[13]. A close review of their Reference Guide suggests a careful approach in which support provided for their cutoffs is tempered with statements that more work is necessary to enhance the validity of their scales. Difficulty arises when this careful, scientific approach is contrasted with the flashy marketing used to sell the Fitnessgram® product.

The Fitnessgram® website (http://www.fitnessgram.net/overview/) states:

> *Created more than 20 years ago by The Cooper Institute, FITNESSGRAM is based on rock-solid research. It's the only health-related fitness assessment to use criterion-referenced standards, called Healthy Fitness Zones, to determine students' fitness levels based on what is optimal for good health. These standards are backed by the highly respected FITNESSGRAM Scientific Advisory Board.*

This hyperbole can be dangerous when results of Fitnessgram® assessments are released to parents, students, and the media without any responsible caveats. A recent newspaper article demonstrates this point:

> *Texas public school students are startlingly unhealthy and their fitness levels decline sharply through 12th grade, where less than 10 percent of students passed a fitness test this year, according to the first results of an annual health assessment.*[14]

[13] See Appendix F, p. 37
[14] See Appendix D

In this case, common sense did not appear to prevail as indicated by Senator Jane Nelson in her statement

> *These results just confirm what many of us already knew and that is that our children's health is in jeopardy, said Sen. Jane Nelson, a Lewisville Republican who pushed legislation requiring the fitness assessment last year. We cannot allow an entire generation of Texans to grow up and live a shorter life than previous generations.*

Senator Nelson's statement raises an important point. There is support from the work of the Surgeon General in 2001 and other sources that obesity has become more prevalent among our nation's children. Increased levels of obesity are associated with increased risks for a variety of poor health outcomes. This is an extremely important issue. However, in our attempt to highlight this critical issue we must be more careful in how we interpret and present data examining these issues.

Relationship between Fitnessgram® and FCAT

Table 10

MEAN FCAT ACHIEVEMENT LEVELS FOR STUDENTS SCORING IN THE HEALTHY FITNESS ZONE ON 0-6 FITNESSGRAM MEASURES									
	Number of Scores in the Healthy Fitness Zone								
	0	1	2	3	4	5	6		Total
Reading	2.29	2.13	2.35	2.52	2.70	2.87	3.11		2.86
Math	2.53	2.29	2.44	2.59	2.80	2.99	3.23		2.97
N	15	238	1158	3100	6021	9513	11022		31067

Results presented in Table 10 show a clear positive relationship between assessments of physical functioning and academic achievement. Students' mean Reading and Math achievement levels increase as the number of physical fitness assessments passed increases. The only exception to this relationship occurs because of unreliability due to small sample size at the level of 0 HFZs.

Also notice that the overall mean achievement levels are very close to the mean achievement levels obtained by students achieving 5 out of 6 scores in the Healthy Fitness Zone. Students who achieve less than five HFZs have Reading and Math achievement levels that are below average and decline in relation to the number of HFZs achieved. Students who are able to achieve six out of six HFZs score better on average than the mean on FCAT Reading and Math achievement tests.

These results provide strong support for the existence of a relationship between Fitnessgram® and FCAT assessment results. These data also replicate those provided in the April 2005 California study in which Fitnessgram® HFZs were related to achievement testing results with higher levels of HFZs associated with higher achievement test scores.

Table 11

	HFZ on BMI			HFZ on Pacer		HFZ on Curl Up		HFZ on Trunk Lift		HFZ on Push-Up		HFZ on Sit and Reach			Overall Mean
	Low	In HFZ	High	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes		
Reading	3.18	2.89	2.73	2.49	3.02	2.50	2.92	2.60	2.89	2.72	2.93	2.37	2.86		2.86
Math	3.26	3.00	2.84	2.61	3.12	2.58	3.04	2.69	3.01	2.79	3.06	2.51	2.97		2.97

Results presented in Table 11 indicate that HFZ scores on each of the six Fitnessgram® subscales are associated with FCAT results. Students who perform within the HFZ range on each of the assessments perform better on both FCAT Reading and Math than do students who do not perform within the HFZ range. This evidence highlights the discriminant validity of each of these scales in differentiating groups of students in terms of academic performance.

However, the uniformity of these results during an initial investigation essentially looks too good. Student motivation is always a confounding factor to consider when comparing performance on two separate measures of anything. The fact that a student's ability to stretch out his/her arms is associated with his/her reading and math achievement suggests that factors other than the ability to stretch successfully may be influencing these relationships.

Also unclear at this point is why students who are below the HFZ range on BMI perform better than students who are within the HFZ range. If valid, this finding indicates that students who are thinner than what is considered 'healthy' by Fitnessgram® standards perform better academically. One explanation for this finding may be that a portion of students who are within the HFZ range would be more correctly classified as being within the high range, meaning that the upper HFZ cutoffs are set too high. These students may be included in the HFZ range yet performing on the FCAT equivalent to those in the high range on BMI. This may deflate the mean score of those within the HFZ range on BMI and create separation from those below the HFZ range. Another possibility is that a number of students below the HFZ range are actually in particularly good health. In this case, the lower HFZ cutoffs would be set too high. For example, a student track athlete may present as thin according to BMI standards but may otherwise be particularly healthy. These are preliminary hypotheses. We are not sure why students below the HFZ range on BMI perform better academically than those within the HFZ range.

Table 12

MEAN FCAT ACHIEVEMENT LEVELS FOR STUDENTS SCORING IN THE HEALTHY FITNESS ZONE ON 0-6 FITNESSGRAM MEASURES for EACH GRADE LEVEL

		Number of Scores in the Healthy Fitness Zone							
		0	1	2	3	4	5	6	Total
GRADE 3	Reading		2.08	1.99	2.63	2.88	3.06	3.22	3.05
	Math		2.46	2.57	2.81	3.08	3.27	3.46	3.27
	N	0	13	78	370	1122	2164	2511	6258
GRADE 4	Reading	*	2.22	2.53	2.66	2.85	3.01	3.22	3.01
	Math	*	2.50	2.60	2.80	2.91	3.09	3.30	3.09
	N	1	50	232	573	1248	2118	2566	6788
GRADE 5	Reading	2.75	2.44	2.60	2.69	2.85	2.96	3.15	2.94
	Math	2.75	2.45	2.56	2.68	2.81	2.99	3.18	2.95
	N	4**	60	349	816	1340	2016	2233	6818
GRADE 6	Reading		2.00	2.26	2.36	2.57	2.67	3.03	2.76
	Math		1.87	1.83	2.02	2.25	2.41	2.84	2.52
	N	0	15	70	255	456	763	1190	2749
GRADE 7	Reading		2.12	2.31	2.37	2.56	2.67	3.09	2.73
	Math		1.77	2.11	2.21	2.36	2.57	2.97	2.59
	N	0	27	154	346	540	727	925	2719
GRADE 8	Reading	1.50	1.91	2.11	2.33	2.38	2.50	2.75	2.50
	Math	2.50	2.07	2.37	2.49	2.66	2.81	3.15	2.81
	N	2	44	142	378	688	867	900	3021
GRADE 9	Reading	2.67	1.67	1.78	2.23	2.32	2.45	2.70	2.45
	Math	2.33	1.67	2.30	2.55	2.72	2.86	3.24	2.89
	N	3	6	40	143	246	362	371	1171
GRADE 10	Reading	1.75	1.83	2.08	2.24	2.38	2.52	2.89	2.48
	Math	2.40	2.81	2.58	2.81	3.11	3.23	3.51	3.15
	N	5	23	93	219	381	496	326	1543

* Means not presented based upon one student
** Any means based upon a sample size less than 30 are not reliable

Results presented in Table 12 indicate that the clear positive relationship between assessments of physical functioning and academic achievement holds across every grade level. While these findings suggest that this relationship is consistent across grade levels, they also indicate that the overall relationship between physical fitness and academic achievement is not being driven by a strong, grade-level specific anomaly. That this finding is robust across grade-levels strengthens the argument for its validity.

Table 13

MEAN FCAT ACHIEVEMENT LEVELS FOR STUDENTS SCORING IN THE HEALTHY FITNESS ZONE ON 0-6 FITNESSGRAM MEASURES by LUNCH STATUS									
		Number of Scores in the Healthy Fitness Zone							
		0	1	2	3	4	5	6	Total
Free/Reduced	Reading	2.38	1.97	2.09	2.24	2.42	2.47	2.67	2.47
	Math	2.44	2.11	2.18	2.32	2.50	2.58	2.75	2.56
	N	9	132	690	1766	3185	4571	4471	14824
Not Free/Reduced	Reading	2.17	2.33	2.75	2.89	3.02	3.23	3.41	3.21
	Math	2.67	2.52	2.81	2.95	3.14	3.36	3.55	3.34
	N	6	106	467	1334	2834	4940	6550	16237

Results presented in Table 13 indicate that although the positive relationship between HFZs and FCAT scores exist both for students who do receive free/reduced lunch and those who do not, the relationship is somewhat stronger for those who do not receive free/reduced lunch[15]. These results also replicate those found in the California-based Fitnessgram study (CST study)[16]. The authors of the CST study state that this finding suggests that socioeconomic status may be the proxy variable driving the correlational relationship between physical fitness and academic achievement. This appears to be an overly conservative reading of these data. While socioeconomic status appears to play some role in the relationship between Fitnessgram® and FCAT scores based upon the presence of the interaction, even when lunch status is removed from the equation, a clear relationship between physical functioning and academic achievement remains for students who do receive free/reduced lunch and those who do not[17]. The relationship between physical and academic functioning cannot be dismissed as an artifact of socioeconomic status based upon the results of the CST study and the present FCAT study.

Table 14

		HFZ on BMI			HFZ on Pacer		HFZ on Curl Up		HFZ on Trunk Lift		HFZ on Push-Up		HFZ on Sit and Reach		Overall Mean
		Low	HFZ	High	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	
Free/Reduced	Reading	2.69	2.48	2.43	2.21	2.60	2.24	2.52	2.26	2.50	2.39	2.52	2.09	2.48	2.47
	Math	2.75	2.56	2.54	2.30	2.69	2.32	2.61	2.33	2.60	2.46	2.62	2.22	2.57	2.56
Not Free/Reduced	Reading	3.48	3.23	3.10	2.80	3.36	2.88	3.26	2.97	3.25	3.08	3.27	2.84	3.22	3.21
	Math	3.56	3.37	3.20	2.97	3.48	2.96	3.39	3.08	3.38	3.16	3.42	3.01	3.34	3.34

Results presented in Table 14 indicate that the relationship between HFZ status and FCAT scores holds both for students who do received free/reduced lunch and those who do not across Fitnessgram® assessments with the exception of the relationship between BMI HFZ and FCAT scores for students receiving free/reduced lunch. This is an important finding for several reasons. First, BMI is the only assessment in the Fitnessgram® battery that cannot be influenced by effort expended in the assessment. A student cannot change his or her height or weight on the day of the assessment through putting out maximum effort. Second, BMI has the strongest validity support in terms of its relationship to health outcomes. It's a case of 'which test is not like the others' so when a result is isolated to BMI it's more likely to be providing unique information than to have been a spurious result.

One hypothesis concerning this result is that the multitude of factors associated with free/reduced lunch status are strong enough to outweigh any potential relationship between body composition and academic achievement. An alternative

[15] $F = 5.791$, $p < .001$ for Reading and $F = 7.905$, $p < .001$ for Math on the HFZ x Lunch interaction term in a MANOVA analysis

[16] See Appendix A

[17] $F = 167.88$, $p < .001$ for Reading and $F = 191.18$, $p < .001$ for Math on the main effect of HFZ score in the MANOVA analysis

hypothesis is that the cutoffs are less valid for students receiving free/reduced lunch. A higher percentage of students receiving free/reduced lunch are above the HFZ range on BMI relative to those not receiving free reduced lunch[18]. Given the higher percentage of students high on BMI there may be less of a contrast between the HFZ and high groups among free/reduced lunch students than among HFZ and high BMI students who do not receive free/reduced lunch. The bottom line is that we're just not sure at this point.

Table 15

MEAN FCAT ACHIEVEMENT LEVELS FOR STUDENTS SCORING IN THE HEALTHY FITNESS ZONE ON 0-6 FITNESSGRAM MEASURES by GENDER										
		Number of Scores in the Healthy Fitness Zone								
		0	1	2	3	4	5	6		Total
Girls	Reading	2.00	2.11	2.23	2.51	2.72	2.93	3.19		2.93
	Math	2.80	2.19	2.17	2.46	2.69	2.94	3.19		2.92
	N	5	71	407	1223	2776	4643	5543		14668
Boys	Reading	2.44	2.14	2.42	2.53	2.69	2.80	3.02		2.80
	Math	2.40	2.34	2.58	2.68	2.88	3.04	3.26		3.01
	N	10	167	751	1877	3245	4870	5479		16399

Results presented in Table 15 indicate that relationships between physical fitness and academic achievement are also found for both boys and girls. The relationship is slightly stronger for girls[19], as was found in the California study. Yet the main point is that the relationship between total HFZs and FCAT scores clearly exists for both girls and boys in Pinellas.

The fact that we have an almost exact replication of the results of the California-based study in which a relationship is found between Fitnessgram® total HFZs and academic achievement test scores provides strong evidence for the validity of this relationship, especially in light of the very large, representative samples in both studies. The fact that these findings are robust across levels of lunch status and gender in both studies lends further support the strength of these results.

Table 16

		HFZ on BMI			HFZ on Pacer		HFZ on Curl-Up		HFZ on Trunk Lift		HFZ on Push-Up		HFZ on Sit and Reach			Overall Mean
		Low	In HFZ	High	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes		
Girls	Reading	3.24	2.97	2.68	2.40	3.07	2.57	2.99	2.62	2.96	2.79	3.02	2.30	2.93		2.93
	Math	3.25	2.97	2.66	2.44	3.05	2.50	3.00	2.56	2.96	2.76	3.03	2.30	2.93		2.92
Boys	Reading	3.09	2.80	2.76	2.53	2.96	2.44	2.86	2.59	2.83	2.64	2.86	2.40	2.80		2.80
	Math	3.27	3.03	2.94	2.70	3.20	2.65	3.07	2.78	3.05	2.83	3.08	2.61	3.02		3.01

Results presented in Table 16 are analogous to those found in table 14. Relationships between HFZ status and FCAT achievement levels are consistent across Fitnessgram® assessments for both girls and boys with the notable exception of a negligible relationship between boys BMI HFZ level and FCAT results. Here, it is less likely to be the case that factors associated with being a boy outweigh the relationship between body composition and academic achievement. By proxy, this also weakens the argument that factors associated with receiving free/reduced lunch outweighed any potential relationship between body composition and academic achievement. There appears to be a statistical explanation for this association based upon the levels set for the Fitnessgram® cutoffs and the differential placement of boys relative to girls

[18] 28% of Pinellas students receiving free/reduced lunch are high on BMI relative to 21% of those who do not receive free/reduced lunch- table excluded for the sake of parsimony

[19] $F = 8.55$, $p<.001$ for Reading and $F = 6.60$, $p<.001$ for Math on the HFZ x Gender interaction term in the MANOVA model

in the high BMI category. A higher percentage of boys are placed in the high BMI category relative to girls in grades 3-10[20]. This result mirrors that found for students receiving free/reduced lunch. The higher frequencies of boys and students receiving free/reduced lunch in the high BMI category appears to be associated with a diminished likelihood to find differences in FCAT scores based upon BMI status. Why this would be the case is uncertain at this time.

Two potentially competing hypotheses that are not purely statistical in nature remain for this finding. The first is that the social impact of being high on BMI is more detrimental to girls due to body image issues- especially among teenage girls. Some research has suggested that the psychological impact associated with girls who are high in BMI may then influence their engagement in school and academic achievement. This would lead to a differential relationship between BMI and achievement across gender where high BMI would have a more adverse impact upon achievement scores for girls. A second competing hypothesis is that boys have more muscle mass. High BMI measurements are more likely to be invalid for boys due to this confound. This would be perhaps the strongest hypothesis were there not an effect of lunch status upon the relationship between BMI and FCAT achievement. The synchrony of these two findings necessitates extreme caution in any interpretations at this point. These various hypotheses can be disentangled, though, through further research using surveys and qualitative data.

Table 17

	Total HFZs by Exceptional Education Status							
	0	1	2	3	4	5	6	Total
EMH	0	4	7	28	16	19	5	79
	0%	5%	9%	35%	20%	24%	6%	
EH	0	10	31	73	116	161	108	499
	0%	2%	6%	15%	23%	32%	22%	
SLD	1	42	146	345	523	596	511	2164
	0%	2%	7%	16%	24%	28%	24%	
EH/SLD	1	7	20	31	30	51	27	167
	1%	4%	12%	19%	18%	31%	16%	
GIFTED	0	2	45	143	352	835	1235	2612
	0%	0%	2%	5%	13%	32%	47%	
EX-ED OTHER	0	24	92	217	332	469	388	1522
	0%	2%	6%	14%	22%	31%	25%	
GEN ED	13	149	815	2258	4644	7365	8742	23986
	0%	1%	3%	9%	19%	31%	36%	
TOTAL	15	238	1156	3095	6013	9496	11016	31029
	0%	1%	4%	10%	19%	31%	36%	

A final means through which we examined the relationship between Fitnessgram® HFZ scores and FCAT data was through an examination of the performance of exceptional education subgroups. Analysis of patterns of relationships among special populations can often provide unique insights that can then enhance our understanding of processes taking place in the general student population. Results presented in Table 17 appear to be no exception.

The first clear and apparent finding that jumps out of Table 17 concerns the gifted student group. Forty-seven percent of gifted students achieve 6 of 6 scores in the HFZ range. This rate is 11% higher than the general education population and 22% higher the special education population. Gifted students can be quite competitive. These results suggest that there is likely a bit of motivation involved in the degree to which students achieve scores within the HFZ range. This does not

[20] See Table 2

appear to be an artifact of socioeconomic status as assessed by lunch[21]. However, it could be the case that within the non-free/reduced lunch group, gifted students are more likely to come from a high socioeconomic status background versus a more moderate socioeconomic status background of their peers. We're not able to disentangle this potential effect with the data available. Another alternative is that physical fitness may in part be responsible for giftedness. However, gifted students generally score in the gifted range on tests at a very young age and their level of assessed intelligence generally remains constant through most of their lifespan. So, for now, our primary hypothesis is that the motivation of gifted students to achieve is responsible in part for their performance on the Fitnessgram® assessments.

The second notable finding contained in Table 17 involves differences between general education and special education students. General education students are approximately 10% more likely to achieve 6 of 6 HFZs relative to their peers who receive special education services. This finding highlights the possibility that behavioral issues may influence students' performance on the Fitnessgram® assessment battery. Alternatively, there may be a true relationship between special education status and physical fitness levels where students receiving special education services are generally less physically fit overall then their peers. At this point, we're not sure which hypothesis is stronger. However, differential motivation across groups is the simplest explanation of these findings.

Table 18

	HFZ on BMI			HFZ on Pacer		HFZ on Curl Up		HFZ on Trunk Lift		HFZ on Push-Up		HFZ on Sit and Reach			
	Low	In HFZ	High	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes		Total N
EMH	6	47	26	44	35	27	52	26	53	51	28	3	76		79
	8%	59%	33%	56%	44%	34%	66%	33%	67%	65%	35%	4%	96%		
EH	15	351	133	252	247	120	379	77	422	181	318	8	491		499
	3%	70%	27%	51%	49%	24%	76%	15%	85%	36%	64%	2%	98%		
SLD	50	1470	644	1072	1092	477	1687	342	1822	867	1297	25	2139		2164
	2%	68%	30%	50%	50%	22%	78%	16%	84%	40%	60%	1%	99%		
EH/SLD	2	103	62	101	66	54	113	28	139	69	98	9	158		2612
	1%	62%	37%	60%	40%	32%	68%	17%	83%	41%	59%	5%	95%		
GIFTED	165	1980	467	383	2229	234	2378	225	2387	664	1948	20	2592		167
	6%	76%	18%	15%	85%	9%	91%	9%	91%	25%	75%	1%	99%		
EX-ED OTHER	71	1052	399	523	999	344	1178	258	1264	661	861	16	1506		1522
	5%	69%	26%	34%	66%	23%	77%	17%	83%	43%	57%	1%	99%		
GEN ED	806	17382	5798	6889	17097	3305	20681	2738	21248	7775	16211	199	23787		23986
	3%	72%	24%	29%	71%	14%	86%	11%	89%	32%	68%	1%	99%		
TOTAL	1115	22385	7529	9264	21765	4561	26468	3694	27335	10268	20761	280	30749		31029
	4%	72%	24%	30%	70%	15%	85%	12%	88%	33%	67%	1%	99%		

Results presented in Table 18 appear to support the motivation hypothesis presented in the previous section. The key data point here involves gifted students' performance on the PACER. Gifted students are within the HFZ range on the PACER at an 85% rate. This rate is 14% higher than the general education population and head and shoulders above students receiving special education. There are two possible explanations for these results. Either gifted students have exceptional aerobic capacity relative to other students, or they just don't stop running.

BMI results suggest that gifted students may generally have better body composition relative to special education populations, who are more likely to be high on BMI. This suggests that gifted students' scores on the PACER may be partly a function of having a higher level of physical fitness. The influences of motivation, background, persistence, and physical fitness upon Fitnessgram® assessment results are not mutually exclusive. A combination of influences may account for the anomalous performance of the gifted students in Pinellas County.

[21] A separate analysis not included here demonstrated that gifted students' higher HFZ performance held across levels of lunch status.

Table 19

		TOTAL HFZs							
		0	1	2	3	4	5	6	Total
EH	READING	.	2.89	1.84	1.79	2.05	1.94	2.06	1.98
	MATH	.	1.90	2.13	2.07	2.20	2.00	2.25	2.12
	N	0	10	31	73	116	161	108	499
SLD	READING	.	1.66	1.68	1.71	1.85	1.82	1.95	1.83
	MATH	.	1.78	1.91	1.88	2.12	2.08	2.17	2.06
	N	1	42	146	345	523	596	511	2164
EH/SLD	READING	.	1.00	1.40	1.87	1.50	1.65	1.67	1.60
	MATH	.	1.00	1.58	1.84	1.87	1.88	2.04	1.84
	N	1	7	20	31	30	51	27	167
GIFTED	READING	.	.	4.16	4.14	4.15	4.20	4.22	4.20
	MATH	.	.	4.36	4.07	4.22	4.33	4.34	4.30
	N	0	2	45	143	352	835	1235	2612
EX-ED OTHER	READING	.	1.67	1.82	1.90	2.18	2.37	2.49	2.25
	MATH	.	1.87	1.97	2.01	2.25	2.57	2.76	2.42
	N	0	24	92	217	332	469	388	1522
GEN ED	READING	2.42	2.34	2.49	2.65	2.75	2.86	3.06	2.88
	MATH	2.62	2.59	2.52	2.71	2.83	2.97	3.17	2.97
	N	13	149	815	2258	4644	7365	8742	23986
TOTAL	READING	2.29	2.13	2.35	2.52	2.70	2.87	3.11	2.86
	MATH	2.53	2.29	2.43	2.59	2.80	2.99	3.23	2.97
	N	15	238	1156	3095	6013	9496	11016	31029

Results presented in Table 19 provide essential information to inform our understanding of the relationship between Fitnessgram® and FCAT scores. The relationship between Fitnessgram® HFZs and FCAT scores for the General Education and Exceptional Education 'Other' groups mirror those presented in Table 10 for the district as a whole. However, these relationships do not hold for students in the gifted group or for those receiving special educational services through EH or SLD.

The results for the EH and EH/SLD groups are nearly random. Scores for these groups on both Fitnessgram® and FCAT are likely influenced by factors associated with their emotional handicaps. Consequently, a true assessment of either their physical fitness or academic achievement is likely difficult to obtain.

There is a small linear relationship between Fitnessgram® and FCAT scores for students in the SLD group. On average, these students are likely trying their best on both assessments, yet the FCAT is too difficult given their disability and creates a floor effect which dilutes the relationship between their FCAT scores and anything- including Fitnessgram® results.

The relationship between Fitnessgram® and FCAT results is essentially a flat line for gifted students. Gifted students' scores on FCAT are driven by their IQ. Even if physical fitness is associated with achievement for this group it will not register statistically because of the overarching influence of IQ upon those scores.

What Table 19 demonstrates is that any relationship between physical fitness assessments and FCAT performance are going to be found in the middle of the student distribution. For students on the extremes in terms of behavioral difficulties, learning difficulties, or IQ, those factors will trump the effect of physical fitness, and likely many other competing influences upon FCAT achievement scores. However, for students not on these extremes, a relationship between physical fitness assessments and FCAT assessments clearly exists.

Summary and Conclusions

The primary goal of this evaluation was to begin to understand the relationship between Fitnessgram® physical fitness assessments and FCAT achievement test results among students in Pinellas County. Prior research had provided evidence of a relationship between Fitnessgram® and achievement test scores in California. Prior media reports had also made sensational claims that cast suspicion upon the validity of the Fitnessgram® cutoffs to provide valid assessments of the degree to which students are at risk for poor health outcomes. Given this background, a two-stage evaluation process was implemented. We first examined the properties of the Fitnessgram® subscales to determine factors that may influence student performance on these scales. We then examined the relationship between Fitnessgram® and FCAT scores cut several different ways to begin to obtain a clearer understanding of the several potential factors influencing this relationship.

Our scale analysis suggested that the cutoffs for the PACER assessment of aerobic capacity were problematic. Cutoffs on the PACER rose sharply as students' mean scores only increased moderately with age. As a result, less than 20% of 18yo students were in the Healthy Fitness Zone (HFZ) range on the PACER. In terms of validity, we're not confident enough to state that 80% of our 18yo students lack sufficient aerobic capacity. This necessitated a detailed review of the Fitnessgram® reference guide to determine the methods through which cutoffs on the PACER and each of the five remaining scales were derived. A detailed summary of this research was excluded from this report. However, based upon this review we concluded that only the BMI assessment had sufficient scientific merit to begin to make statements about potential risk for problematic health outcomes based upon whether or not a student's score was in the HFZ range. Also problematic was our finding that there was almost no variability in students' performance on the Sit and Reach test of flexibility. Almost all students were in the HFZ range on this scale.

Despite these concerns, we determined that the pattern of frequencies in which students were classified as either within or outside the HFZ range, especially on the BMI assessment of body composition and the three measures of muscular strength and endurance, were sufficient to provide general distinctions between students who were more vs. less physically fit. While there was likely considerable misclassification on the PACER test and a lesser amount of statistical 'slop' in the remaining scales, we nevertheless expected that students would generally find their way into categories that approximated their level of physical fitness in relation to their peers. This in turn would allow us to assess the relationship between physical fitness and academic achievement with an understanding that our independent variable was much less than perfect.

Analysis of the relationship between Fitnessgram total HFZ scores and FCAT Reading and Math Achievement Levels indicated a clear, positive relationship between the number of HFZs and student performance on the FCAT. Higher numbers of assessments completed within the HFZ range were associated with higher FCAT achievement levels. While these results were stronger for girls and students not receiving free/reduced lunch relative to boys and those receiving free/reduced lunch, the relationship between Fitnessgram® and FCAT assessments held for all four groups. These data provided an almost exact replication of the previous California study in which Fitnessgram® HFZ scores were examined in relation to achievement test results. The consistency of findings across these two large samples provides strong support for the validity of the relationship between physical fitness assessments and FCAT assessments.

The more difficult task ahead is to understand the complexities of the relationship between Fitnessgram® and FCAT assessment results. Results presented in this study are correlational. Based upon these results we cannot say that being physically fit causes students to perform better academically. Yet this remains a distinct possibility to be supported or refuted through future investigation. It is likely that this relationship is multidetermined and that a number of factors contribute to the relationship between Fitnessgram® and FCAT assessment results, one of which very well may be actual physical fitness.

The authors of the California study using these same Fitnessgram® assessments suggest that perhaps a family that can afford to buy more nutritious foods and pay to access improved healthcare services can also afford to buy more books and computers and learning aids. In this case, two unrelated causes, ability to access improved healthcare and ability to buy more learning aids may account for these results. The presence of a significant interaction in both the California study and the present study suggest that these factors may account for a portion of the relationship between Fitnessgram® and achievement test results. However, the data indicate that a strong relationship exists between fitness assessments and academic achievement test results even after socioeconomic status, as assessed by lunch status, is removed from the equation.

Another potential factor that may be driving the relationship between Fitnessgram® and FCAT results is that of motivation. The performance of gifted students appeared to present a strong case for the role of motivation in determining

performance on the Fitnessgram® assessment. The performance of gifted students on the PACER assessment in particular was so extreme that one almost must conclude that drive to reach the finish line plays a role in determining Fitnessgram® assessment results. While the relationship between Fitnessgram® and FCAT assessments was essentially a flat line for gifted students, their performance on the Fitnessgram® assessments suggests that motivation is likely a key factor that may in part explain the relationship between Fitnessgram® and FCAT assessment results for students in the middle of the general education population whose scores on FCAT are not being driven by extreme behavioral difficulties, learning disabilities, or high IQ.

Another key finding was that BMI was not related to FCAT results for boys and for students receiving free/reduced lunch. We are not at all certain what these findings may mean. One hypothesis suggests that BMI may have a stronger relationship to FCAT scores via psychological factors and detachment from school associated with increased stigma faced by girls who are high on BMI. Another hypothesis is that BMI is a less valid measure among boys because of their increased levels of muscle mass. Boys high in BMI are more likely to be physically fit due to higher muscle mass. Findings regarding lunch status also raise several questions. One hypothesis is that the factors associated with free/reduced lunch status supersede the relationship between BMI and FCAT results. Another potential explanation is statistical. Perhaps the cutoffs on BMI are set too low to provide discrimination among students receiving free/reduced lunch. Characteristics of this population, including the confound with ethnicity, may necessitate a reevaluation of the BMI norms among this group. BMI norms may also need to be set higher for boys or some other means should be used to assess whether a boy high on BMI is overweight or muscular- a simple observational checklist for each student may help clarify this issue. Further research is necessary to disentangle these issues.

Despite the correlational nature of our findings, the data that we have examined so far is impressive. We've replicated the results of data based upon another huge, representative sample in California. There appears to be a valid relationship between physical fitness assessments and academic achievement test results in these data. There are scale construction issues with Fitnessgram® that completely prohibit our ability to make any statements regarding the degree to which students' scores assess their risk for future health outcomes. However, the data appear to do a good enough job of classifying students according to their level of physical fitness for the purpose of examining their scores in relation to achievement test results. Our data suggest that motivation and factors associated with socioeconomic status play some role in the relationship between Fitnessgram® and FCAT assessments. However, these factors cannot completely explain the relationship.

A review of the broader research literature indicated that we are still in the formative stage of our understanding of the relationships among physical health, physical activity, and academic achievement. As such, this evaluation itself, based upon its sample size alone, represents a fairly useful step forward. Our findings confirm the existence of a significant relationship between physical fitness assessments and academic achievement assessments and point toward potentially useful avenues of future investigation. The data collected here are a credit to physical education instructors throughout Pinellas County. Results obtained from this and future analyses of Pinellas' fitness data have the potential to have a significant impact upon our understanding of this important relationship in Pinellas County and beyond.

Appendix A

2004 California PFT to Achievement Study

California Physical Fitness Test

A Study of the Relationship Between Physical Fitness and Academic Achievement in California Using 2004 Test Results

April 2005

Prepared by the
California Department of Education

For further information or questions pertaining to this study, contact Jim Grissom, Educational Research and Evaluation Consultant, Standards and Assessment Division of the California Department of Education (CDE), at 1430 N Street, Suite #5408, Sacramento, CA 95814; or jgrissom@cde.ca.gov (e-mail); or (916) 445-8420 (phone).

Questions pertaining to the California Physical Fitness Test or the *Fitnessgram* should be directed to Debbie Vigil, Education Program Consultant, Standards and Assessment Division, California Department of Education, 1430 N Street, Suite #5408, Sacramento, CA 95814; or pft@cde.ca.gov (e-mail); or (916) 319-0341 (phone).

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Introduction

Little research has examined the relationship between physical fitness and academic achievement. Even so, available research suggests a positive relationship between physical fitness and academic achievement (Grissom 2004). That is, as one measure improves, so does the other. There is no evidence that this relationship is causal. That is, there is no evidence that improving physical fitness causes academic achievement to improve or vice versa.

This study does not address causality. It validates previous correlational research by documenting the relationship between fitness and achievement and the strength of this relationship.

Data from the 2004 Physical Fitness Test (PFT*)* and the *California Standards Tests (CSTs)* were used to study the relationship between fitness and academic achievement. PFT data were scores from the *Fitnessgram.* The *Fitnessgram* is the designated test in California to determine a student's level of physical fitness and was administered during the months of February, March, April, and May to fifth-, seventh-, and ninth-grade public school students. The *CST* scores were measures of academic achievement in English–language arts, mathematics, history–social science, and science. The *CSTs* were administered in spring 2004 to students in the second grade through the eleventh grade in California public schools.

Method

Student demographic information, such as birth date and gender, was collected as part of both the PFT and *CSTs*. The demographic information from the two testing programs was used to create matched files. Specifically, students' county/district/school codes, grade levels, birth dates, genders, and ethnicities were used to match student records from each testing program. The result was that each student record for which there was a match had individual scores for both the *Fitnessgram* and the *CSTs*. As such, these data could be used to compare scores on the PFT with scores on the *CSTs*. The matched student records file will be referred to as the matched cohort sample.

The PFT measured six aspects of fitness: (1) aerobic capacity, (2) body composition, (3) abdominal strength, (4) trunk strength, (5) upper body strength, and (6) flexibility. Student performance was classified at two levels: (1) in the healthy fitness zone, which means students met or exceeded the fitness target, or (2) needs improvement, which means students failed to meet the fitness target. Overall PFT scores ranged from zero, none of the standards were met, to six, all standards were met or exceeded. Including only students with complete data ensured comparability of overall PFT scores.[1]

[1]If missing data were included, the overall PFT score, except for a score of six, could have multiple meanings. A score of less than six could mean (1) the test was incomplete, (2) the student was absent, or (3) the student failed to achieve the minimum standard on one to six tests. When there were no missing or incomplete data, the meaning of scores was clear: students attempted all of the tests and were able to demonstrate minimal competency on the number of tests indicated by the score.

Analyses first calculated the mean scale scores for the *CST* in English–language arts and the *CST* in mathematics for each overall PFT score. Second, analysis of variance (ANOVA) and linear regression were used to test the statistical significance of the relationship between the overall PFT and achievement scores.

Results

Figure 1 shows the mean scale scores on the 2004 *CST* in English–language arts by the number of fitness standards achieved (i.e., the overall PFT score).

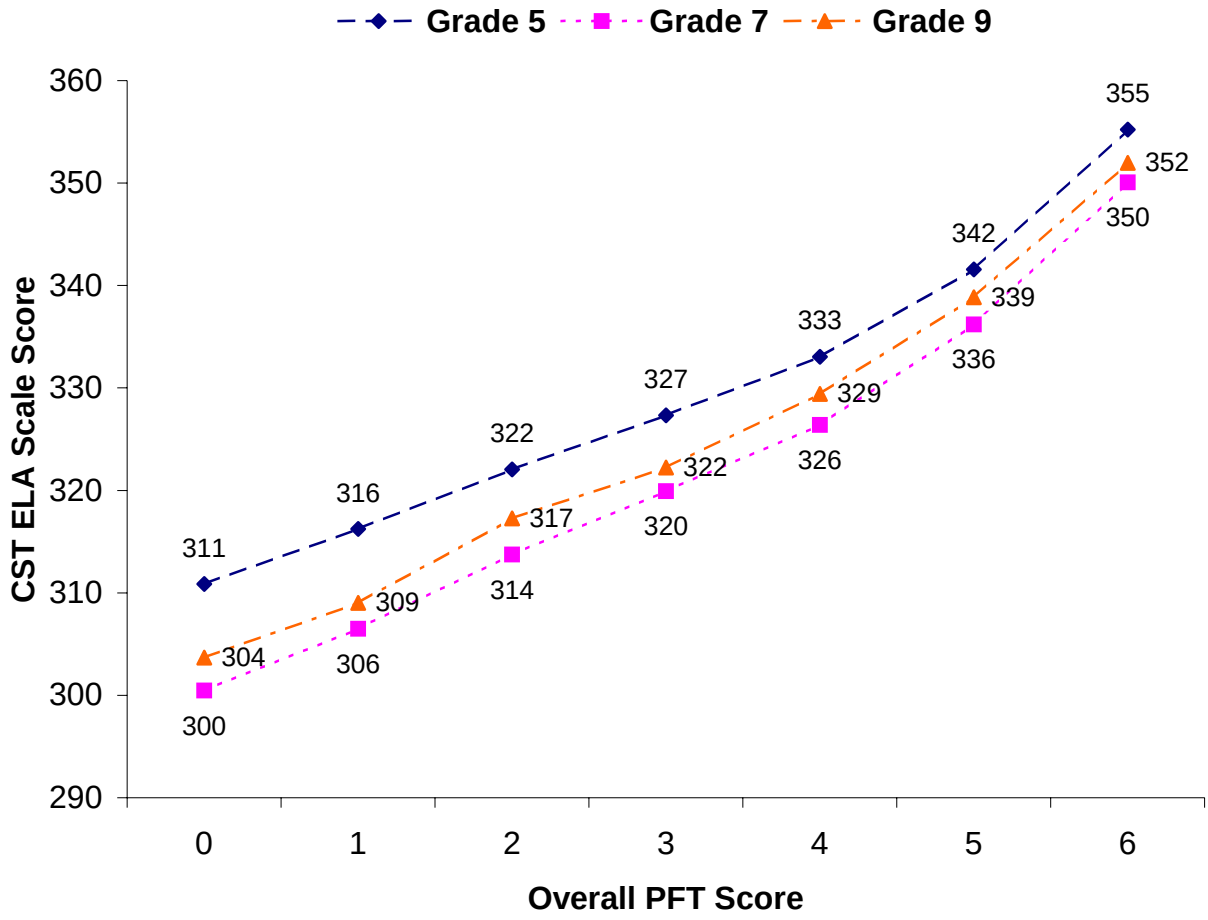

Figure 1. 2004 *CST* in English–language arts mean scale scores for grades 5, 7, and 9 by overall PFT scores. In grade 5 there were 371,198 students, grade 7 had 366,278 students, and grade 9 had 298,910 students.

As the overall PFT score improved, the mean scale score on the *CST* in English–language arts also improved. The average scale score on the *CST* in English–language arts for fifth-grade students who did not achieve any of the fitness standards was 311. The same scale score for seventh and ninth graders was 300 and 304, respectively. The average scale score on the *CST* in English–language arts for fifth-grade students who achieved all six fitness standards was 355. The same scale score for seventh and ninth graders was 350 and 352, respectively. The change in average scale scores on the *CST* in English–language arts from those who achieved none of the fitness standards to those who achieved all six was around 50 points. Results indicate a

positive relationship between academic achievement and physical fitness. As one measure improved, so did the other.

Figure 2 shows these same results using 2004 *CST* in mathematics scale scores.

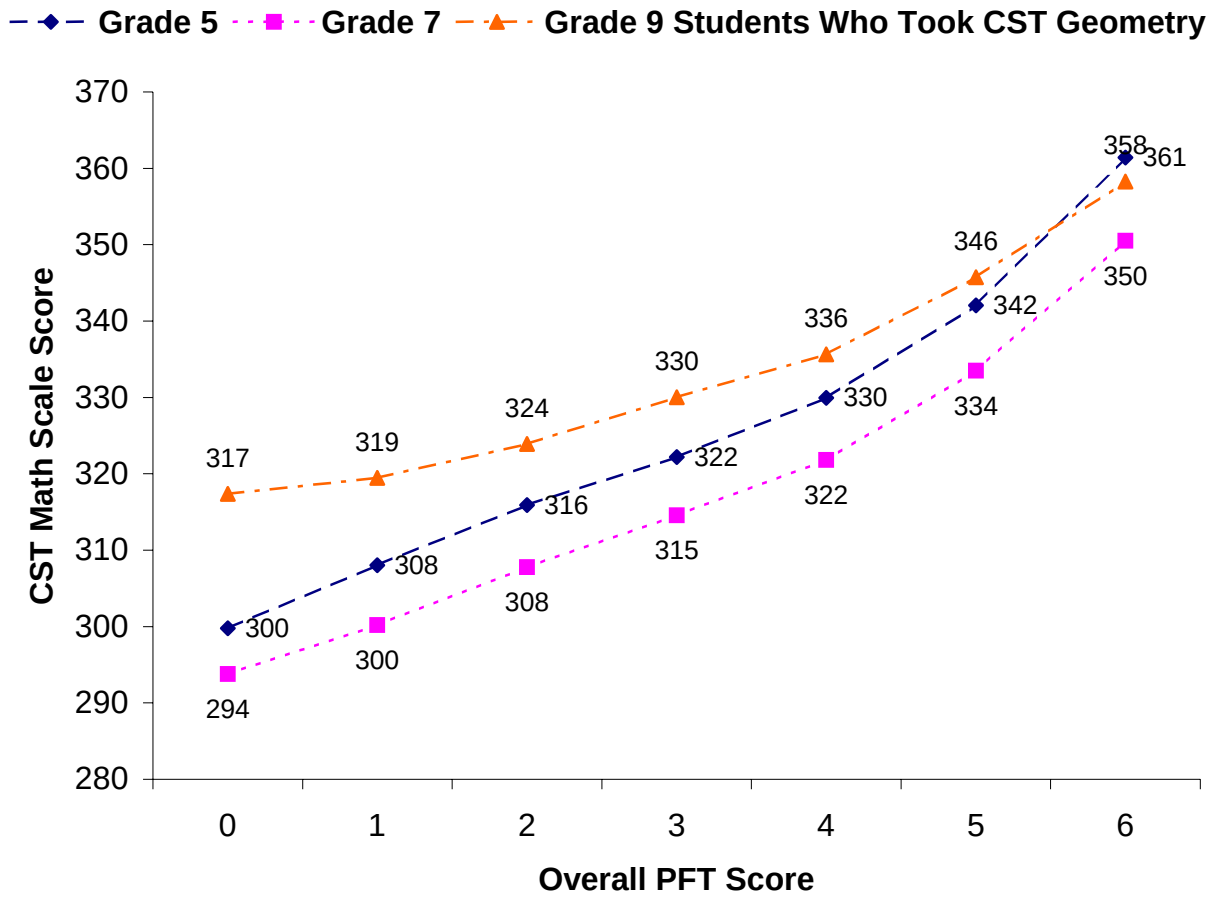

Figure 2. 2004 *CST* in mathematics mean scale scores by overall PFT scores for grades 5, 7, and 9. The numbers of students in grades 5 and 7 were the same as those in Figure 1. The number of grade 9 geometry students was 63,028.

Mathematics results were consistent with English–language arts results. That is, as the overall PFT score improved, the mean scale score on the *CST* in mathematics also improved. Results indicate that even when the measure of academic achievement changed, a positive relationship between academic achievement and physical fitness remained.

Although evidence suggests a relationship between physical fitness and academic achievement, analysis of variance (ANOVA) and linear regression were used to test the relationship for statistical significance. The results from ANOVA and linear regression were statistically significant. (See Appendix A.)

Determining whether the relationship between physical fitness and academic achievement was affected by student characteristics required subgroup analyses. First, the relationship between physical fitness and academic achievement was examined by gender. Figure 3 shows the relationship between 2004 overall PFT scores and *CST* in English–language arts mean scale scores by gender for fifth graders.

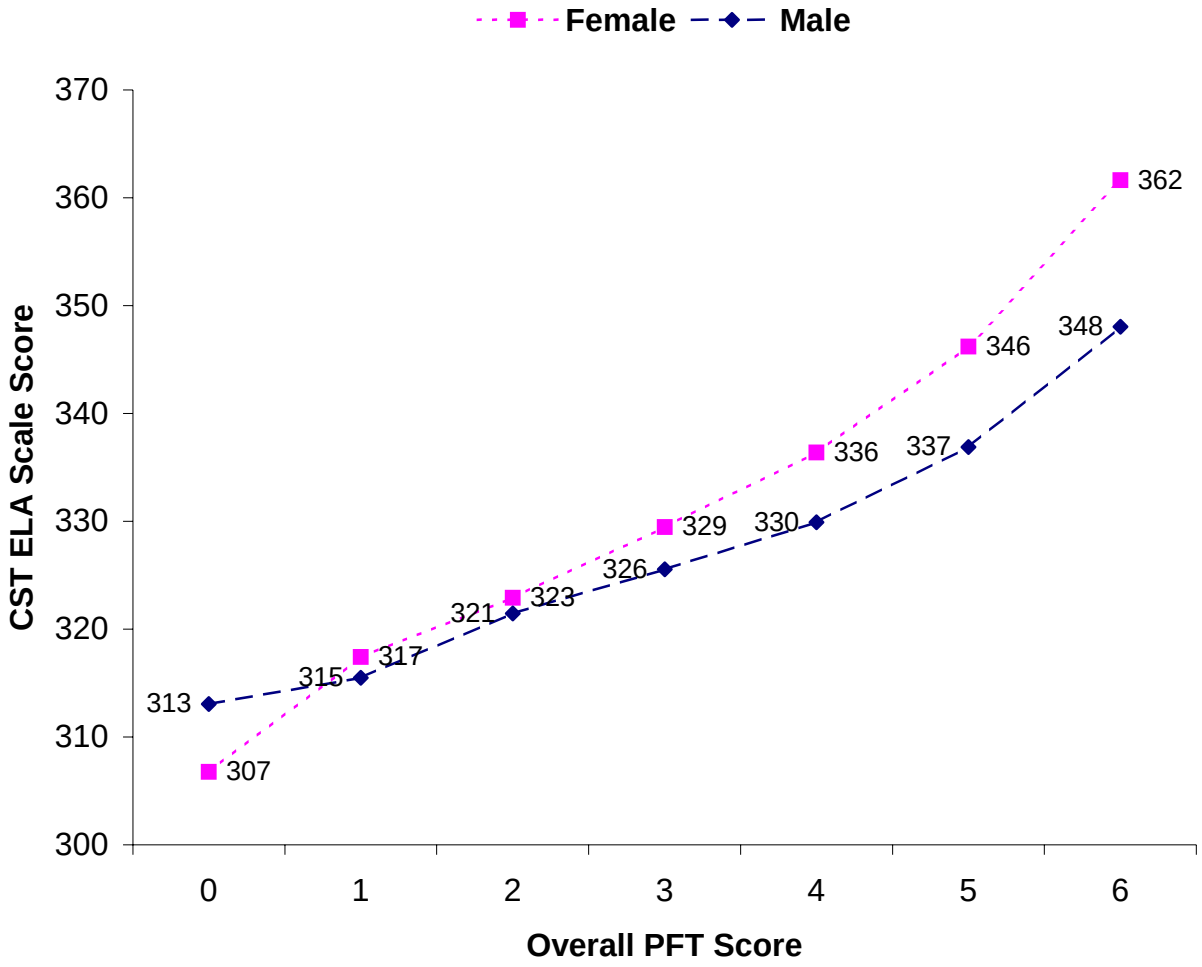

Figure 3. 2004 *CST* in English–language arts mean scale score for grade 5 by overall PFT score and gender. The number of female and male students was 182,287 and 188,921, respectively.

Figure 3 shows that the relationship between fitness and achievement was consistent across genders. For females and males, as the overall PFT score increased, so did the mean *CST* in English–language arts scale scores.

Even though the relationship between fitness and achievement was consistent across genders, the rate of change in achievement scores was greater for females than for males. The difference in mean scale scores on the *CST* in English–language arts between the least and most fit students was 55 points for females and 35 points for males. Results using mathematics scores were consistent with those using English–language arts scores, and the results for seventh- and ninth-grade students were consistent with those for fifth graders.

Next, the relationship between physical fitness and academic achievement was examined by socioeconomic status (SES). The National School Lunch Program (NSLP) served as a proxy for SES. Whether students received free or reduced lunch was an indicator of being economically disadvantaged or lower SES. Non-NSLP participation was an indicator of not being economically disadvantaged or higher SES. Figure 4 shows these results for fifth graders.

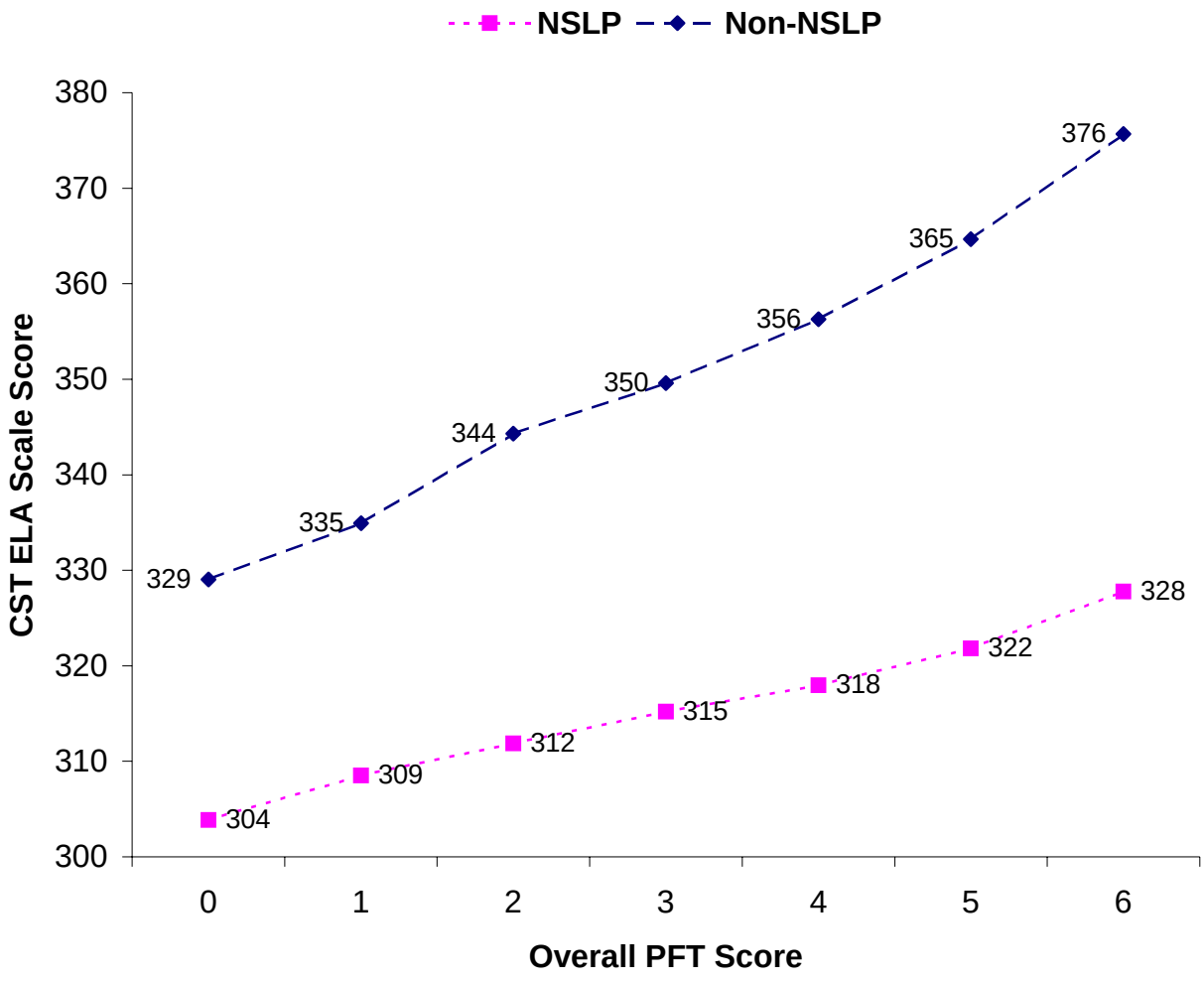

Figure 4. 2004 *CST* in English–language arts mean scale score for grade 5 by overall PFT score and NSLP. The number of NSLP and non-NSLP students in grade 5 was 203,726 and 167,472 respectively.

Figure 4 indicates that as the PFT score increased, so did the mean academic achievement for both non-NSLP and NSLP students. However, the rate of change in achievement scores was greater for non-NSLP students than for NSLP students. The difference in mean scale scores on the *CST* in English–language arts between the least and most fit students was 47 points for non-NSLP and 24 points for NSLP. Results using mathematics scores were consistent with those using English–language arts

scores, and results for seventh- and ninth-grade students were consistent with those for fifth graders.

Although evidence suggests the relationship between physical fitness and academic achievement was different for females and males and different for higher SES and lower SES students, ANOVA was used to test whether these differences were statistically significant. ANOVA results indicated that the rate of increase in mean achievement scores by PFT scores was significantly greater for females than for males and significantly greater for students not receiving NSLP (i.e., higher SES) than for students receiving NSLP (i.e., lower SES). (See Appendix B.)

Discussion

Results validate earlier studies. There was a strong positive relationship between physical fitness and academic achievement. The relationship between fitness and achievement was stronger for females than for males and stronger for higher SES students than for lower SES students.

However, neither ANOVA nor regression results indicate causality. That is, it cannot be inferred from these data that improved physical fitness caused an increase or improvement in academic achievement or vice versa.

However, it is possible that better general health and/or better living conditions were responsible for both higher fitness levels and higher levels of academic achievement. Previous research has shown that as SES improves, so does overall health (Evans 2004) and as SES improves, so does academic achievement (Herrenkohl, Herrenkohl, Rupert, Egolf, & Lutz 1995). Results from this study indicate a stronger relationship between fitness and achievement for higher SES students. This cumulative evidence indicates that conditions that improve general health promote both a healthy body and improved intellectual capacity.

Appendix A

ANOVA results for fifth–grade students when the *CST* in English–language arts scale scores are the dependent variable and overall PFT scores are the independent variable.

Source	*df*	*SS*	*MS*	*F*	*Pr > F*
Regression	6	50979850	8496642	3090.0	< .0001
Residual	368172	1012365755	2750		
Total	368178	1063345605			

ANOVA results and multiple comparison tests indicated that students who had an overall PFT score of six had a mean scale score on both the *CST* in English–language arts and mathematics that was significantly greater than students who had an overall PFT score of five or less. For example, fifth-grade students who had an overall PFT score of six had a mean scale score of 355 on the *CST* in English–language arts. The English–language arts mean score of 355 was statistically greater than the mean English–language arts score of 342, which was the mean scale score on the *CST* in English–language arts for students who had an overall PFT score of five. Students who had an overall PFT score of five had a mean *CST* scale score that was statistically greater than students who had an overall PFT score of four or less and so on. There was one exception to this pattern: Students who had a PFT score of one tended to have a *CST* mean scale score that was not statistically greater than students who had a PFT score of zero.

Results from linear regression analyses showed that as overall PFT scores increased, *CST* scores also increased in a statistically significant pattern. The regression equation indicated that for every unit increase in overall PFT score, the scale score on the *CST* in English–language arts increased eight points for fifth graders, ten points for seventh graders, and nine points for ninth graders.

Appendix B

ANOVA results for fifth-grade students when the *CST* in English–language arts scale scores are the dependent variable and overall PFT scores, gender, and NSLP are the independent variables.

Source	*df*	*SS*	*MS*	*F*	*Pr > F*
Regression	20	213450342	10672517	4623.1	< .0001
Residual	368158	849895263	2309		
Total	368178	1063345605			
Overall* PFT *Score	6	21986377.2	3664396.2	1587.3	< .0001
Gender	1	310443.9	310443.9	134.5	< .0001
NSLP	1	10978627.9	10978627.9	4755.7	< .0001
Gender*PFT *Score	6	943467.5	157244.6	68.1	< .0001
NSLP*PFT *Score	6	2608492.8	434748.8	188.3	< .0001
Contrast	***df***	***SS***	***MS***	***F***	***Pr > F***
Six compared to Scores Less than Six	1	8808564.4	8808564.4	3815.7	< .0001
Five compared to Scores Less than Five	1	3589235.8	3589235.8	1554.8	< .0001
Four compared to Scores Less than Four	1	1432484.7	1432484.7	620.5	< .0001
Three compared to Scores Less than Three	1	582932.3	582932.3	252.5	< .0001
Two compared to Scores Less than Two	1	212324.2	212324.2	92.0	< .0001
One compared to Zero	1	27469.8	27469.8	11.9	0.0006

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Evans, G. W. (2004). The environment of childhood poverty. *American Psychologist*, 59 (2), 77–92.

Herrenkohl, E. C., Herrenkohl, R. C., Rupert, L. J., Egolf, B. P., & Lutz, J. G. (1995). Risk factors for behavioral dysfunction: The relative impact of maltreatment, SES, physical health problems, cognitive ability, and quality of parent-child interaction. *Child Abuse & Neglect*, 19 (2), 191–203.

Appendix B

Physical Activity and Student Performance at School

Physical Activity and Student Performance at School

Howard Taras

ABSTRACT: *To review the state of research on the association between physical activity among school-aged children and academic outcomes, the author reviewed published studies on this topic. A table includes brief descriptions of each study's research methodology and outcomes. A review of the research demonstrates that there may be some short-term improvements of physical activity (such as on concentration) but that long-term improvement of academic achievement as a result of more vigorous physical activity is not well substantiated. The relationship between physical activity in children and academic outcomes requires further elucidation.* (J Sch Health. 2005;75(6):214-218)

An understanding of the impact of student health on educational outcomes has major implications. Among them are ramifications for how schools address health concerns. The National Coordinating Committee on School Health and Safety (NCCSHS), comprising representatives of federal departments and national nongovernmental organizations, encourages school districts to respond to evolving challenges by developing coordinated school health programs. To enhance awareness of existing evidence linking health and school performance and to identify gaps in knowledge, the NCCSHS has begun a project designed to ascertain the status of research in these areas. The project involves a literature search of peer-reviewed published research reporting on the relationship between students' health and their performance in school. Compilations of research articles exploring the association between academic performance and health include those on chronic conditions. This article summarizes findings on the association between physical activity and academic outcomes among school-aged children.

BACKGROUND ON PHYSICAL ACTIVITY IN THE ACADEMIC SETTING

Few teachers, administrators, and parents would argue with the assumption that physical activity is likely to help children perform better in school. Physical activity improves general circulation, increases blood flow to the brain, and raises levels of norepinephrine and endorphins—all of which may reduce stress, improve mood, induce a calming effect after exercise, and perhaps as a result improve achievement.[1,2] The structure of physical activity in schools also provides social benefits that could result in academic outcomes. Children who learn to cooperate, share, and abide by rules of group physical activities and those who learn to discover and test their physical abilities even in individual activities are likely to feel more connected to their school and community and want to challenge themselves. Physically active adolescents are less likely to attempt suicide, adopt risk-taking behaviors, and become pregnant—all of which may be associated with better academic outcomes.[3,4]

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Nevertheless, daily physical education among elementary and secondary school students is not common in US schools and may be becoming less so[5], despite the recommendations from the federal government and professional education associations. The National Association for Sport and Physical Education has recommended standards for physical education and developed sound sequential curricula that build student knowledge and skills from year to year in developmentally appropriate ways.[6] Healthy People 2010 objectives include increasing the proportion of adolescents who participate in daily school physical education and the proportion of the nation's public and private schools that require daily physical education for all students.[7]

SELECTION OF PHYSICAL ACTIVITY ARTICLES

Only articles meeting the following criteria were selected for review. (1) Study subjects were school-aged children (5 to 18 years), (2) article was published later than 1984 (20 years) in a peer-reviewed journal, and (3) research included at least one of the following outcomes: school attendance, academic achievement, a measure of cognitive ability (such as general intelligence, memory), and attention. If a full article could not be retrieved, studies with detailed abstracts were included. Many studies cited here had major outcome measures other than those pertinent to the objectives of this project. These alternative outcomes may not be described at all or are briefly mentioned.

LITERATURE REVIEW

There were 14 articles published since 1984 that examined the association between physical activity in school-aged children and academic performance (Table 1). Most were descriptive retrospective studies that compared reports on physical activity levels with reported academic achievement in a defined population. Some studies addressed the impact of physical education programs, others involvement in sports and other extracurricular activities. For the most part, the studies showed either significant but weak associations between activity level and better academic performance or no correlation at all. It is difficult from these studies to know if the association is causal and if so, the direction of the cause-effect.

Five articles (Caterino and Polak 1999, MacMahon and Gross 1987, Raviv 1990, Sallis et al 1999, Shephard 1996 in Table 1) had prospective, controlled experimental designs. A physical activity regimen was instituted to a portion of a population, and outcomes were measured in both control and intervention groups. Conclusions are

Table 1
Published Research Articles that Address Childhood Physical Activity and School Performance *(Continued on next page)*

Reference	Experimental Design	Outcomes Related to School Performance
Caterino MC, Polak ED. Effects of 2 types of activity on the performance of 2nd-, 3rd-, and 4th-grade students on a test of concentration. *Percept Mot Skills.* 1999;89:245-248. (United States)	54 children (second to fourth graders) were divided into 2 groups: "no physical activity" or "physical activity" (15 minutes of stretching and aerobic walking). All children were then given Woodcock-Johnson Test of Concentration.	Fourth graders showed significantly better performance on Woodcock-Johnson Tests of Concentration if they had participated in physical activity prior to the test. No differences associated with physical activity were found on test performance among second and third graders.
Daley AJ, Ryan J. Academic performance and participation in physical activity by secondary school adolescents. *Percept Mot Skills.* 2000;91:531-534. (United Kingdom)	232 students in a private school (in grades 8-11; ages 13-16) were randomly selected and asked about sports-based physical activities. Academic performance assessed using most recent examination scores in English, Math, and Science.	Various correlations between academic performance and physical activity (minutes and frequency) were not significant.
Dexter T. Relationship between sport knowledge, sport performance and academic ability: empirical evidence from GCSE Physical Education. General Certificate of Secondary Education. *J Sport Sci.* 1999;17:283-295. (United Kingdom)	Sports knowledge and achievement in English and Math were determined by looking at graduation examinations of 517 16-year-old students from 17 different schools. All students had chosen Physical Education as an elective. Performance in physical activities was assessed using teacher scores.	A weak but positive correlation was found between academic ability in Math and in English and sport performance.
Field T, Diego M, Sanders CE. Exercise is positively related to adolescents' relationships and academics. *Adolescence.* 2001; 36(141):106-110. (United States)	89 high school seniors were given questionnaire on exercise habits, academic performance, and other questions. For exercise, the median was found and the group divided into high- and low-exercise groups. Grade point averages (GPAs) were scored on a 4-point scale (from A to D).	Adolescents in high-exercise group engaged in sports more hours per week and statistically had significantly higher GPAs.
Fisher M, Juszczak L, Friedman SB. Sports participation in an urban high school: academic and psychologic correlates. *J Adolesc Health.* 1996;18:329-334. (United States)	Anonymous questionnaires were given to 838 students in high school gym classes. Demographics, academic performance, sports involvement, leisure time, substance use, and other questions were given.	Sports involvement was not statistically associated with academic performance.
Harrison PA, Gopalakrishnan N. Differences in behavior, psychological factors, and environmental factors associated with participation in school sports and other activities in adolescence. *J Sch Health.* 2003;73(3):113-120. (United States)	Data taken from statewide multiyear surveillance. Over 50,000 ninth graders were surveyed for extracurricular activities, sports participation, and other habits/ attitudes.	Students involved in both sports and other extracurricular activities had the highest chances of doing more than 3 hours homework per week (58% for those in sports and other extracurricular; 52% for those in extracurricular; 38% for those in sports only; 30% in neither).

Table 1
Published Research Articles that Address Childhood Physical Activity and School Performance *(Continued from previous page)*

Reference	Experimental Design	Outcomes Related to School Performance
Oh SY, Kim WK, Jang YA, Won HS, Lee HS, Kim SH. Academic performance of Korean children is associated with dietary behaviours and physical status. *Asia Pac J Clin Nutr.* 2003;12(2):186-192. (Korea)	More than 6000 students (grades 5, 8, and 11) were given a questionnaire that included food frequency. GPAs, height, weight, and physical fitness scores were recorded from school records.	Small positive association of physical fitness to academic performance was found.
Knight D, Rizzuto T. Relations for children in grades 2, 3, and 4 between balance skills and academic achievement. *Percept Mot Skills.* 1993; 76:1296-1298. (USA)	122 students (second to fourth grades; ages 7-11) were assessed on 10 balance skills (eg, balance beam walking, 1 foot hop). Children either passed or failed each, giving a score from 0 to 10. Iowa Test of Basic Skills scores for mathematics and reading subtests were ascertained.	Reading and mathematics achievement scores increase as balance skills scores increased.
MacMahon JR, Gross RT. Physical and psychological effects of aerobic exercise in boys with learning disabilities. *Dev Behav Pediatr.* 1987;8(5):274-277. (United States)	54 boys (ages 7-12) from a private school were randomly assigned to an aerobic exercise program or to a less vigorous exercise program—each lasting 20 weeks. All boys had average or higher Wechsler Intelligence Scale for Children-Revised (WISC-R) intelligence test scores and had been diagnosed as learning disabled (Wide Range Achievement Test [WRAT] test of achievement greater than 1.5 standard deviations below mean). WRAT was used to measure academic achievement prior to and after the 20 weeks. The Bruininks-Oseretsly Test of Motor Proficiency, physical measures, and self-concept were also measured.	Prior to initiating the exercise programs, no significant differences existed between the 2 groups for all measures. After the 20 weeks, the aerobic group demonstrated significantly better self-concept and physical fitness. No significant differences were found for motor proficiency or academic achievement.
Oja L, Jurimae T. Physical activity, motor ability, and school readiness of 6-year-old children. *Percept Mot Skills.* 2002;95(2):407-415. (Estonia)	Parent and teacher reports collected for 294 6-year-old children, using history; also a motor ability test and endurance test were given. Controlled drawing test was used as predictor of school readiness and development of mental abilities.	Outdoor activities on weekdays and weekends did not influence scores on the Control Draw Test. Various physical activities account for up to 25% of children's ability on the Control Draw Test. Motor ability tests, which demand children's total attention and concentration account for up to 20% of ability, reflected on this school readiness test. Children with highest physical activity tended to have the better scores on the subtest of fine motor control.
Raviv S, Low M. Influence of physical activity on concentration among junior high-school students. *Percept Mot Skills.* 1990;70(1):67-74. (Israel)	96 students (ages 11-12) divided into 4 groups: 1 received physical education at 8 AM, the other at 2 PM. The 2 remaining groups received science, not physical education, at 8 AM and 2 PM. A standardized measure of concentration was given at the beginning and end of each lesson.	Receiving physical education or science class had no bearing on education. Concentration scores were better at the end of each lesson, compared to the beginning.

Table 1
Published Research Articles that Address Childhood Physical Activity and School Performance *(Continued from previous page)*

Reference	Experimental Design	Outcomes Related to School Performance
Sallis JF, McKenzie TL, Kolody B, Lewis M, Marshall S, Rosengard P. Effects of health-related physical education on academic achievement: project SPARK. *Res Q Exerc Sport.* 1999;(2): 127-134. (United States)	Students in 7 schools in an affluent school district were followed from fourth through sixth grades. Two schools were assigned to having a certified physical education specialist and an activity program. In another 2 schools, regular classroom teachers were taught how to deliver the activity program. One school was a control where classroom teachers taught physical activity in their usual way. Metropolitan Achievement Test was used to measure academic achievement.	Achievement scores were higher than national averages at baseline; nevertheless, significant differences occurred among those receiving the intervention. Spending more time in physical education did not have harmful effects on standardized achievement. Favorable effects were found on 4 of 8 academic achievement measures. Those receiving physical education experienced smaller declines in test scores over the 3 years, compared to controls. In only 1 of 8 subtests, controls had an advantage over those receiving physical education.
Sanders CE, Field TM, Diego M, Kaplan M. Moderate involvement in sports is related to lower depression levels among adolescents. *Adolescence.* 2000; 35(140): 793-797. (United States)	89 high school seniors were given questionnaire on exercise habits, academic performance, and other questions. Three categories of exercise were determined from responses low (2 hours/week or less), moderate (3-6 hours/week), and high (>7 hours/week). GPA was assessed based on students' estimates.	Although moderate exercise was associated with less depression, low, moderate, and high exercise levels were not associated with GPAs.
Shephard RJ. Habitual physical activity and academic performance. *Nutr Rev.* 1996;54(4): S32-S36. (Canada, France)	Review of 2 studies. (1) 546 students (followed from grades 1 through 6) from 2 schools; intervention: 1 hour/day physical activity; control from preceding and succeeding classes in same schools received 14% more academic instruction; academic performance reported by homeroom teacher. (2) Half of each school day was assigned to physical activities with 26% less teaching.	Study 1: Prior to intervention at first grade, students in intervention group had significantly poorer grades than control. From grades 2 to 6, "intervention students" scored significantly better in math grades than control but had poorer performance in languages and "overall intelligence." Intervention benefited girls more than boys. Study 2: There was no difference in academic progress, despite curtailed instruction time. Conclusion of Studies 1 and 2: Do not expect academic improvement from physical activity, but expect improved rate of academic learning per unit of class time.

difficult to reach from such a small number of studies. Concentration appears to improve in the immediate period after children are physically active, but this improved level of concentration is not necessarily sufficient to influence improvement in school achievement (Caterino and Polak 1999, Raviv 1990 in Table 1). Shephard (Table 1) concluded that although academic improvement may not improve because of a physical activity program, there is an improved rate of academic learning per unit of class time. This should help thwart concerns that time devoted to physical activity draws from academic advancement in other subjects. Other studies demonstrated mixed results; for example, studies showed positive effects of physical activity (for example, on physical fitness and self-concept)

but little effect (Sallis et al 1999 in Table 1) or no effect (MacMahon and Gross 1987 in Table 1) on academic performance in the long term.

Clearly, more investigation into the benefits of physical activity on school performance is warranted before drawing conclusions. In adults, a meta-analysis of numerous studies found that the influence of exercise on cognition was inconsequential when small and temporary changes were implemented. However, exercise administered over a long period of time to produce fitness gains was more likely to enhance cognitive abilities.[8] One unpublished study demonstrated a significant difference in academic performance among low-achieving children who participated in aerobic activity during the school day.[9] It may be that the beneficial effects of high child physical activity levels on school achievement only exists in certain subpopulations of students. Alternatively, it is possible that the benefits of physical activity on academics are subtle and can only be detected when extremely large populations of students are studied, when physical activity programs are sufficiently aerobic, or when they have become part of children and youth's lives after many years.

CONCLUSION

Physical activity is well associated with improved overall health. Among school-aged children, physical activities programs help children develop social skills, improve mental health, and reduce risk-taking behaviors. Relatively few studies have explored the relationship between physical activity and academic outcome, and more investigation is warranted before researchers can better understand the effect of physical activity on student performance. This paucity of evidence should not be considered justification to limit school physical education programs because they may detract from time better spent on other subject areas. There is evidence to suggest that short-term cognitive benefits of physical activity during the school day adequately compensate for time spent away from other academic areas. ■

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Appendix C

FITNESSGRAM Recommended Tests

The Cooper Institute
Healthy Living...Down to a Science

HUMAN KINETICS
The Information Leader in Physical Activity

FITNESSGRAM® Tests

Six Recommended Tests Are Bolded


2

AEROBIC CAPACITY

1) **PACER** (Progressive Aerobic Cardiovascular Endurance Run) – Set to music, a paced, 20-meter shuttle run increasing in intensity as time progresses

Or:

- One-Mile Run – Students run (or walk if needed) one mile as fast as they can
- Walk Test – Students walk one mile as fast as they can (for ages 13 or above since the test has only been validated for this age group)


3

BODY COMPOSITION

2) **Skin Fold Test** – Measuring percent body fat by testing the tricep and calf areas

Or:

- Body Mass Index – Calculated from height and weight


4

MUSCULAR STRENGTH AND ENDURANCE

3) **Curl Up** – Measuring abdominal strength and endurance, students lie down with knees bent and feet unanchored. Set to a specified pace, students complete as many repetitions as possible to a maximum of 75

4) **Trunk Lift** – Measuring trunk extensor strength, students lie face down and slowly raise their upper body long enough for the tester to measure the distance between the floor and the student's chin


5

5) **Push-Up** – Measuring upper body strength and endurance, students lower body to a 90-degree elbow angle and push up. Set to a specified pace, students complete as many repetitions as possible

Or:

- Modified Pull-Up (proper equipment required) – With hands on a low bar, legs straight and feet touching the ground, students pull up as many repetitions as possible
- Flexed Arm Hang – Students hang their chin above a bar as long as possible


6

FLEXIBILITY

6) **Back-Saver Sit and Reach** – Testing one leg at a time, students sit with one knee bent and one leg straight against a box and reach forward

Or:

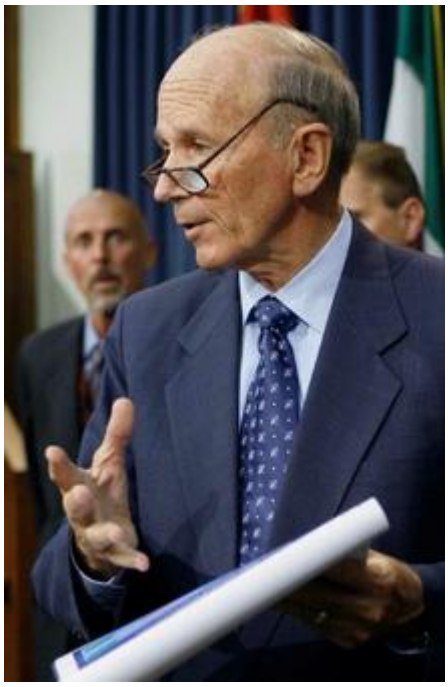
- Shoulder Stretch – With one arm over the shoulder and one arm tucked under behind the back, students try to touch their fingers and then alternate arms

Appendix D

Article: Texas Student Fitness

Study: Students' fitness in bad shape

By April Castro
Associated Press
Tuesday, July 1, 2008



AP Photo/Harry Cabluck Dr. Kenneth Cooper speaks during a news conference Tuesday in Austin. He is the founder of the Cooper Aerobics Center. discussed the physical fitness assessment of some 2.6 million Texas public school students, disclosing that elementary-age children are the more physically fit. Decreasing emphasis on physical education in upper grades was cited as one cause. Jeff Kloster, Texas associate education commissioner, is in the background, on the left.

AUSTIN -- Texas public school students are startlingly unhealthy and their fitness levels decline sharply through 12th grade, where less than 10 percent of students passed a fitness test this year, according to the first results of an annual health assessment.

The most physically healthy class was third grade girls, of whom 32 percent were deemed physically fit according to a six-part measure of aerobic capacity, body composition, muscular strength, muscular endurance and flexibility.

But the number of physically fit students declined every year through high school, where just 7.8 percent of senior girls and 8.5 percent of senior boys reached the "Healthy Fitness Zone."

"These results just confirm what many of us already knew and that is that our children's health is in jeopardy," said Sen. Jane Nelson, a Lewisville Republican who pushed legislation requiring the fitness assessment last year. "We cannot allow an entire generation of Texans to grow up and live a shorter life than previous generations."

The new law requires a physical fitness assessment of all public school students beginning in third grade. The results are to be reported to the Texas Education Agency, which will analyze the results by school district annually, comparing results to students' grades, attendance, obesity, disciplinary problems and school meal programs. That data is expected to be available later this year.

The poor results in upper grades correspond with decreased physical fitness requirements in high school, said Texas Education Commissioner Robert Scott.

The new law also requires 30 minutes of daily "moderate to vigorous" physical activity, or 135 minutes a week, for children up to fifth grade. For students in sixth through eighth grades, 30 minutes a day, 125 minutes a week or 225 minutes over two weeks is required.

The Fitnessgram test, developed by aerobics pioneer Dr. Kenneth Cooper, includes a skin fold test, curl-ups and push-ups. Another exercise tests flexibility, with students sitting with one bent leg and one straight leg and then reaching forward as far as they can.

In the trunk lift, which tests trunk extensor strength, students lie on their stomachs and raise their upper body while the teacher measures the distance between the students' chins and the floor. The last test is called the pacer, a paced 20-meter run that increases in intensity as time progresses.

The results are recorded on a report card that allows parents and teachers to identify the physical strengths and weaknesses of each student. Results, unattached to students' names, also go to the TEA, which will compare the fitness data to students' grades, attendance, obesity, disciplinary problems and school meal programs.

Health experts say there is a correlation between physical fitness and good grades and Cooper called exercise "fertilizer for the brain."

"If you want to increase grades in school, get your kids in shape," he said.

"Clearly, we need to make sure our children are more active," Scott said. "But schools can't do this alone. We need to work with parents and communities and we need to make sure our children achieve a more healthy lifestyle."

Forty-two percent of the state's fourth-graders, 39 percent of eighth-graders and 36 percent of 11th-graders are overweight or at risk of being overweight, according to a 2007 report from the Texas comptroller. Overweight people have increased risk for adult heart disease and diabetes and lower life expectancy.

More than 8,000 Texas schools participated in the Fitnessgram test.

Appendix E

Report: Texas Statewide Fitness

Title: Report: Texas schoolkids flunk statewide fitness assessment. Citation: Dallas Morning News (Dallas, TX) July 2, 2008, pNA Year: 2008 Note: Text available
Full Text COPYRIGHT 2008 The Dallas Morning News External: Electronic resource (HTML) Text: Byline: Terrence Stutz and Karin Shaw Anderson
Jul. 2--AUSTIN -- Texas students are out of shape -- and the older they get, the flabbier they get, according to the first statewide physical fitness assessments of public schoolchildren.
Based on evaluations of nearly 2.6 million students in grades three through 12, the testing found that fitness levels drop with each passing grade -- and elementary-age children perform the best.
Results showed that only about 32 percent of third-grade girls and 28 percent of third-grade boys reached the "healthy fitness zone," meeting performance targets on six fitness tests.
Among 12th-graders, only 8 percent of girls and 9 percent of boys met the health standards on all six tests.
"That doesn't surprise me," said Elizabeth Jenkins, a Dallas grandmother who took her four grandchildren to a splash park Tuesday afternoon. "Most parents don't take the time to prepare the proper food, and so the kids eat a lot of junk food."
And children spend too much time idle in front of the TV or in day care instead of outside playing, Ms. Jenkins said.
The fitness tests -- conducted last school year and tailored to students based on age and gender -- included push-ups, curl-ups, trunk lifts, shoulder stretches, a one-mile run and a skin fold test.
Joe Tessler, who took the test as a junior at Colleyville Heritage High School, said he was penalized for being too lean. He carries about 130 pounds on a 6-foot-1-inch frame.
"I'm a weak computer geek," Joe said. "But I think anybody in high school should be able to complete the test."
Students at his school self-reported their results, and not all students took the tests seriously, he said. That could have diluted the accuracy of the results.
Even so, he was surprised by the dismal passing rate for kids his age.
"I know my friends and I are a lot more fit than that," he said.
Results will be further analyzed later this year to study the correlation between physical fitness and academic achievement -- including scores on the Texas Assessment of Knowledge and Skills.
Girls generally fared better on the fitness tests until they reached the ninth grade. At that point, boys achieved better passing rates.
Jan Ramos, a physical education teacher at Kennedy Middle School in Grand Prairie, said the gender switch is a familiar scenario to her.
If she tosses a basketball toward a group of 12- to 14-year-olds, the boys will grab the ball and start playing.
"The girls won't do that," Ms. Ramos said. "They don't want to sweat."
State Sen. Jane Nelson, R-Flower Mound, author of the legislation that required the physical assessments -- called Fitnessgram -- said the decline in physical fitness corresponds to decreasing emphasis on physical education in the upper grades.
The senator said Tuesday that she will consider legislation that would beef up physical education requirements in middle schools and high schools. Elementary schools already have daily P.E. requirements. Ms. Nelson would initially like to see middle school students spend more time in physical

education and then expand the requirements to high schools, where students are required to take only 1 1/2 years of P.E. classes.

Beginning this fall, sixth-, seventh- and eighth-graders will have to participate in physical activity for at least four of six semesters in those grades.

"Our children's health is in jeopardy," Ms. Nelson said at a news briefing on the testing. "Children are leading a much different lifestyle today. They have Xboxes and watch way too much television. Our children are leading a sedentary, super-sized lifestyle, and it is showing."

Asked about the possibility of lengthening the school day to allow more time for physical education, the senator and state Education Commissioner Robert Scott said they expect the Legislature to discuss it in the future.

Kenneth Cooper, founder of the Cooper Institute of Dallas, said Tuesday that at least 15 states have expressed interest in using the Fitnessgram -- developed by the institute -- to evaluate their schoolchildren.

It cost about $2.5 million, about $230 per school, to establish the program in Texas and was paid for through private contributions, mostly raised by Dr. Cooper's foundation.

"I hope these results shock the state into reality and into action," Dr. Cooper said. "Our kids are the fattest and least fit they have been in our lifetimes."

A national report last year indicated that Texas ranked sixth among the states with the highest obesity rate for children ages 10 to 17.

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Appendix F

FITNESSGRAM Reference Guide

is available on our website

Research and Accountability reports

Office Ph. 727-588-6253

FITNESSGRAM® / ACTIVITYGRAM® Reference Guide (3rd ed.)

Editors

Gregory J. Welk and Marilu D. Meredith

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Reference to the whole book:
Welk, G. J. & Meredith, M.D. (Eds.). (2008). Fitnessgram / Activitygram Reference Guide. Dallas, TX: The Cooper Institute.

Appendix G

Surgeon General Report on Obesity

The Surgeon General's Call To Action To Prevent and Decrease Overweight and Obesity 2001

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Office of the Surgeon General
Rockville, MD

National Library of Medicine Cataloging in Publication

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In Memory of

PAUL AMBROSE, M.D., M.P.H.

(December 26, 1968–September 11, 2001)

Office of Disease Prevention and Health Promotion,
U.S. Department of Health and Human Services

As senior editor of this *Call To Action*, Dr. Ambrose's commitment to promoting public health and preventing disease was a critical force in the development of this document.

A Call To Action To Prevent and Decrease Overweight and Obesity

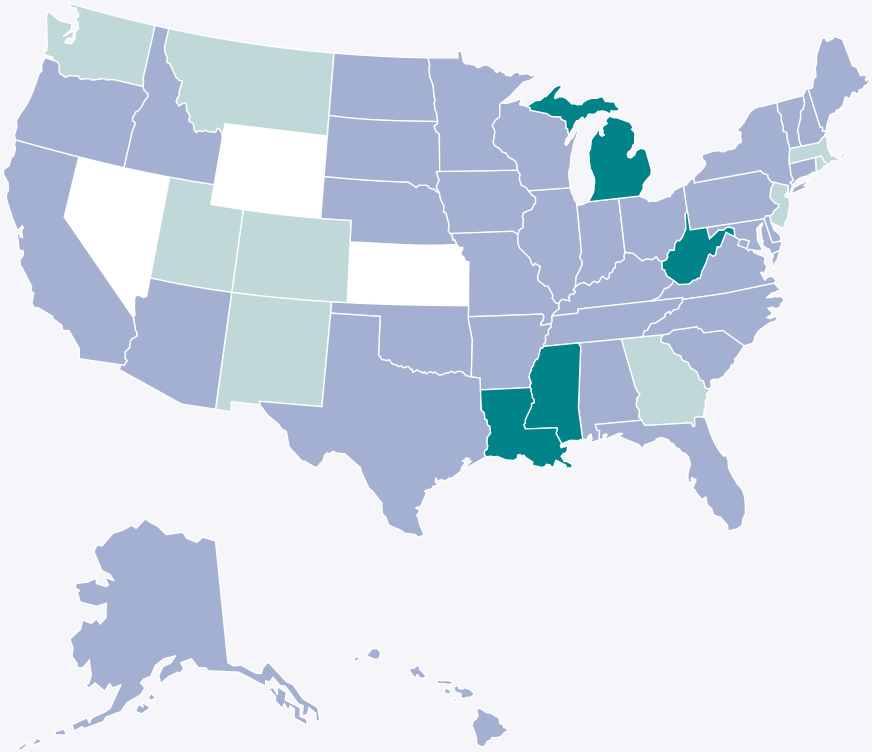
PRINCIPLES:

Overweight and obesity have reached nationwide epidemic proportions. Both the prevention and treatment of overweight and obesity and their associated health problems are important public health goals. To achieve these goals, *The Surgeon General's Call To Action To Prevent and Decrease Overweight and Obesity* is committed to five overarching principles:

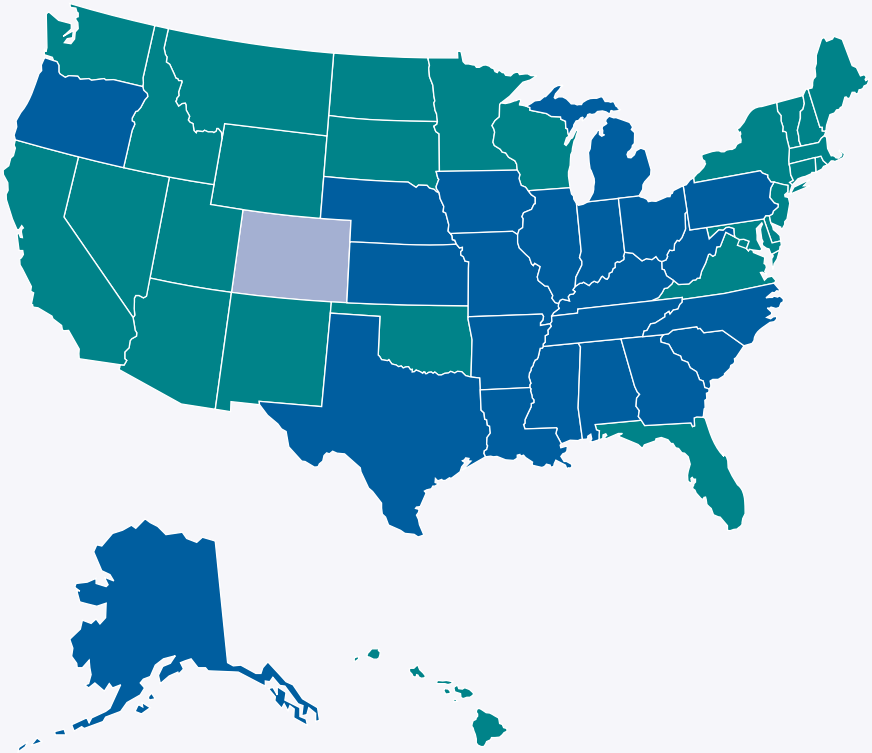
- Promote the recognition of overweight and obesity as major public health problems.
- Assist Americans in balancing healthful eating with regular physical activity to achieve and maintain a healthy or healthier body weight.
- Identify effective and culturally appropriate interventions to prevent and treat overweight and obesity.
- Encourage environmental changes that help prevent overweight and obesity.
- Develop and enhance public-private partnerships to help implement this vision.

THE SURFACING OF AN EPIDEMIC: PREVALENCE OF OBESITY* AMONG U.S. ADULTS

1991



2000



No Data | <10% | 10%-14% | 15%-19% | ≥20%

These two figures demonstrate the increasing prevalence of obesity among U.S. adults*

**Approximately 30 pounds overweight*

Source: Behavioral Risk Factor Surveillance System (BRFSS)

Note: BFRSS uses self-reported height and weight to calculate obesity; self-reported data may underestimate obesity prevalence.

Table of Contents

Message From the Secretary
U.S. Department of Health and Human Services

The 20th century saw remarkable and unprecedented improvements in the lives of the people of our country. We saw the infant mortality rate plummet and life expectancy increase by 30 years. Deaths from infectious diseases dropped tremendously, and improvements in medical care allowed many individuals with chronic disease to lead longer, fuller lives. Yet despite these and other successes, complex new health challenges continue to confront us.

Overweight and obesity are among the most important of these new health challenges. Our modern environment has allowed these conditions to increase at alarming rates and become highly pressing health problems for our Nation. At the same time, by confronting these conditions, we have tremendous opportunities to prevent the unnecessary disease and disability that they portend for our future.

As we move to acknowledge and understand these conditions, it is important to remember that they are as sensitive for each of us as they are challenging and important for our country's health. This is truly the time for a *Call To Action*, because each one of us as an individual must understand that we are called upon to act, just as our institutions are called upon to consider how they can help confront this new epidemic.

This Surgeon General's *Call To Action* represents an opportunity for individuals to make healthy lifestyle choices for themselves and their families. It encourages health care providers to help individuals prevent and treat these conditions. At a broader level, it prompts all communities to make changes that promote healthful eating and adequate physical activity. It calls for scientists to pursue new research. Above all, it calls upon individuals, families, communities, schools, worksites, organizations, and the media to work together to build solutions that will bring better health to everyone in this country.

I wholeheartedly support *The Surgeon General's Call To Action To Prevent and Decrease Overweight and Obesity*, and I urge all of us to work together to achieve its ambitious and essential vision.

Like many across the Nation, the Department of Health and Human Services was reminded how small the world is when, on September 11, we lost one of our own, Paul Ambrose, M.D., M.P.H. He had just finished the final edits on the *Call To Action* and was on his way to a conference in California on childhood obesity when tragedy struck. Paul was a man of great compassion and heart, committed to helping people in rural America obtain better health care and improving prevention measures for all Americans. He cared deeply for the issues he worked on but even more for the people affected. While we will miss Paul's energy and dedication, we will miss his humanity even more.

Tommy G. Thompson

Foreword From the Surgeon General
U.S. Department of Health and Human Services

Overweight and obesity may not be infectious diseases, but they have reached epidemic proportions in the United States. Overweight and obesity are increasing in both genders and among all population groups. In 1999, an estimated 61 percent of U.S. adults were overweight or obese, and 13 percent of children and adolescents were overweight. Today there are nearly twice as many overweight children and almost three times as many overweight adolescents as there were in 1980. We already are seeing tragic results from these trends. Approximately 300,000 deaths a year in this country are currently associated with overweight and obesity. Left unabated, overweight and obesity may soon cause as much preventable disease and death as cigarette smoking.

Overweight and obesity have been grouped as one of the Leading Health Indicators in *Healthy People 2010*, the Nation's health objectives for the first decade of the 21st century. The Leading Health Indicators reflect the major public health concerns and opportunities in the United States. While we have made dramatic progress over the last few decades in achieving so many of our health goals, the statistics on overweight and obesity have steadily headed in the wrong direction. If this situation is not reversed, it could wipe out the gains we have made in areas such as heart disease, diabetes, several forms of cancer, and other chronic health problems. Unfortunately, excessive weight for height is a risk factor for all of these conditions.

Many people believe that dealing with overweight and obesity is a personal responsibility. To some degree they are right, but it is also a community responsibility. When there are no safe, accessible places for children to play or adults to walk, jog, or ride a bike, that is a community responsibility. When school lunchrooms or office cafeterias do not provide healthy and appealing food choices, that is a community responsibility. When new or expectant mothers are not educated

about the benefits of breastfeeding, that is a community responsibility. When we do not require daily physical education in our schools, that is also a community responsibility. There is much that we can and should do together.

Taking action to address overweight and obesity will have profound effects on increasing the quality and years of healthy life and on eliminating health disparities in the United States. With this outcome in mind, I asked the Office of Disease Prevention and Health Promotion, along with other agencies in the Department of Health and Human Services, to assist me in developing this *Surgeon General's Call To Action To Prevent and Decrease Overweight and Obesity.* Our ultimate goal is to set priorities and establish strategies and actions to reduce overweight and obesity. This process begins with our attitudes about overweight and obesity. Recognition of the epidemic of overweight and obesity is relatively recent, and there remain enormous challenges and opportunities in finding solutions to this public health crisis. Overweight and obesity must be approached as preventable and treatable problems with realistic and exciting opportunities to improve health and save lives. The challenge is to create a multifaceted public health approach capable of delivering long-term reductions in the prevalence of overweight and obesity. This approach should focus on health rather than appearance and empower both individuals and communities to address barriers, reduce stigmatization, and move forward in addressing overweight and obesity in a positive and proactive fashion.

Several events have drawn attention to overweight and obesity as public health problems. In 1998, the National Heart, Lung, and Blood Institute in cooperation with the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health released the *Clinical Guidelines on the Identification, Evaluation, and Treatment of Obesity in Adults: Evidence Report.* This report was the result of a thorough scientific review of the evidence related to the risks and treatment of overweight and obesity, and it provided evidence-based treatment guidelines for health care providers. In early 2000, the release of *Healthy People 2010* identified overweight and obesity as major public health problems and set national objectives for reduction in their prevalence. The National Nutrition Summit in May 2000 illuminated the impact of dietary and physical activity habits on

achieving a healthy body weight and began a national dialogue on strategies for the prevention of overweight and obesity. Finally, a Surgeon General's Listening Session, held in late 2000, and a related public comment period, generated many useful ideas for prevention and treatment strategies and helped forge and reinforce an important coalition of stakeholders. Participants in these events considered many prevention and treatment strategies, including such national priorities as ensuring daily physical education in schools, increasing research on the behavioral and environmental causes of obesity, and promoting breastfeeding.

These activities are just a beginning, however. Effective action requires the close cooperation and collaboration of a variety of organizations and individuals. This *Call To Action* serves to recruit your talent and inspiration in developing national actions to promote healthy eating habits and adequate physical activity, beginning in childhood and continuing across the lifespan. I applaud your interest in this important public health challenge.

David Satcher, M.D., Ph.D.

SECTION 1:

Overweight and Obesity as Public Health Problems in America

This *Surgeon General's Call To Action To Prevent and Decrease Overweight and Obesity* seeks to engage leaders from diverse groups in addressing a public health issue that is among the most burdensome faced by the Nation: the health consequences of overweight and obesity. This burden manifests itself in premature death and disability, in health care costs, in lost productivity, and in social stigmatization. The burden is not trivial. Studies show that the risk of death rises with increasing weight. Even moderate weight excess (10 to 20 pounds for a person of average height) increases the risk of death, particularly among adults aged 30 to 64 years.[1]

Overweight and obesity are caused by many factors. For each individual, body weight is determined by a combination of genetic, metabolic, behavioral, environmental, cultural, and socioeconomic influences. Behavioral and environmental factors are large contributors to overweight and obesity and provide the greatest opportunity for actions and interventions designed for prevention and treatment.

For the vast majority of individuals, overweight and obesity result from excess calorie consumption and/or inadequate physical activity. Unhealthy dietary habits and sedentary behavior together account for approximately 300,000 deaths every year.[2,3] Thus, a healthy diet and regular physical activity, consistent with the *Dietary Guidelines for Americans*, should be promoted as the cornerstone of any prevention or treatment effort.[4,5] According to the U.S. Department of Agriculture's 1994–1996 Continuing Survey of Food Intakes by Individuals, very few Americans meet the majority of the Food Guide Pyramid recommendations. Only 3 percent of all individuals meet four of the five recommendations for the intake of grains, fruits, vegetables, dairy products, and meats.[6] Much work needs to be done to ensure the nutrient adequacy of our diets while at the same time avoiding excess calories. Dietary adequacy and moderation in energy consumption are both important for maintaining or achieving a healthy weight and for overall health.

Many adult Americans have not been meeting Federal physical activity recommendations to accumulate at least 30 minutes of moderate physical activity most days of the week.[4,7] In 1997, less than one-third of adults engaged in the recommended amount of physical activity, and 40 percent of adults engaged in no leisure-time physical activity.[7] Although nearly 65 percent of adolescents reported participating in vigorous activity for 20 minutes or more on 3 or more out of 7 days, national data are not available to assess whether children and adolescents meet the Federal recommendations to accumulate at least 60 minutes of moderate physical activity most days of the week.[4,8] Many experts also believe that physical *inactivity* is an important part of the energy imbalance responsible for the increasing prevalence of overweight and obesity. Our society has become very sedentary; for example, in 1999, 43 percent of students in grades 9 through 12 viewed television more than 2 hours per day.[8]

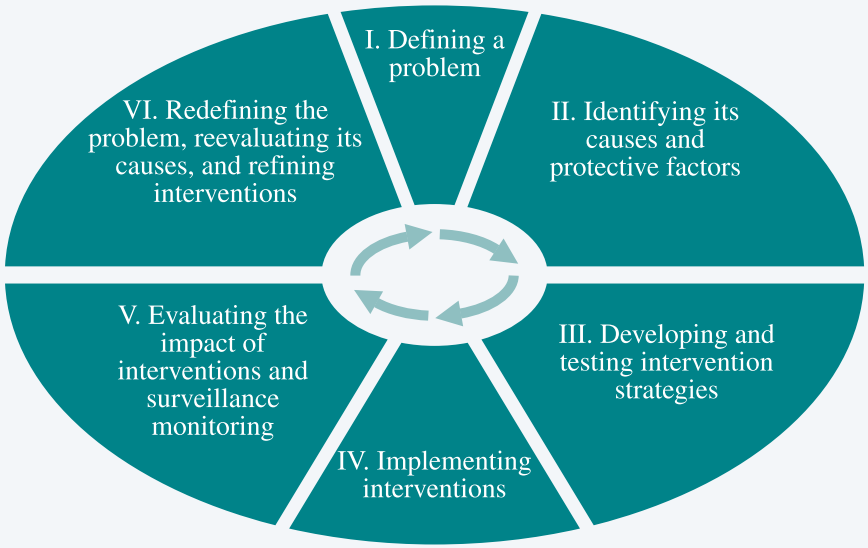
Both dietary intake and physical activity are difficult to measure on either an individual or a population level. More research is clearly necessary to fully understand the specific etiology of this crisis. However, these statistics and the increasing prevalence of overweight and obesity highlight the need to engage all Americans as we move forward to ensure the quality and accessibility of prevention and treatment programs.

Public Health and the Surgeon General

Through cooperative action, public health programs have successfully prevented the spread of infectious disease, protected against environmental hazards, reduced accidents and injuries, responded to disasters, worked toward ensuring the quality and accessibility of health services, and promoted healthy behaviors.[9] Over the past 100 years, thanks largely to public health efforts, the life expectancy of Americans has increased by approximately 50 percent.[10]

Public health success has traditionally come from the reduction in the incidence of infectious diseases through improved sanitation and nutrition, cleaner air and water, and national vaccination programs. As the threats to America's health have shifted, so too have public health efforts. In recent years, public health efforts have successfully navigated new frontiers such as violence prevention, tobacco cessation, and mental health. Public health officials remain poised to address new health challenges through the collaborative processes of scientific research, policy development, and community mobilization.

The public health approach involves a circle of activities:



Measuring Overweight and Obesity

The first challenge in addressing overweight and obesity lies in adopting a common public health measure of these conditions. An expert panel, convened by the National Institutes of Health (NIH) in 1998, has utilized Body Mass Index (BMI) for defining overweight and obesity.[11] BMI is a practical measure that requires only two things: accurate measures of an individual's weight and height (figure 1). BMI is a measure of weight in relation to height. BMI is calculated as weight in pounds divided by the square of the height in inches, multiplied by 703. Alternatively, BMI can be calculated as weight in kilograms divided by the square of the height in meters.

Studies have shown that BMI is significantly correlated with total body fat content for the majority of individuals.[11] BMI has some limitations, in that it can overestimate body fat in persons who are very muscular, and it can underestimate body fat in persons who have lost muscle mass, such as many elderly. Many organizations, including over 50 scientific and medical organizations that have endorsed the NIH *Clinical Guidelines*, support the use of a BMI of 30 kg/m^2 or greater to identify obesity in adults and a BMI between 25 kg/m^2 and 29.9 kg/m^2 to identify overweight in adults.[12,13] These definitions are based on evidence that suggests health risks are greater at or above a BMI of 25 kg/m^2 compared to those at a BMI below that level.[12] The risk of death, although modest until a BMI of 30 kg/m^2 is reached, increases with an increasing Body Mass Index.[1]

Figure 1: Adult Body Mass Index

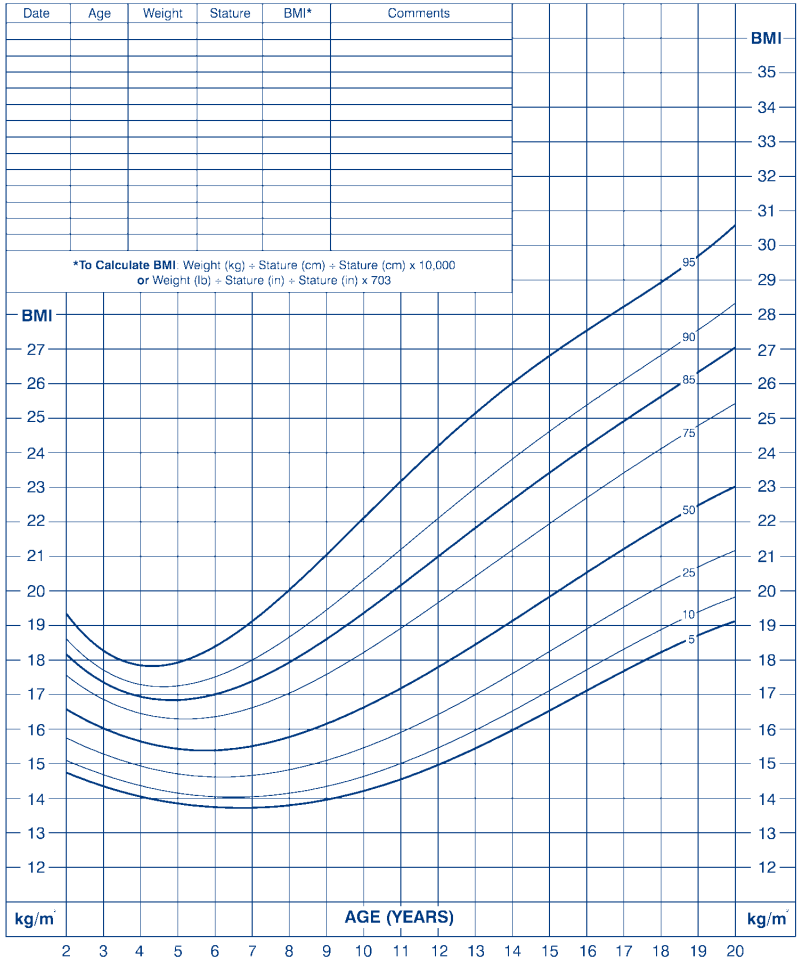
$$BMI = \left\{ \frac{\text{WEIGHT (pounds)}}{\text{HEIGHT (inches)}^2} \right\} \times 703$$

Height in Feet and Inches \ Weight in Pounds	120	130	140	150	160	170	180	190	200	210	220	230	240	250
4'6	29	31	34	36	39	41	43	46	48	51	53	56	58	60
4'8	27	29	31	34	36	38	40	43	45	47	49	52	54	56
4'10	25	27	29	31	34	36	38	40	42	44	46	48	50	52
5'0	23	25	27	29	31	33	35	37	39	41	43	45	47	49
5'2	22	24	26	27	29	31	33	35	37	38	40	42	44	46
5'4	21	22	24	26	28	29	31	33	34	36	38	40	41	43
5'6	19	21	23	24	26	27	29	31	32	34	36	37	39	40
5'8	18	20	21	23	24	26	27	29	30	32	34	35	37	38
5'10	17	19	20	22	23	24	26	27	29	30	32	33	35	36
6'0	16	18	19	20	22	23	24	26	27	28	30	31	33	34
6'2	15	17	18	19	21	22	23	24	26	27	28	30	31	32
6'4	15	16	17	18	20	21	22	23	24	26	27	28	29	30
6'6	14	15	16	17	19	20	21	22	23	24	25	27	28	29
6'8	13	14	15	17	18	19	20	21	22	23	24	25	26	28

Healthy Weight Overweight Obese

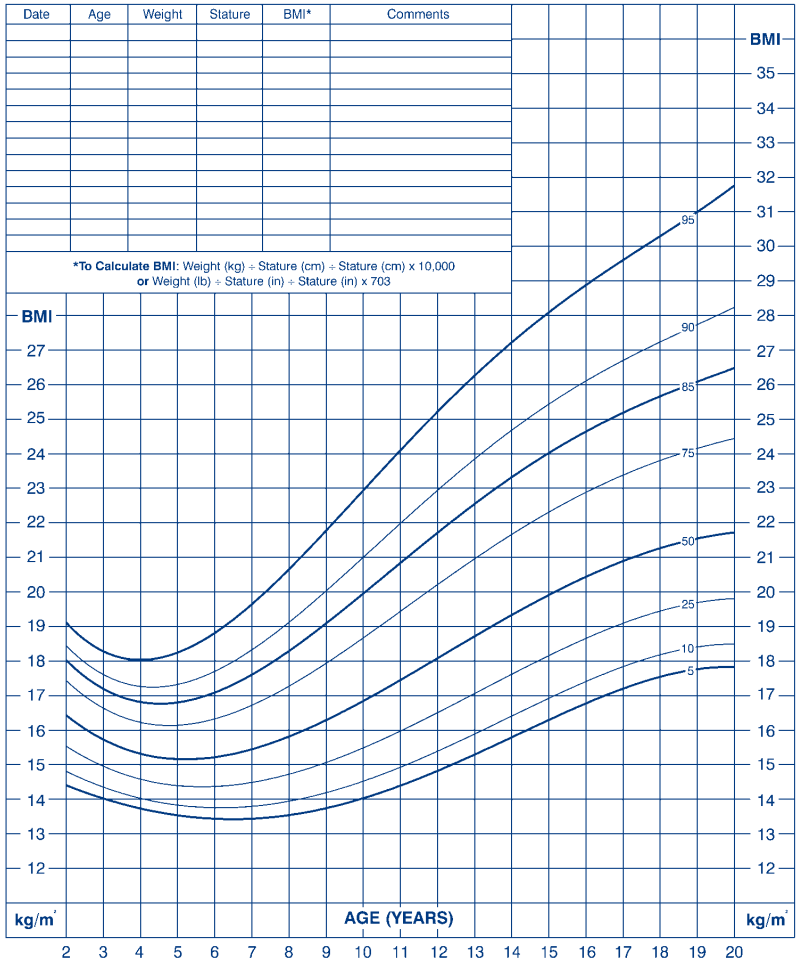
In children and adolescents, overweight has been defined as a sex- and age-specific BMI at or above the 95th percentile, based on revised Centers for Disease Control and Prevention (CDC) growth charts (figures 2 and 3).[14] Neither a separate definition for obesity nor a definition for overweight based on health outcomes or risk factors is defined for children and adolescents.[15]

FIGURE 2: BODY MASS INDEX-FOR-AGE PERCENTILES: BOYS AGED 2 TO 20 YEARS



Source: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000)

FIGURE 3: BODY MASS INDEX-FOR-AGE PERCENTILES: GIRLS AGED 2 TO 20 YEARS



Source: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000)

Health Risks

Epidemiological studies show an increase in mortality associated with overweight and obesity. Individuals who are obese (BMI ≥ 30) have a 50 to 100 percent increased risk of premature death from all causes compared to individuals with a BMI in the range of 20 to 25.[16] An estimated 300,000 deaths a year may be attributable to obesity.[3]

Morbidity from obesity may be as great as from poverty, smoking, or problem drinking.[17] Overweight and obesity are associated with an increased risk for coronary heart disease; type 2 diabetes; endometrial, colon, postmenopausal breast, and other cancers; and certain musculoskeletal disorders, such as knee osteoarthritis (table 1).[18] Both modest and large weight gains are associated with significantly increased risk of disease. For example, a weight gain of 11 to 18 pounds increases a person's risk of developing type 2 diabetes to twice that of individuals who have not gained weight, while those who gain 44 pounds or more have four times the risk of type 2 diabetes.[19]

A gain of approximately 10 to 20 pounds results in an increased risk of coronary heart disease (nonfatal myocardial infarction and death) of 1.25 times in women[20] and 1.6 times in men.[21] Higher levels of body weight gain of 22 pounds in men and 44 pounds in women result in an increased coronary heart disease risk of 1.75 and 2.65, respectively.[20,21] In women with a BMI of 34 or greater, the risk of developing endometrial cancer is increased by more than six times.[22] Overweight and obesity are also known to exacerbate many chronic conditions such as hypertension and elevated cholesterol.[23] Overweight and obese individuals also may suffer from social stigmatization, discrimination, and poor body image.[24]

Although obesity-associated morbidities occur most frequently in adults, important consequences of excess weight as well as antecedents of adult disease occur in overweight children and adolescents. Overweight children and adolescents are more likely to become overweight or obese adults; this concern is greatest among adolescents. Type 2 diabetes, high blood lipids, and hypertension as well as early maturation and orthopedic problems also occur with increased frequency in overweight youth. A common consequence of childhood overweight is psychosocial—specifically discrimination.[25]

These data on the morbidity and mortality associated with overweight and obesity demonstrate the importance of the prevention of weight gain, as well as the role of obesity treatment, in maintaining and improving health and quality of life.

Table 1: Health risks associated with obesity

Obesity is Associated with an Increased Risk of:	
• premature death • type 2 diabetes • heart disease • stroke • hypertension • gallbladder disease • osteoarthritis (degeneration of cartilage and bone in joints) • sleep apnea • asthma • breathing problems • cancer (endometrial, colon, kidney, gallbladder, and postmenopausal breast cancer)	• high blood cholesterol • complications of pregnancy • menstrual irregularities • hirsutism (presence of excess body and facial hair) • stress incontinence (urine leakage caused by weak pelvic-floor muscles) • increased surgical risk • psychological disorders such as depression • psychological difficulties due to social stigmatization

Adapted from www.niddk.nih.gov/health/nutrit/pubs/statobes.htm[26]

Economic Consequences

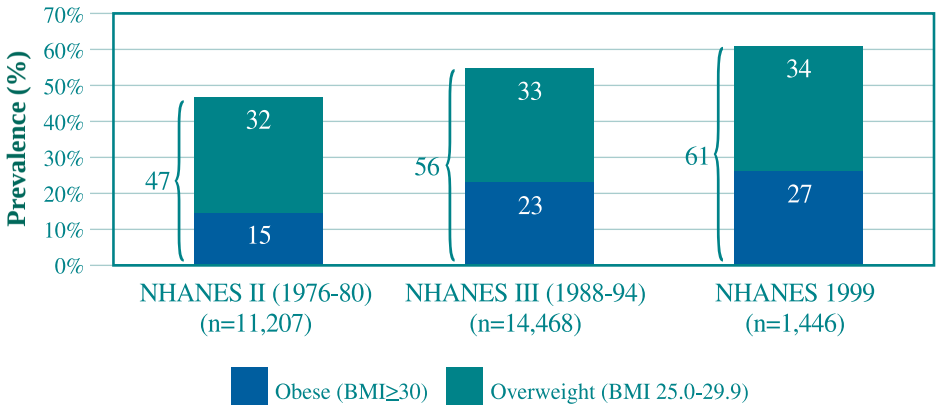
Overweight and obesity and their associated health problems have substantial economic consequences for the U.S. health care system. The increasing prevalence of overweight and obesity is associated with both direct and indirect costs. Direct health care costs refer to preventive, diagnostic, and treatment services related to overweight and obesity (for example, physician visits and hospital and nursing home care). Indirect costs refer to the value of wages lost by people unable to work because of illness or disability, as well as the value of future earnings lost by premature death.[27]

In 1995, the total (direct and indirect) costs attributable to obesity amounted to an estimated $99 billion.[27] In 2000, the total cost of obesity was estimated to be $117 billion ($61 billion direct and $56 billion indirect).[28] Most of the cost associated with obesity is due to type 2 diabetes, coronary heart disease, and hypertension.[29]

EPIDEMIOLOGY

The United States is experiencing substantial increases in overweight and obesity (as defined by a BMI ≥ 25 for adults) that cut across all ages, racial and ethnic groups, and both genders.[30] According to self-reported measures of height and weight, obesity (BMI ≥ 30) has been increasing in every State in the Nation.[31] Based on clinical height and weight measurements in the 1999 National Health and Nutrition Examination Survey (NHANES), 34 percent of U.S. adults aged 20 to 74 years are overweight (BMI 25 to 29.9), and an additional 27 percent are obese (BMI ≥ 30).[32] This contrasts with the late 1970s, when an estimated 32 percent of adults aged 20 to 74 years were overweight, and 15 percent were obese (figure 4).[30]

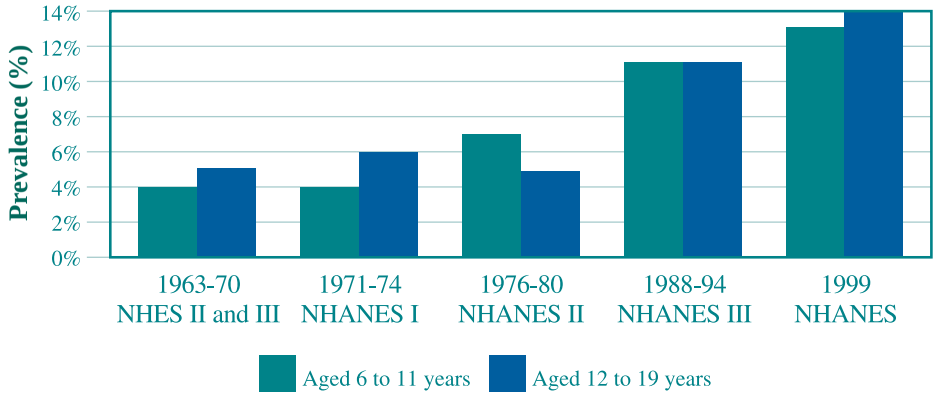
FIGURE 4: AGE-ADJUSTED PREVALENCE OF OVERWEIGHT AND OBESITY AMONG U.S. ADULTS AGED 20 TO 74 YEARS



Source: Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), National Health and Nutrition Examination Survey (NHANES)

The most recent data (1999) estimate that 13 percent of children aged 6 to 11 years and 14 percent of adolescents aged 12 to 19 years are overweight.[33] During the past two decades, the percentage of children who are overweight has nearly doubled (from 7 to 13 percent), and the percentage of adolescents who are overweight has almost tripled (from 5 to 14 percent) (figure 5).[33]

FIGURE 5: PREVALENCE OF OVERWEIGHT* AMONG U.S. CHILDREN AND ADOLESCENTS



**Gender- and age-specific BMI ≥ the 95th percentile*
Source: Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS) National Health Examination Survey (NHES), National Health and Nutrition Examination Survey (NHANES)

DISPARITIES IN PREVALENCE

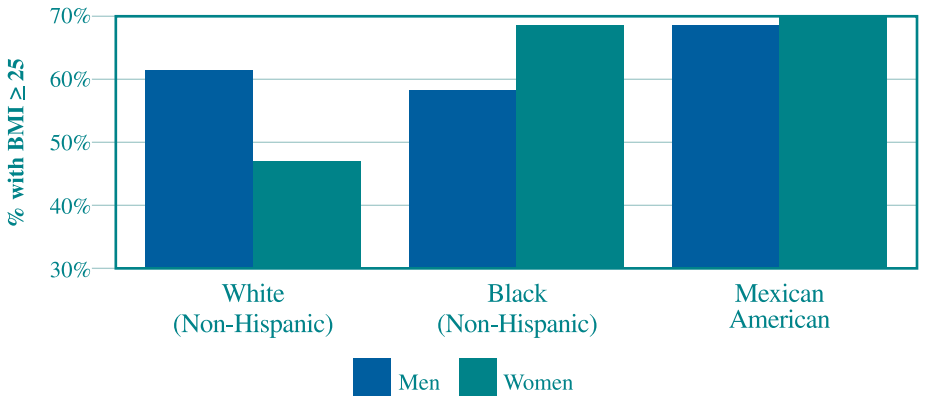
Between the second and third National Health and Nutrition Examination Surveys (NHANES II and III), the prevalence of overweight and obesity (BMI ≥ 25 for adults and ≥ 95th percentile for age and gender in children) increased in both genders, across all races and ethnicities, and across all age groups.[15,30] Disparities in overweight and obesity prevalence exist in many segments of the population based on race and ethnicity, gender, age, and socioeconomic status. For example, overweight and obesity are particularly common among minority groups and those with a lower family income.

Race and Ethnicity, Gender, and Age

In general, the prevalence of overweight and obesity is higher in women who are members of racial and ethnic minority populations than in non-Hispanic white women. Among men, Mexican Americans have a higher prevalence of overweight and obesity than non-Hispanic whites or non-Hispanic blacks. For non-Hispanic men, the prevalence of overweight and obesity among whites is slightly greater than among blacks.[30]

Within racial groups, gender disparities exist, although not always in the same direction. Based on NHANES III (1988–1994),[30] the proportion of non-Hispanic black women who were overweight or obese (BMI ≥ 25; 69 percent) was higher than the proportion of non-Hispanic black men (58 percent) (figure 6). For non-Hispanic whites, on the other hand, the proportion of men who were overweight or obese (BMI ≥ 25; 62 percent) exceeded the proportion of women (47 percent). However, when looking at obesity alone (BMI ≥ 30), the prevalence was slightly higher in non-Hispanic white women compared to non-Hispanic white men (23 percent and 21 percent, respectively).[30] The prevalence of overweight or obesity (BMI ≥ 25) was about the same in Mexican American men and women (69 percent and 70 percent, respectively).[30] Although smaller surveys indicate a higher prevalence of overweight and obesity in American Indians, Alaska Natives, and Pacific Islander Americans and a lower prevalence in Asian Americans compared to the general population, the number surveyed in NHANES III was too small to reliably report prevalence comparisons of overweight and obesity for these populations.[34]

Figure 6: Age-adjusted prevalence of overweight or obesity in selected groups (NHANES III, 1988–1994)



Source: Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), National Health and Nutrition Examination Survey (NHANES)

Racial and ethnic disparities in overweight may also occur in children and adolescents. Data for youth from NHANES III showed a similar pattern to that seen among adults. Mexican American boys tended to have a higher prevalence of overweight than non-Hispanic black and non-Hispanic white boys. Non-Hispanic black girls tended to have a higher prevalence of overweight compared to non-Hispanic white and Mexican American girls.[15] The National Heart, Lung, and Blood Institute Growth and Health Study on overweight in children found a higher mean BMI for black girls aged 9 and 10 years, compared to white girls of the same ages.[35] This racial difference in BMI widened and was even greater at age 19.[36]

In addition to racial and ethnic and gender disparities, the prevalence of overweight and obesity also varies by age. Among both men and women, the prevalence of overweight and obesity increases with advancing age until the sixth decade, after which it starts to decline.[30]

Socioeconomic Status

Disparities in the prevalence of overweight and obesity also exist based on socioeconomic status. For all racial and ethnic groups combined, women of lower socioeconomic status (income ≤ 130 percent of poverty threshold) are approxi-

mately 50 percent more likely to be obese than those with higher socioeconomic status (income > 130 percent of poverty threshold). Men are about equally likely to be obese whether they are in a low or high socioeconomic group.[37]

Among children, the relationship between socioeconomic status and overweight in girls is weaker than it is in women; that is, girls from lower income families have not consistently been found to be overweight compared to girls from higher income families. Among Mexican American and non-Hispanic black children and adolescents, family income does not reliably predict overweight prevalence. However, non-Hispanic white adolescents from lower income families experience a greater prevalence of overweight than those from higher income families.[15]

Health Benefits of Weight Loss

The recommendations to treat overweight and obesity are based on two rationales. First, overweight and obesity are associated with an increased risk of disease and death, as previously discussed.[3,16,18] Second, randomized controlled trials have shown that weight loss (as modest as 5 to 15 percent of excess total body weight) reduces the risk factors for at least some diseases, particularly cardiovascular disease, in the short term. Weight loss results in lower blood pressure, lower blood sugar, and improved lipid levels.[38] While few published studies have examined the link between weight loss and reduced disease or death in the long-term,[39] current data as well as scientific plausibility suggest this link.

Studies have shown that reducing risk factors for heart disease, such as blood pressure and blood cholesterol levels, lowers death rates from heart disease and stroke. Therefore, it is highly probable that weight loss that reduces these risk factors will reduce the number of deaths from heart disease and stroke. Trials examining the direct effects of weight loss on disease and death are currently under way.[40,41] For example, one trial shows that weight loss, a healthful diet, and exercise prevent the development of type 2 diabetes among persons who are overweight or obese.[42] The recently completed Diabetes Prevention Program from NIH also confirmed significant reductions in the risk for developing type 2 diabetes among obese subjects with impaired glucose tolerance through similar lifestyle interventions.[43]

Section 2: Posing Questions and Developing Strategies

Current knowledge is clear on many issues: the prevalence of overweight and obesity is high, and that of obesity is increasing rapidly; adolescents who are overweight are at high risk of becoming overweight or obese adults; overweight and obesity increase the risk for serious diseases such as type 2 diabetes, hypertension, and high blood cholesterol; and overweight and obesity are associated with premature death and disability. It is also known that a healthy diet and adequate physical activity aid in maintaining a healthy weight and, among overweight or obese persons, can promote weight loss.

Knowledge is less clear, however, on some very important questions. How can overweight and obesity be prevented? What are the most effective prevention and treatment strategies? How can the environment be modified to promote healthier eating and increased physical activity? Determining the answers to these questions demands a national public health response. Assembling the components of this response has begun.

Developing a Public Health Response

In December 2000, the Surgeon General hosted a public Listening Session on overweight and obesity. The meeting—Toward a National Action Plan on Overweight and Obesity: The Surgeon General's Initiative—began a developmental process that led to this *Surgeon General's Call To Action To Prevent and Decrease Overweight and Obesity.* A menu of important activities has been assembled from comments received during the Surgeon General's Listening Session, a public comment period, and the National Nutrition Summit. The menu, which is presented in the following section, highlights areas that received significant attention during one or more of these events. Although not meant to be prescriptive, the menu should establish useful starting points as individuals and groups focus their own skills, creativity, and inspiration on the national epidemic of overweight and obesity.

The discussions at the Surgeon General's Listening Session centered on activities and interventions in five key settings: families and communities, schools, health care, media and communications, and worksites. The key actions discussed are presented for each of these settings. Many of these actions overlap the different settings and can be applied in several or all environments.

CARE To Address Overweight and Obesity

The key actions are organized by setting in a framework called CARE: Communication, Action, and Research and Evaluation.

Communication: Provision of information and tools to motivate and empower decision makers at the governmental, organizational, community, family, and individual levels who will create change toward the prevention and decrease of overweight and obesity.

Action: Interventions and activities that assist decision makers in preventing and decreasing overweight and obesity, individually or collectively.

Research and Evaluation: Investigations to better understand the causes of overweight and obesity, to assess the effectiveness of interventions, and to develop new communication and action strategies.

Within the CARE framework, effective actions must occur at multiple levels. Obviously, individual behavioral change lies at the core of all strategies to reduce overweight and obesity. Successful efforts, however, must focus not only on individual behavioral change, but also on group influences, institutional and community influences, and public policy. Actions to reduce overweight and obesity will fail without this multidimensional approach. Individual behavioral change can occur only in a supportive environment with accessible and affordable healthy food choices and opportunities for regular physical activity. Furthermore, actions aimed exclusively at individual behavioral change, while not considering social, cultural, economic, and environmental influences, are likely to reinforce attitudes of stigmatization against the overweight and obese.

Setting 1: Families and Communities

Families and communities lie at the foundation of the solution to the problems of overweight and obesity. Family members can share their own knowledge and

habits regarding a healthy diet and physical activity with their children, friends, and other community members. Emphasis should be placed on family and community opportunities for communication, education, and peer support surrounding the maintenance of healthy dietary choices and physical activity patterns.

Communication

- Raise consumer awareness about the effect of being overweight on overall health.
- Inform community leaders about the importance of developing healthy communities.
- Highlight programs that support healthful food and physical activity choices to community decision makers.
- Raise policy makers' awareness of the need to develop social and environmental policy that would help communities and families be more physically active and consume a healthier diet.
- Educate individuals, families, and communities about healthy dietary patterns and regular physical activity, based on the *Dietary Guidelines for Americans*.
- Educate parents about the need to serve as good role models by practicing healthy eating habits and engaging in regular physical activity in order to instill lifelong healthy habits in their children.
- Raise consumer awareness about reasonable food and beverage portion sizes.
- Educate expectant parents and other community members about the potentially protective effect of breastfeeding against the development of obesity.

Action

- Form community coalitions to support the development of increased opportunities to engage in leisure time physical activity and to encourage food outlets to increase availability of low-calorie, nutritious food items.
- Encourage the food industry to provide reasonable food and beverage portion sizes.
- Increase availability of nutrition information for foods eaten and prepared away from home.

- Create more community-based obesity prevention and treatment programs for children and adults.
- Empower families to manage weight and health through skill building in parenting, meal planning, and behavioral management.
- Expand efforts to encourage healthy eating patterns, consistent with the *Dietary Guidelines for Americans*, by nutrition assistance recipients.
- Provide demonstration grants to address the lack of access to and availability of healthy affordable foods in inner cities.
- Promote healthful dietary patterns, including consumption of at least five servings of fruits and vegetables a day.
- Create community environments that promote and support breastfeeding.
- Decrease time spent watching television and in similar sedentary behaviors by children and their families.
- Provide demonstration grants to address the lack of public access to safe and supervised physical activity.
- Create and implement public policy related to the provision of safe and accessible sidewalks, walking and bicycle paths, and stairs.

Research and Evaluation

- Conduct research on obesity prevention and reduction to confirm their effects on improving health outcomes.
- Determine the root causes, behaviors, and social and ecological factors leading to obesity and how such forces vary by race and ethnicity, gender, and socioeconomic status.
- Assess the factors contributing to the disproportionate burden of overweight and obesity in low-income and minority racial and ethnic populations.
- Develop and evaluate preventive interventions that target infants and children, especially those who are at high risk of becoming obese.
- Coordinate research activities to refine risk assessment, to enhance obesity prevention, and to support appropriate consumer messages and education.
- Study the cost-effectiveness of community-directed strategies designed to prevent the onset of overweight and obesity.

- Conduct behavioral research to identify how to motivate people to increase and maintain physical activity and make healthier food choices.
- Evaluate the feasibility of incentives that support healthful dietary and physical activity patterns.
- Identify techniques that can foster community motivation to reduce overweight and obesity.
- Examine the marketing practices of the fast food industry and the factors determining construction of new food outlets.

Setting 2: Schools

Schools are identified as a key setting for public health strategies to prevent and decrease the prevalence of overweight and obesity. Most children spend a large portion of time in school. Schools provide many opportunities to engage children in healthy eating and physical activity and to reinforce healthy diet and physical activity messages. Public health approaches in schools should extend beyond health and physical education to include school policy, the school physical and social environment, and links between schools and families and communities. Schools and communities that are interested in reducing overweight among the young people they serve can consider options listed below. Decisions about which options to select should be made at the local level.

Communication

- Build awareness among teachers, food service staff, coaches, nurses, and other school staff about the contribution of proper nutrition and physical activity to the maintenance of lifelong healthy weight.
- Educate teachers, staff, and parents about the importance of school physical activity and nutrition programs and policies.
- Educate parents, teachers, coaches, staff, and other adults in the community about the importance they hold as role models for children, and teach them how to be models for healthy eating and regular physical activity.
- Educate students, teachers, staff, and parents about the importance of body size acceptance and the dangers of unhealthy weight control practices.

- Develop sensitivity of staff to the problems encountered by the overweight child.

Action

- Provide age-appropriate and culturally sensitive instruction in health education that helps students develop the knowledge, attitudes, skills, and behaviors to adopt, maintain, and enjoy healthy eating habits and a physically active lifestyle.
- Ensure that meals offered through the school breakfast and lunch programs meet nutrition standards.
- Adopt policies ensuring that all foods and beverages available on school campuses and at school events contribute toward eating patterns that are consistent with the *Dietary Guidelines for Americans.*
- Provide food options that are low in fat, calories, and added sugars, such as fruits, vegetables, whole grains, and low-fat or nonfat dairy foods.
- Ensure that healthy snacks and foods are provided in vending machines, school stores, and other venues within the school's control.
- Prohibit student access to vending machines, school stores, and other venues that compete with healthy school meals in elementary schools and restrict access in middle, junior, and high schools.
- Provide an adequate amount of time for students to eat school meals, and schedule lunch periods at reasonable hours around midday.
- Provide all children, from prekindergarten through grade 12, with quality daily physical education that helps develop the knowledge, attitudes, skills, behaviors, and confidence needed to be physically active for life.
- Provide daily recess periods for elementary school students, featuring time for unstructured but supervised play.
- Provide extracurricular physical activity programs, especially inclusive intramural programs and physical activity clubs.
- Encourage the use of school facilities for physical activity programs offered by the school and/or community-based organizations outside of school hours.

Research and Evaluation

- Conduct research on the relationship of healthy eating and physical activity to student health, learning, attendance, classroom behavior, violence, and other social outcomes.
- Evaluate school-based behavioral health interventions for the prevention of overweight in children.
- Develop an ongoing, systematic process to assess the school physical activity and nutrition environment, and plan, implement, and monitor improvements.
- Conduct research to study the effect of school policies such as food services and physical activity curricula on overweight in children and adolescents.
- Evaluate the financial and health impact of school contracts with vendors of high-calorie foods and beverages with minimal nutritional value.

Setting 3: Health Care

The health care system provides a powerful setting for interventions aimed at reducing the prevalence of overweight and obesity and their consequences. A majority of Americans interact with the health care system at least once during any given year. Recommendations by pediatric and adult health care providers can be influential in patient dietary choices and physical activity patterns. In collaboration with schools and worksites, health care providers and institutions can reinforce the adoption and maintenance of healthy lifestyle behaviors. Health care providers also can serve as effective public policy advocates and further catalyze intervention efforts in the family and community and in the media and communications settings.

Communication

- Inform health care providers and administrators of the tremendous burden of overweight and obesity on the health care system in terms of mortality, morbidity, and cost.

- Inform and educate the health care community about the importance of healthy eating, consistent with the *Dietary Guidelines for Americans*, and physical activity and fitness for the promotion of health.
- Educate health care providers and administrators to identify and reduce the barriers involving patients' lack of access to effective nutrition and physical activity interventions.
- Inform and educate the health care community about assessment of weight status and the risk of inappropriate weight change.
- Educate health care providers on effective ways to promote and support breastfeeding.

Action

- Train health care providers and health profession students in effective prevention and treatment techniques for overweight and obesity.
- Encourage partnerships between health care providers, schools, faith-based groups, and other community organizations in prevention efforts targeted at social and environmental causes of overweight and obesity.
- Establish a dialogue to consider classifying obesity as a disease category for reimbursement coding.
- Explore mechanisms that will partially or fully cover reimbursement or include as a member benefit health care services associated with weight management, including nutrition education and physical activity programs.

Research and Evaluation

- Develop effective preventive and therapeutic programs for obesity.
- Study the effect of weight reduction programs on health outcomes.
- Analyze the cost-effectiveness data on clinical obesity prevention and treatment efforts and conduct further research where the data are inconclusive.
- Promote research on the maintenance of weight loss.
- Promote research on breastfeeding and the prevention of obesity.
- Review and evaluate the reimbursement policies of public and private health insurance providers regarding overweight and obesity prevention and treatment efforts.

Setting 4: Media and Communications

The media can provide essential functions in overweight and obesity prevention efforts. From a public education and social marketing standpoint, the media can disseminate health messages and display healthy behaviors aimed at changing dietary habits and exercise patterns. In addition, the media can provide a powerful forum for community members who are addressing the social and environmental influences on dietary and physical activity patterns.

Communication

- Emphasize to media professionals that the primary concern of overweight and obesity is one of health rather than appearance.
- Emphasize to media professionals the disproportionate burden of overweight and obesity in low-income and racial and ethnic minority populations and the need for culturally sensitive health messages.
- Communicate the importance of prevention of overweight through balancing food intake with physical activity at all ages.
- Promote the recognition of inappropriate weight change.
- Build awareness of the importance of social and environmental influences on making appropriate diet and physical activity choices.
- Provide professional education for media professionals on policy areas related to diet and physical activity.
- Emphasize to media professionals the need to develop uniform health messages about physical activity and nutrition that are consistent with the *Dietary Guidelines for Americans.*

Action

- Conduct a national campaign to foster public awareness of the health benefits of regular physical activity, healthful dietary choices, and maintaining a healthy weight, based on the *Dietary Guidelines for Americans.*
- Encourage truthful and reasonable consumer goals for weight loss programs and weight management products.

- Incorporate messages about proper nutrition, including eating at least five servings of fruits and vegetables a day, and regular physical activity in youth-oriented TV programming.
- Train nutrition and exercise scientists and specialists in media advocacy skills that will empower them to disseminate their knowledge to a broad audience.
- Encourage community-based advertising campaigns to balance messages that may encourage consumption of excess calories and inactivity generated by fast food industries and by industries that promote sedentary behaviors.
- Encourage media professionals to utilize actors' influences as role models to demonstrate eating and physical activity lifestyles for health rather than for appearance.
- Encourage media professionals to employ actors of diverse sizes.

Research and Evaluation

- Evaluate the impact of community media advocacy campaigns designed to achieve public policy and health-related goals.
- Conduct consumer research to ensure that media messages are positive, realistic, relevant, consistent, and achievable.
- Increase research on the effects of popular media images of ideal body types and their potential health impact, particularly on young women.

Setting 5: Worksites

More than 100 million Americans spend the majority of their day at a worksite. While at work, employees are often aggregated within systems for communication, education, and peer support. Thus, worksites provide many opportunities to reinforce the adoption and maintenance of healthy lifestyle behaviors. Public health approaches in worksites should extend beyond health education and awareness to include worksite policies, the physical and social environments of worksites, and their links with the family and community setting.

Communication

- Inform employers of the direct and indirect costs of obesity.
- Communicate to employers the return-on-investment (ROI) data for worksite obesity prevention and treatment strategies.

Action

- Change workflow patterns, including flexible work hours, to create opportunities for regular physical activity during the workday.
- Provide protected time for lunch, and ensure that healthy food options are available.
- Establish worksite exercise facilities or create incentives for employees to join local fitness centers.
- Create incentives for workers to achieve and maintain a healthy body weight.
- Encourage employers to require weight management and physical activity counseling as a member benefit in health insurance contracts.
- Create work environments that promote and support breastfeeding.
- Explore ways to create Federal worksite programs promoting healthy eating and physical activity that will set an example to the private sector.

Research and Evaluation

- Evaluate best practices in worksite overweight and obesity prevention and treatment efforts, and disseminate results of studies widely.
- Evaluate economic data examining worksite obesity prevention and treatment efforts.
- Conduct controlled worksite studies of the impact of overweight and obesity management programs on worker productivity and absenteeism.

Section 3:
The Power of People and Ideas

Public health efforts are carried by the force of ideas and by the power of commitment. *Healthy People 2010* identifies goals to improve the country's health status, including reducing the prevalence of overweight and obesity. This *Surgeon General's Call To Action To Prevent and Decrease Overweight and Obesity* addresses the *Healthy People 2010* objectives to reduce the prevalence of overweight and obesity and presents many ideas by which this can be done. Translating these ideas into meaningful action will require a great commitment. We must collectively build on existing successful programs in both the public and private sectors, identify current gaps in action, and develop and initiate actions to fill those gaps. Public-private working groups should be formed around key themes or around the major settings in which obesity prevention and treatment efforts need to take place. While the magnitude of the problem is great, the range of potential solutions is even greater. The design of successful interventions and actions for prevention and management of overweight and obesity will require the careful attention of many individuals and organizations working together through multiple spheres of influence.

Individuals

Individuals lie at the foundation of the solution to the problems of overweight and obesity. Individuals can share their own knowledge and habits regarding a healthy diet and physical activity with their children, other family members, friends, and co-workers. Through frank dialogue regarding the methods, challenges, and benefits of adopting a healthy lifestyle, individuals can make the effort to combat the obesity epidemic both personal and relevant.

Organizations

Organizations represent individuals who have common goals and purposes. Organizations can initiate discussions on obesity and overweight within their membership and can establish weight and lifestyle goals. Organizations can develop programs that educate members on food choices and appropriate levels of physical

activity and engage members in these healthy habits. Using their links to and influence within the broader community, organizations can share their experiences in weight management and thus serve as an important public resource.

Industry

Industry has a vital role in the prevention of overweight and obesity. Through the production and distribution of food and other consumer products, industry exerts a tremendous impact on the nutritional quality of the food we eat and the extent of physical activity in which we engage. Industry can use that leverage to create and sustain an environment that encourages individuals to achieve and maintain a healthy or healthier body weight.

Communities

Communities consist of multiple components, including individuals, faith-based and other community organizations, worksites, and governments. A forum should be provided in which all community members can discuss the scope of the problem of overweight and obesity within the community. Also, the nature and adequacy of available resources for public education and treatment, as well as current and future policies and programs to reduce the burden of overweight and obesity within the community, must be addressed. Clearly, the discussions and the strategies adopted will vary depending on the prevalence of obesity and overweight within each community.

Government

Local governments can work together with organizations and communities to facilitate goals for reducing overweight and obesity. Local governments can assist with providing services to increase physical activity and improve nutritional intake. State, Tribal, and local governments can collaborate more with Federal nutrition assistance programs that provide services promoting healthy eating and physical activity. States can form task forces, steering committees, or advisory committees and can also develop State strategic plans. State and national governments can provide funding for research on the effects of interventions on overweight and obesity prevalence, prevention, and treatment, and on trends in diet and exercise

among at-risk populations. Governments can also provide support for public education, public awareness campaigns, and treatment services. Finally, governments can create and promote policies that promote an environment in which healthy dietary and physical activity options are readily accessible.

Creating National Action

Interventions and actions in the fundamental areas of the CARE approach should catalyze a process of national, State, and local action to address overweight and obesity. While strategies and action steps will vary, all who take action should acknowledge and embrace the following principles:

- Actions by diversified and cooperative groups are desirable. Working groups may form around settings or around crosscutting themes, as appropriate, to best leverage their talents and resources against overweight and obesity. Partnerships among all levels of government; public and private national, State, Tribal, and local organizations; and faith-based and other community groups will increase the likelihood that true gaps in action will be addressed. Partnerships also may foster learning, sharing of resources, division of labor, and consistency in the message to the public. Additionally, they may enhance media prominence and the social credibility of actions to address overweight and obesity.
- Actions require vigorous, dedicated commitment. The social, environmental, and behavioral factors responsible for the epidemic of overweight and obesity are firmly entrenched in our society. Identifying and dislodging these factors will require deliberate, persistent action and a degree of patience.
- Actions should strive to help all Americans maintain a healthy or healthier weight through balancing caloric intake and energy expenditure. Actions should focus at multiple levels, targeting the environment, behavior change, and policy.
- Actions should be carefully planned. The choice of actions should be based on the relative feasibility, effectiveness, and suitability of all potential actions, and all partners should have a clearly defined role in the action.

- Actions should be sensitive to the needs of minority populations and to the social stigmatization that can surround overweight and obesity.
- Actions and their outcomes should be evaluated. While implementing a system to monitor outcomes should not stand as a barrier to action, groups that are able should monitor and document the short-term and long-term effects of the actions they take. This type of tracking provides important information for the next round of actions and increases the likelihood of success. Developing a concrete evaluation plan early may help focus the goals for action.

Sustaining National Action

Effectiveness of the public health response to overweight and obesity requires strong leadership, regular monitoring, and committed support of all—government; industry; public, private, and professional organizations; communities; schools; families; and individuals. These features will ensure sustained action, productive collaboration, and ongoing progress toward the vision of this *Call To Action.*

Leadership

A network of leadership across the country needs to be established to ensure that actions are employed in the appropriate settings nationwide. This network should be structured at the organizational, industrial, State, and community levels. The creation of a public-private partnership in the form of a national steering committee could provide an overarching perspective and a more centralized leadership to such efforts. A dialogue among all these spheres of leadership is essential. Several key functions of this leadership structure are described in the following section.

Monitoring

The effectiveness of a CARE approach to overweight and obesity must be assessed at regular intervals. Monitoring should include gathering new information on overweight and obesity as well as reporting on the status of current interventions.

Information Gathering

- Update on the biological, epidemiological, and psychological aspects of obesity and overweight.
- Review of surveillance data systems to track overweight and obesity.
- Update on the latest behavioral and pharmacological interventions for overweight and obesity.
- Discussion of new ideas and goals for continued national activity.

Reporting

- Reporting on progress based on measurable objectives, such as those outlined in *Healthy People 2010.*
- Discussion of the progress achieved through actions undertaken within the various settings.
- Reporting on the status of current policies, programs, and interventions.
- Creation and dissemination of a library of best practices based on evidence-based programs.
- Recognition of exemplary intervention programs, for example, through an awards program.

Monitoring will ensure that all members of the various settings can communicate their ideas and strategies. Monitoring will allow planners to see which objectives are reached or exceeded as well as those that fall short of expectations.

Promotion

In addition to strong leadership and regular evaluation, a successful public health effort requires active promotion. Continuous public education on the magnitude of the problem of overweight and obesity will reinforce the goals of the national effort and will encourage public participation. Therefore, the national action to combat overweight and obesity should:

- Foster a consistent message to the public regarding the risks of overweight and obesity as well as the mechanisms by which a person can adopt a healthy lifestyle.
- Target high-risk groups for education on overweight and obesity.

- Promote interventions that address disparities in the prevalence of overweight and obesity.
- Seek to improve the general sensitivity to the social stigma of overweight and obesity.

Committed Government Support

Local, State, Tribal, and national governments have previously declared their support of efforts to maintain and improve America's health. Such governmental backing may be enhanced through the following:

- Creation of laws and policies that support a healthy physical and nutritional environment for the public.
- Allocation of resources to both government and private organizations to carry out national action to prevent and decrease overweight and obesity.
- Provision of authority to specific Federal and State agencies to enforce policies aimed at reducing overweight and obesity.

Ongoing Dialogue

At a minimum, a national steering committee should convene an annual meeting modeled after the Surgeon General's Listening Session. This event would provide leaders with a useful forum for information exchange and enhance their abilities to carry out the functions listed above.

Section 4:
Vision for the Future

This *Surgeon General's Call To Action To Prevent and Decrease Overweight and Obesity* underscores the tremendous health impact that overweight and obesity have on the United States. Through widespread action on the part of all Americans, this *Call To Action* aims to catalyze a process that will reduce the prevalence of overweight and obesity on a nationwide scale. Without support and investment from a broad array of public and private partners, these efforts will not succeed. With such support, however, there exist few limitations on the potential of this effort to improve the health of individuals, families, communities, and, ultimately, the Nation as a whole.

Surgeon General's Priorities for Action

The previously discussed CARE framework presents a menu of important activities for the prevention and treatment of overweight and obesity. Building from this menu, the Surgeon General identifies the following 15 activities as national priorities for immediate action. Individuals, families, communities, schools, worksites, health care, media, industry, organizations, and government must determine their role and take action to prevent and decrease overweight and obesity.

Communication

The Nation must take an informed, sensitive approach to communicate with and educate the American people about health issues related to overweight and obesity. Everyone must work together to:

- Change the perception of overweight and obesity at all ages. The primary concern should be one of health and not appearance.
- Educate all expectant parents about the many benefits of breastfeeding.
  - Breastfed infants may be less likely to become overweight as they grow older.
  - Mothers who breastfeed may return to pre-pregnancy weight more quickly.
- Educate health care providers and health profession students in the prevention and treatment of overweight and obesity across the lifespan.

- Provide culturally appropriate education in schools and communities about healthy eating habits and regular physical activity, based on the *Dietary Guidelines for Americans,* for people of all ages. Emphasize the consumer's role in making wise food and physical activity choices.

Action

The Nation must take action to assist Americans in balancing healthful eating with regular physical activity. Individuals and groups across all settings must work in concert to:

- Ensure daily, quality physical education in all school grades. Such education can develop the knowledge, attitudes, skills, behaviors, and confidence needed to be physically active for life.
- Reduce time spent watching television and in other similar sedentary behaviors.
- Build physical activity into regular routines and playtime for children and their families. Ensure that adults get at least 30 minutes of moderate physical activity on most days of the week. Children should aim for at least 60 minutes.
- Create more opportunities for physical activity at worksites. Encourage all employers to make facilities and opportunities available for physical activity for all employees.
- Make community facilities available and accessible for physical activity for all people, including the elderly.
- Promote healthier food choices, including at least five servings of fruits and vegetables each day, and reasonable portion sizes at home, in schools, at worksites, and in communities.
- Ensure that schools provide healthful foods and beverages on school campuses and at school events by:
  - Enforcing existing U.S. Department of Agriculture regulations that prohibit serving foods of minimal nutritional value during mealtimes in school food service areas, including in vending machines.

  - Adopting policies specifying that all foods and beverages available at school contribute toward eating patterns that are consistent with the *Dietary Guidelines for Americans.*
  - Providing more food options that are low in fat, calories, and added sugars such as fruits, vegetables, whole grains, and low-fat or nonfat dairy foods.
  - Reducing access to foods high in fat, calories, and added sugars and to excessive portion sizes.
- Create mechanisms for appropriate reimbursement for the prevention and treatment of overweight and obesity.

Research and Evaluation

The Nation must invest in research that improves our understanding of the causes, prevention, and treatment of overweight and obesity. A concerted effort should be made to:

- Increase research on behavioral and environmental causes of overweight and obesity.
- Increase research and evaluation on prevention and treatment interventions for overweight and obesity, and develop and disseminate best practice guidelines.
- Increase research on disparities in the prevalence of overweight and obesity among racial and ethnic, gender, socioeconomic, and age groups, and use this research to identify effective and culturally appropriate interventions.

Conclusion

This *Call To Action* is for all who can have an impact on overweight and obesity in the United States to take action to create a future where:

- It is widely recognized that overweight and obesity can reduce the length and quality of life.
- The etiology of this complex problem of overweight and obesity is better understood.

- Effective and practical prevention and treatment are widely available and integrated in health care systems.
- Environments have been modified to promote healthy eating and increased physical activity.
- Disparities in overweight and obesity prevalence based on race and ethnicity, socioeconomic status, gender, and age are eliminated.
- The health consequences of overweight and obesity are reduced.
- The social stigmatism associated with overweight and obesity is eradicated.

This vision should be approached vigorously and optimistically but with patience. There is no simple or quick answer to this multifaceted challenge. This *Surgeon General's Call To Action To Prevent and Decrease Overweight and Obesity* calls upon individuals, families, communities, schools, worksites, organizations, government, and the media to work together to build solutions that will bring better health to everyone in this country. Working together, we can make this vision become a reality.

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Office of the Surgeon General	Ann Elderkin
Office of Minority Health	Violet Woo
Office on Women's Health	Wanda Jones
	Kathy McCarty
	Jonelle Rowe
President's Council on Physical Fitness and Sports	Christine Spain

Appendix A: Examples of Federal Programs and Initiatives

Programs on overweight and obesity span multiple departments, offices, and agencies in the Federal Government and promote valuable research and action in various settings. These programs are amplified by State, Tribal, local, and private-sector activities. Some examples of Federal initiatives on overweight and obesity, and the programs that support them, are listed below. For more information on a number of these programs, please see appendix B.

Setting 1: Families and Communities

- The Centers for Disease Control and Prevention (CDC) has a community planning tool called the *Planned Approach to Community Health (PATCH)*. This tool can be valuable in the process of developing and sustaining action.
- The Federal Highway Administration, the Environmental Protection Agency, and the Georgia Department of Transportation have developed *Strategies for Metropolitan Atlanta's Regional Transportation and Air Quality,* a document that provides a framework for assessing which factors of land use and transportation investment policies have the greatest potential to reduce the level of automobile dependence, which may consequently increase walking and bicycling activities while promoting the economic and environmental health of the Atlanta metropolitan region.
- The Head Start Bureau of the Administration for Children and Families, in conjunction with members of the community and various Federal agencies, will convene a focus group in fall 2002 to identify issues, effective practices, and recommendations addressing overweight in children of the Head Start Program.
- The Head Start Bureau has published a *Training Guide for the Head Start Learning Community: Enhancing Health in the Head Start Workplace*. The guide addresses the importance of health in the workplace and presents health

promotion principles and activities that can be applied to a variety of workplace health issues, including achieving and maintaining a healthy weight.

- The Health Resources and Services Administration (HRSA) has sponsored Statewide Partnerships in Women's Health that have begun a new prevention initiative entitled WISEWOMAN. Three Statewide Partnerships in Women's Health grantees (Alaska, North Carolina, and Vermont) have WISEWOMAN programs in their States. These grantees are encouraged to collaborate with the WISEWOMAN programs in their States and with other community-based partners to support cardiovascular screenings for women aged 40 to 64 years who then receive nutrition counseling and physical activity support.
- Under the Healthy People 2010 initiative, the Department of Health and Human Services (HHS) has produced the document *Healthy People in Healthy Communities: A Community Planning Guide Using Healthy People 2010*. This document is a guide to developing an action plan through building community coalitions, creating a vision, measuring results, and creating partnerships. It outlines strategies to help start community activities.
- HHS sponsored the development of a *Healthy People 2010 Toolkit* to provide guidance, technical tools, and resources to groups as they develop and sustain a successful plan of action. The *Toolkit* is organized around common elements of health planning and improvement and provides useful tips for getting started.
- HHS has recently released a *Blueprint for Action on Breastfeeding*. The *Blueprint for Action*, which was developed by health and scientific experts from 14 Federal agencies and 23 health care professional organizations, offers action steps for the health care system, families, the community, researchers, and the workplace to better focus attention on the importance of breastfeeding.
- HHS, the U.S. Department of Agriculture (USDA) and other organizations have collaborated to form the United States Breastfeeding Committee. They have developed *Breastfeeding in the United States: A National Agenda*, which is a strategic plan to protect, promote, and support breastfeeding.

- The Indian Health Service and Head Start Bureau have partnered in the development of an initiative, Healthy Children, Healthy Families, and Healthy Communities: A Focus on Diabetes and Obesity Prevention, which has focused on obesity and diabetes prevention activities for Head Start children, families, staff, and communities.
- The National Institutes of Health (NIH) Pathways research fosters culturally appropriate healthy eating practices and increased physical activity among American Indian children, their families, food service staff, and physical education and classroom teachers.
- NIH and the National Recreation and Park Association have developed the Hearts N' Parks program, which will create national dissemination magnet sites for implementing activities encouraging healthy eating and physical activity.
- NIH has developed a health awareness campaign called Sisters Together: Move More, Eat Better to encourage African American women in Boston to maintain or achieve a healthier weight by increasing their physical activity and eating healthy foods. NIH is currently expanding this program to other sites.
- The Office for American Indian, Alaska Native, and Native Hawaiian Programs has developed the Wisdom Steps Health Promotion Program for Elders, a partnership between the Tribes and Minnesota's State Unit on Aging. The program promotes health awareness, with major emphasis on assisting elders in weight loss, participation in exercise programs, improvement of diet, and smoking cessation.
- The Office on Women's Health has developed the Girls and Obesity Initiative, serving to identify existing government obesity programs and to adapt these programs toward gender-specific guidance for girls.
- USDA's Cooperative State Research, Education, and Extension Service (CSREES) has developed a nationwide project, Reversing Childhood Obesity Trends: Helping Children Achieve Healthy Weights. This project will achieve its goals through the integration of research, education, and innovative approaches to help children achieve healthy weights. The project will test a number of program interventions designed to reduce the prevalence of

childhood overweight and obesity in various populations. Both quantitative and qualitative methodologies will be employed in determining the most appropriate and effective program intervention for a specific population.

- CSREES also funds WIN the Rockies (Wellness IN the Rockies), which seeks to improve attitudes and behaviors about food, physical activity, and body image among rural residents of Idaho, Montana, and Wyoming in order to reverse the rising tide of obesity. Interventions will be community based and will target youth, limited-resource audiences, and overweight or obese adults.
- The Women, Infants, and Children (WIC) Farmer's Market Nutrition Program was established by Congress to provide fresh and nutritious foods from farmers' markets to low-income families participating in the WIC program.

Setting 2: Schools

- The Assistant Secretary for Health, the Assistant Secretary of Elementary and Secondary Education, and USDA's Under Secretary for Food, Nutrition, and Consumer Services co-chair a Federal Interagency Committee on School Health that serves to integrate efforts across three Cabinet departments to improve the health and education of young people, including efforts to prevent and decrease obesity.
- CDC currently supports 20 State education agencies for coordinated school health programs to reduce the following chronic disease risk factors: tobacco use, poor eating habits, physical activity, and obesity. CDC also has developed guidelines for school health programs based on a review of published research and input from academic experts.
- *School Health Index for Physical Activity and Healthy Eating: A Self Assessment & Planning Guide,* is a guide developed by CDC that enables schools to identify strengths and weaknesses of their physical activity and nutrition policies and programs; develop an action plan for improving student health; and involve teachers, parents, students, and the community in improving school services.

- CDC and USDA are developing a mentoring curriculum to promote nutrition and physical activity in 11- to 18-year-old African American males in an effort to address racial disparities in nutrition and physical activity.
- CDC, the President's Council on Physical Fitness and Sports (PCPFS), and the Department of Education have developed a report, *Promoting Better Health for Young People Through Physical Activity and Sports,* in which they describe strategies to increase the number of youth engaging in physical activity.
- PCPFS has developed the President's Challenge Physical Activity and Fitness Awards Program, incorporating the Presidential, National, Participant, and Health Fitness Awards, and for the first time this year, the Presidential Active Lifestyle Award; the State Champion Award; the National School Demonstration Program; and the Presidential Sports Award Program as means of encouraging individual children and schools to adopt and maintain an active, fit, and healthy lifestyle.
- USDA has launched efforts to foster healthy school environments that support proper nutrition and the development of healthful eating habits, including re-emphasizing regulations that prohibit serving foods of minimal nutritional value in the food service area during meal periods.
- USDA's Team Nutrition includes a multitude of nutrition education materials for children ranging from prekindergarten through high school that support concepts to maintain a healthy weight. Team Nutrition provides grants to States promoting the Federal *Dietary Guidelines for Americans,* healthy food choices, and physical activity.
- USDA's Team Nutrition resources include a Food and Nutrition Service's "action kit," *Changing the Scene: Improving the School Nutrition Environment,* which can be used at the State and local levels to educate decision makers about the role school environments play in helping students meet the goals of the *Dietary Guidelines for Americans.*

Setting 3: Health Care

- The Agency for Healthcare Research and Quality is supporting the U.S. Preventive Services Task Force's update to the 1996 *Guide to Clinical Preventive Services* chapter on screening for obesity. The report will be expanded to address screening and counseling for overweight and obesity and will assess the effectiveness of primary care-based interventions to prevent or treat obesity.
- CDC has been active in leading discussions about reimbursement, or inclusion as a member benefit, for services relating to the prevention and treatment of overweight and obesity.
- CDC is focusing on the prevention of pediatric overweight in the primary care setting.
- The Department of Defense has developed the LEAN Program, a healthy lifestyle model for the treatment of obesity administered in the Tripler Army Medical Center.
- HRSA and other partners including PCPFS, NIH, and CDC have developed *Bright Futures in Practice: Physical Activity.* These guidelines and tools emphasize health promotion, disease prevention, and early recognition of physical activity issues and concerns of infants, children, and adolescents.
- HRSA, in collaboration with other partners, has developed *Bright Futures in Practice: Nutrition.* These nutrition guidelines provide a thorough overview of nutrition supervision during infancy, childhood, and adolescence. The guidelines also highlight how partnerships among health professionals, families, and communities can improve the nutritional status of infants, children, and adolescents.
- HRSA sponsors a Diabetes and Hypertension Collaborative that includes nutrition and weight management education for patients in community health centers.
- NIH has developed the *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: Evidence Report,* which has been formatted into various products suitable for use by physicians and other health professionals.

- NIH has collaborated with other Federal agencies to conduct and promote research on obesity and associated diseases. These studies focus on biologic and environmental determinants of human overweight and obesity, prevention strategies, and treatment modalities.
- NIH has developed a Weight-control Information Network to provide health professionals and consumers with science-based materials on obesity, weight control, and nutrition.
- HHS has charged members of NIH's National Task Force on Prevention and Treatment of Obesity to publish evidence reviews of overweight and obesity in leading medical journals to provide clinicians with the latest and most accurate information.

Setting 4: Media and Communications

- CDC is using existing surveillance systems to develop biennial reports on national, State, and local trends in the prevalence of cardiovascular disease, cancer, and diabetes; the risk factors related to these diseases; and the school-based programs that may reduce these risk factors.
- CDC, in conjunction with PCPFS and other private and public agencies, is *Promoting Better Health for Young People Through Physical Activity and Sports,* a document that reports on the strategies being used to involve families, school programs, recreation programs, community structural environment, and media campaigns on physical activity.
- The *PCPFS Research Digest,* a quarterly publication, synthesizes scientific information on specific topics in physical fitness, exercise science, and sports medicine for dissemination to fitness professionals and citizens.

Setting 5: Worksites

- CDC has developed the Personal Energy Plan (PEP), a self-help program that promotes healthy eating and physical activity in the workplace. Worksites are encouraged to supplement the PEP self-help kits with added activities and modifications to the nutritional and physical environment.

- CDC has a Web site, *Ready, Set, It's Everywhere You Go: CDC's Guide to Promoting Moderate Physical Activity,* which provides resources and information on how adults can incorporate physical activity into their routines at the workplace.
- CDC has provided funding to State departments of health in Maine, Montana, New York, and North Carolina for the establishment of health promotion programs at multiple worksites. The programs are intended to formulate and implement policy and environmental changes that support increased physical activity and healthy eating.

Appendix B:
Federal Program Resource List

Blueprint for Action on Breastfeeding
Office on Women's Health
U.S. Department of Health and Human Services
200 Independence Avenue, SW., Room 730B
Washington, DC 20201
Phone: (202) 690-7650
Fax: (202) 205-2631
http://www.4woman.gov/Breastfeeding/index.htm

Bright Futures in Practice
Bright Futures Project
HRSA/Maternal and Child Health Bureau
5600 Fishers Lane, Room 18A55
Rockville, MD 20857
Phone: (301) 443-2340
Fax: (301) 443-4842
Email: cdegraw@hrsa.gov
http://www.brightfutures.org

CDC Reports and Guidelines for Overweight and Obesity
http://www.cdc.gov/health/obesity.htm
Phone: (800) 311-3435

Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report

NHLBI Health Information Network
P.O. Box 30105
Bethesda, MD 20824-0105
Phone: (301) 592-8573
Fax: (301) 592-8563
http://www.nhlbi.nih.gov/guidelines/obesity/ob_home.htm

Dietary Guidelines for Americans

Phone: (888) 878-3256
http://www.health.gov/dietaryguidelines

Exercise: A Guide from the National Institute on Aging

http://www.nia.nih.gov/health/pubs/nasa-exercise/index.htm

Exercise: A Video from the National Institute on Aging

http://www.nia.nih.gov/exercisevideo/

5 A Day for Better Health

National Cancer Institute
6130 Executive Boulevard, EPN 232
Bethesda, MD 20892-7332
Phone: (301) 496-8520
http://dccps.nci.nih.gov/5aday/

Girls and Obesity Initiative

Office on Women's Health
U.S. Department of Health and Human Services
200 Independence Avenue, SW., Room 730B
Washington, DC 20201
Phone: (202) 690-7650
Fax: (202) 205-2631
http://www.4woman.gov/owh/education.htm

Guidance on How To Understand and Use the Nutrition Facts Panel on Food Labels

U.S. Food and Drug Administration
Center for Food Safety and Applied Nutrition
Phone: (888) SAFEFOOD
http://www.cfsan.fda.gov/~dms/foodlab.html

Guide to Clinical Preventive Services, 2nd edition, 1996

U.S. Preventive Services Task Force
Phone: (800) 358-9295
http://www.ahrq.gov/clinic/uspstfix.htm

Head Start Bureau—Administration for Children and Families

Phone: (202) 205-8572
http://www2.acf.dhhs.gov/programs/hsb/

healthfinder® Gateway to Reliable Consumer Health Information on the Internet

National Health Information Center
U.S. Department of Health and Human Services
P.O. Box 1133
Washington, DC 20013-1133
Phone: (800) 336-4797
http://www.healthfinder.gov

Healthy Children, Healthy Families, and Healthy Communities

American Indian/Alaska Natives Programs Branch
Administration on Children, Youth and Families
Administration for Children and Families
330 C Street, SW., Room 2030
Washington, DC 20447
Phone: (877) 876-2662
Fax: (202) 205-8436

Healthy People 2010 Initiative

Office of Disease Prevention and Health Promotion
U.S. Department of Health and Human Services
200 Independence Avenue, SW., Room 738G
Washington, DC 20201
Phone: (202) 401-6295
Fax: (202) 205-9478
http://www.health.gov/healthypeople

Healthy People in Healthy Communities: A Community Planning Guide Using Healthy People 2010

http://www.health.gov/healthypeople/publications/HealthyCommunities2001.

Healthy People 2010 Toolkit

Phone: (877) 252-1200
http://www.health.gov/healthypeople/state/toolkit

Hearts N' Parks

National Heart, Lung, and Blood Institute
P.O. Box 30105
Bethesda, MD 20824
Phone: (301) 592-8573
Fax: (301) 592-8563
Email: NHLBIinfo@rover.nhlbi.nih.gov
http://www.nhlbi.nih.gov/health/prof/heart/obesity/hrt_n_pk/index.htm

LEAN Program

Tripler Army Medical Center
Phone: (808) 433-6060
http://das.cs.amedd.army.mil/journal/J9725.HTM

National Breastfeeding Promotion Campaign

USDA Food and Nutrition Service
Phone: (800) 277-4975
http://www.fns.usda.gov/wic/content/bf/brpromo.htm

NHLBI Obesity Education Initiative

NHLBI Health Information Network
P.O. Box 30105
Bethesda, MD 20824-0105
Phone: (301) 592-8573
Fax: (301) 592-8563
http://www.nhlbi.nih.gov and
http://rover.nhlbi.nih.gov/health/public/heart/obesity/lose_wt/

Nutrition.Gov
http://www.nutrition.gov

Partnership for Healthy Weight Management
Phone: (202) 326-3319
http://www.consumer.gov/weightloss/

PATCH
CDC's Planned Approach to Community Health
(770) 488-5426
http://www.cdc.gov/nccdphp/patch/index.htm

Physical Activity and Health: A Report of the Surgeon General
Phone: (202) 512-1800
http://www.cdc.gov/nccdphp/sgr/sgr.htm

President's Council on Physical Fitness and Sports
200 Independence Avenue, SW., Room 738H
Washington, DC 20201
Phone: (202) 690-9000
Fax: (202) 690-5211
http://www.fitness.gov

Promoting Better Health for Young People Through Physical Activity and Sports
Phone: (888) 231-6405
http://www.cdc.gov/nccdphp/dash/presphysactrpt/index.htm

Sisters Together: Move More, Eat Better
1 WIN WAY
Bethesda, MD 20892-3665
Phone: (202) 828-1025 or 1 (877) 946-4627
Fax: (202) 828-1028
Email: win@info.niddk.nih.gov
http://www.niddk.nih.gov/health/nutrit/sisters/sisters.htm

Team Nutrition
USDA Food and Nutrition Service
Child Nutrition Division
3101 Park Center Drive, Room 640
Alexandria, VA 22302
Phone: (703) 305-2590
Fax: (703) 305-2879
Email: cndinternet@fns.usda.gov
http://www.fns.usda.gov/cnd

USDA Food and Nutrition Service
Phone: (703) 305-2286
http://www.fns.usda.gov

USDA's National Agricultural Library
Phone: (301) 504-5755
http://www.nal.usda.gov

Weight-control Information Network (WIN)
1 WIN WAY
Bethesda, MD 20892-3665
Phone: (202) 828-1025 or 1 (877) 946-4627
Fax: (202) 828-1028
Email: win@info.niddk.nih.gov
http://www.niddk.nih.gov/health/nutrit/win.htm

WIN the Rockies (Wellness IN the Rockies)

http://www.uwyo.edu/wintherockies

Wisdom Steps Health Promotion Program for Elders

Office for American Indian, Alaskan Native, and Native Hawaiian
Phone: (202) 619-2713
Fax: (202) 260-1012
http://www.aoa.dhhs.gov/factsheets/natams.html

Appendix H

California PFT Report to the Governor

2007 California Physical Fitness Test

Report to the Governor and the Legislature

Prepared by
California Department of Education

December 2007

Available on the CDE Web site at http://www.cde.ca.gov/ta/tg/pf/

Introduction

In spring 2007, physical fitness testing was conducted in California public schools in grades five, seven, and nine. The test used for physical fitness testing is the *FITNESSGRAM*®, designated for this purpose by the State Board of Education. This report summarizes results of the 2007 test administration, and provides a summary comparison with the results from 2005 and 2006.

Background

Education Code Section 60800 specifies that the California Department of Education shall compile the results of the physical performance test and submit a report every two years, by December 31, to the Governor and the Legislature. This report fulfills that statute.

Description of the Test

The *FITNESSGRAM*® was developed by The Cooper Institute in Dallas, Texas with the primary goal of assisting students in establishing physical activity as part of their daily lives. Because of this goal, the *FITNESSGRAM*® provides a number of performance options so that all students, including those with special needs, have the maximum opportunity to participate.

Physical fitness testing consists of three broad components of fitness: 1) aerobic capacity, 2) body composition, and 3) muscular strength, endurance, and flexibility. To ensure comprehensive measurement of all three components, the *FITNESSGRAM*® is comprised of the following six fitness areas with multiple performance options in most areas:

- **Aerobic Capacity** – Progressive Aerobic Cardiovascular Endurance Run (PACER),
  One-Mile Run, or Walk Test
- **Body Composition** – Skinfold Measurements, Body Mass Index, or Bioelectric Impedance Analyzer
- **Abdominal Strength and Endurance** – Curl-Up
- **Trunk Extensor Strength and Endurance** – Trunk Lift
- **Upper Body Strength and Endurance** – Push-Up, Modified Pull-Up, or Flexed-Arm Hang
- **Flexibility** – Back-Saver Sit and Reach or Shoulder Stretch

More detailed information regarding the *FITNESSGRAM*®, the six fitness areas, and the performance criteria can be found at the California Department of Education Web site: http://www.cde.ca.gov/ta/tg/pf/.

The Fitness Criteria

The *FITNESSGRAM*® uses objective criteria to evaluate fitness performance. These criteria represent a level of fitness that offers a degree of protection against diseases resulting from physical inactivity. Performance on each of the fitness-area tests is classified into two general levels:

- Healthy Fitness Zone
- Needs Improvement (i.e., not in the Healthy Fitness Zone)

The desired performance goal for each fitness-area test is the Healthy Fitness Zone (HFZ). Test results within the HFZ reflect reasonable levels of physical fitness that can be attained by most students. All students should strive to achieve a score within the HFZ for each fitness-area test.

Results of 2007 Testing

A total of 1,370,315 students were administered the California Physical Fitness Test (PFT) in 2007, representing approximately 90 percent of California public school students enrolled in grades five, seven, and nine.

Tables 1 and 2 provide an overall summary of the results of the 2007 PFT by grade level. The percent of students in the Healthy Fitness Zone (HFZ) for each fitness area is presented in Table 1, and the percent of students meeting the HFZ criteria by the number of physical fitness areas is presented in Table 2. Both tables include comparison data from 2005 and 2006.

Table 1: Percentage of Students in the Healthy Fitness Zone by Fitness Area (2005-07)

Physical Fitness Area	Grade 5			Grade 7			Grade 9		
	2005	2006	2007	2005	2006	2007	2005	2006	2007

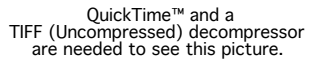
Aerobic Capacity	58.4	60.2	62.7	59.8	60.5	62.2	50.9	52.4	55.5
Body Composition	66.4	67.4	67.9	66.7	67.0	67.7	66.9	68.0	68.7
Abdominal Strength	80.2	80.6	80.2	83.7	83.1	83.5	81.3	82.6	84.0
Trunk Extensor Strength	87.4	88.2	87.9	88.5	89.3	89.6	84.3	86.3	87.9
Upper Body Strength	66.6	67.1	68.5	68.5	68.7	70.1	68.7	69.5	72.2
Flexibility	65.7	66.6	68.1	71.5	72.4	73.9	69.3	70.3	73.6

As summarized in the bullet points below* the data in Table 1 indicate that while a majority of students across all grades tested met minimum fitness levels for each area in 2007, a notable percentage of students did not.

- Aerobic Capacity: 56-63 percent of students were in the HFZ
- Body Composition: 68-69 percent of students were in the HFZ
- Abdominal Strength: 80-84 percent of students were in the HFZ
- Trunk Extensor Strength: 88-90 percent of students were in the HFZ
- Upper Body Strength: 69-72 percent of students were in the HFZ
- Flexibility: 68-74 percent of students were in the HFZ

Of the six fitness areas tested, overall scores for Trunk Extensor Strength in 2007 were the highest (average percent in the HFZ = 88.5 percent), while overall scores for Aerobic Capacity were the lowest (average percent in the HFZ = 60.1 percent).

Figure 1: Average Change in the Percentage of Students in the Healthy Fitness Zone by Fitness Area (2005-07)



From 2005 to 2007, there was an increase in the percentage of students in the HFZ in all six physical fitness areas across all three grade levels. As shown in Figure 1, the largest increase in the overall percentage of students in the HFZ between 2005 and 2007 was for Aerobic Capacity (average change = 3.8 percentage points), while the smallest increase between 2005 and 2007 was for Abdominal Strength (average change = 0.8 percentage points).

Table 2: Percentage of Students by Number(s) of Areas in the Healthy Fitness Zone (2005-07)

Number of Areas in the Healthy Fitness Zone	Grade 5			Grade 7			Grade 9		
	2005	2006	2007	2005	2006	2007	2005	2006	2007

6 of 6	24.5	25.6	27.1	28.8	29.6	30.9	26.7	27.4	30.1
5 of 6	26.3	26.4	26.3	26.6	26.1	26.2	26.3	26.4	26.5
4 of 6	20.7	20.5	20.2	19.3	19.2	19.1	19.2	19.4	19.2
3 of 6	14.4	14.0	13.7	12.7	12.9	12.5	12.1	12.7	12.2
2 of 6	8.2	8.2	8.0	7.2	7.3	7.0	6.6	6.8	6.3
1 of 6	3.7	3.7	3.6	3.1	3.1	3.0	3.2	3.3	2.9
0 of 6	1.8	1.5	1.2	2.3	1.9	1.3	5.8	4.0	2.8

NOTE: Columns may not add up to 100 percent due to rounding.

The PFT performance goal is to achieve the HFZ for all six fitness areas tested. As shown in Table 2, between 27 and 31 percent of students met this goal in 2007.

- Grade Five: 27.1 percent of students achieved the HFZ in six areas
- Grade Seven: 30.9 percent of students achieved the HFZ in six areas
- Grade Nine: 30.1 percent of students achieved the HFZ in six areas

The corollary outcome of these findings is that approximately 70 percent of public school students have not met the HFZ for all six fitness areas.

Figure 2: Change in the Percentage of Students in Six of Six Healthy Fitness Zones by Grade (2005-07)

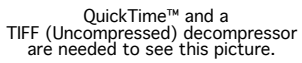


Figure 2 shows the 2005-2007 change in the percent of students achieving the HFZ in six of six areas by grade. All grade levels tested showed an increase over this period.

- Grade Five: increased 2.6 percentage points
- Grade Seven: increased 2.1 percentage points
- Grade Nine: increased 3.4 percentage points

Summary and Implications

This is the eighth year that quality data about the fitness of California's youth has been reported. Full and complete public access to the summary data is available at http://www.cde.ca.gov/ta/tg/pf/. This Web site provides reports for the state and every county, school district, and school.

Current data show that while a minority of California students at the three grade levels tested are meeting the performance goal established for the PFT, gains are being made from year-to-year. There remains much work to do to ensure high levels of fitness for students in California. All students could benefit from a greater emphasis on areas of physical fitness, especially aerobic capacity, body

composition, upper body strength, and flexibility.

School and district administrators, teachers, parents, and guardians can examine the data to get a more complete picture of the yearly fitness levels of their students and children. School districts and schools are encouraged to use the data they receive from this test to examine and make important changes to their physical education programs. Schools and parents and guardians have the opportunity to work together to use this information to inform plans and strategies to improve the physical activity opportunities offered to students during and outside of the regular school day. Collaboration among educators and families is key to effectively increasing the health-related physical fitness of all California’s students.