



# Year 2 Results from the Kansas Fitness Information Tracking (KFIT) System: 2012/2013 School Year



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# A report developed for Healthy Kansas Schools

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# Introduction

Kansas Fitness Information Tracking (K-FIT) is a Healthy Kansas Schools project funded by the Kansas Health Foundation to enhance the understanding of the relationships between various fitness measures (i.e. aerobic capacity, muscular endurance, flexibility) and individual academic indicators. The K-FIT project seeks to further validate the importance of physical education and physical activity to the academic mission of schools. As part of this initiative, K-FIT aims to provide FITNESSGRAM® to 900 schools statewide.

FITNESSGRAM is an online system that enables participating schools to incorporate uniform fitness testing into their physical education curriculum and submit students' results to the Kansas State Department of Education (KSDE). K-FIT is an opportunity for physical educators to help Kansas students set and work toward personal fitness goals through the use of FITNESSGRAM.

In year 2 of the K-FIT project, during the 2012/2013 school year, more than 300 schools across Kansas submitted FITNESSGRAM data to KSDE on approximately 56,000 students. This was a substantial increase over the amount of data submitted during the prior 2011/2012 school year when 152 schools across Kansas submitted FITNESSGRAM data on more than 17,000 students.

KSDE links student-level data from the following sources to create the K-FIT student database:

- Demographics and absenteeism from the Kansas Individual Data on Students (KIDS) database
- Student academic performance assessment results for reading, math and science
- FITNESSGRAM test results

Data were provided by KSDE to the Kansas Department of Health and Environment (KDHE) for statistical analysis. All data were released to KDHE in accordance with the Family Education Rights and Privacy Act.

A total of 56,253 student records were entered into the K-FIT data system during the 2012/2013 school year. Records of students with the following characteristics were excluded from analyses (please see the technical notes for details on the exclusion criteria):

- Students in grades K through 3 and grades 10 through 12
- Students with physical, mental, emotional or developmental disabilities
- Records with missing sex and race/ethnicity data
- Records with no FITNESSGRAM test results

A total of 38,843 student records in the K-FIT database were analyzed and these analyses are presented in this report.

For analyses on fitness measures and weight status, additional student records were also excluded if the fitness tests had scores of zero or if height, weight or body mass index (BMI) data were invalid based on ranges of biologically implausible values as defined by the World Health Organization. BMI validity is computed separately from weight and height validity (see Technical Notes for more information).

Similar to the year 1 report, the purpose of this report is to enhance the understanding of the relationships between various fitness measures (i.e. aerobic capacity, muscular endurance, flexibility) and individual academic indicators for students in grades 4 through 9 in the K-FIT database. The K-FIT project seeks to further validate the importance of physical education and physical activity to the academic mission of schools. Please note: results are based on a convenience sample of schools and only reflect students who were assessed at participating K-FIT schools and are not generalizable to all Kansas students.

## Overview of Fitness Tests

Five student fitness tests were administered using FITNESSGRAM: aerobic capacity, curl-up, trunk lift, 90 degree push-up, and the back-saver sit and reach. Following is a brief description of each test and how it is scored. For more information about how each test is conducted and scored, please refer to the *FITNESSGRAM/ACTIVITYGRAM Test Administration Manual* (The Cooper Institute, 2010).



Aerobic Capacity: The Progressive Aerobic Cardiovascular Endurance Run (PACER) is the default aerobic capacity test in FITNESSGRAM. The PACER score is the total number of laps completed by the student. A lap is defined as one 20-meter distance. A 15-meter version of the PACER is also available for use in smaller facilities. PACER laps are converted to an aerobic capacity score. (See technical notes for more information about how the aerobic capacity score is calculated.)

Curl-up: The curl-up is a test of abdominal strength and endurance. It is a safer and more effective test than the modified sit-up because it does not involve the use of the hip flexor muscles and minimizes compression to the spine. The score is the number of curl-ups performed by the student (maximum=75).



Trunk lift: The trunk lift is a test of trunk extensor strength and flexibility. For this test, students lift their upper body off the floor using the back muscles and hold the position to allow for measurement.

The score is the number of inches the upper body is lifted off the ground while the student is facedown (maximum=12 inches).



90 degree push-up: The 90 degree push-up is a test of upper body strength and endurance. For this test, a student bends the elbow to 90 degrees with the upper arm parallel to the floor. The score is the number of 90 degree push-ups performed by the student.



inches).

Back-saver sit and reach: The back-saver sit and reach is a test of flexibility, particularly the flexibility of the hamstring muscles. For this test, a student reaches to a specified distance on the right and left sides of the body. The score is the number of inches on each side the student can reach on the test apparatus (maximum=12

For each test, students were categorized based on whether or not their score met the FITNESSGRAM Healthy Fitness Zone (HFZ) standard as outlined in the *FITNESSGRAM/ACTIVITYGRAM Test Administration Manual*. HFZ standards are age- and gender-specific. Additionally, a HFZ score was computed to sum the total number of fitness tests for which students met the HFZ standard. The HFZ score values were fewer than two, two, three, four, or all five HFZ standards met.



# Student Demographics

Among students in the K-FIT database, approximately half are girls (50.9%). More than half (54.5%) of students are non-Hispanic white, 1 in 10 (10.3%) are non-Hispanic African-American, and 1 in 4 (26.3%) are Hispanic. Approximately 17.7 percent of students are English for Speakers of Other Languages (ESOL) program eligible.

**Table 1. Demographics of students in K-FIT database, Kansas 2012-2013 school year**

		N	%
	Total	<b>38,843</b>	<b>100.0%</b>
<b>Gender</b>			
	Girls	19,765	50.9%
	Boys	19,078	49.1%
<b>Grade</b>			
	4	7,682	19.8%
	5	9,371	24.1%
	6	5,487	14.1%
	7	7,042	18.1%
	8	4,338	11.2%
	9	4,923	12.7%
<b>Race/ethnicity</b>			
	Non-Hispanic (NH) white	21,165	54.5%
	NH African-American	3,996	10.3%
	NH Asian	1,314	3.4%
	NH other/multiracial	2,171	5.6%
	Hispanic	10,197	26.3%
<b>ESOL Eligibility Status</b>			
	Not ESOL eligible	31,986	82.4%
	ESOL eligible	6,857	17.7%

Source: 2012/2013 K-FIT database, KSDE

# Student Fitness

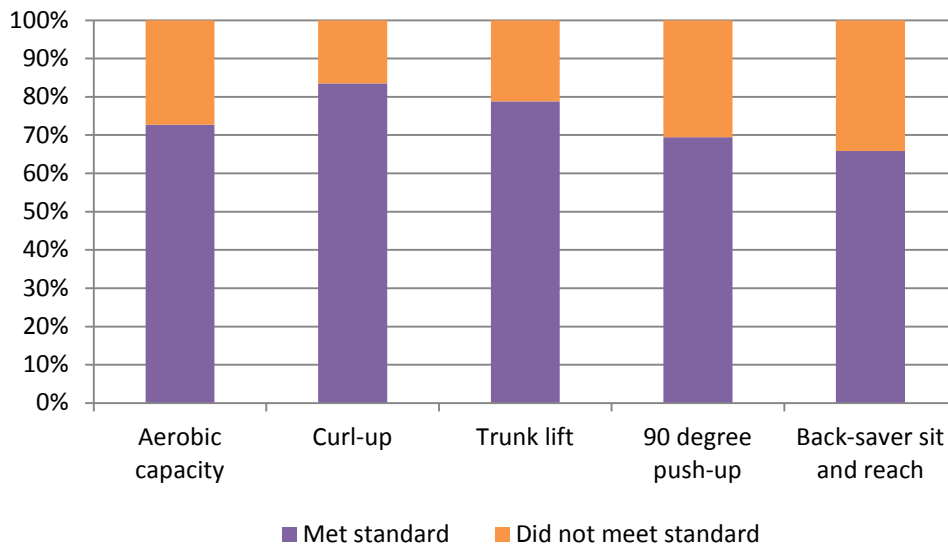
Among students in the KFIT database, approximately 72.7 percent met the HFZ standard for aerobic capacity; 83.5 percent met the standard for curl-ups; 78.8 percent met the standard for trunk lift; 69.5 percent met the standard for the 90 degree push-up; and 65.9 percent met the standard for the back-saver sit and reach (Table 2, Figure 2). Please see Technical Notes for information about these fitness tests.

**Table 2. Percentage of students in K-FIT database who met and did not meet FITNESSGRAM Healthy Fitness Zone standards, by selected fitness test, Kansas 2012-2013 school year**

	N	Met standard	Did not meet standard
Aerobic capacity	25,920	72.7%	27.3%
Curl-up	37,405	83.5%	16.5%
Trunk lift	33,666	78.8%	21.2%
90 degree push-up	36,307	69.5%	30.5%
Back-saver sit and reach	34,895	65.9%	34.1%

Source: 2012/2013 K-FIT database, KSDE

**Figure 2. Percentage of students in K-FIT database who met and did not meet FITNESSGRAM Healthy Fitness Zone standards, by selected fitness test, Kansas 2012-2013 school year**



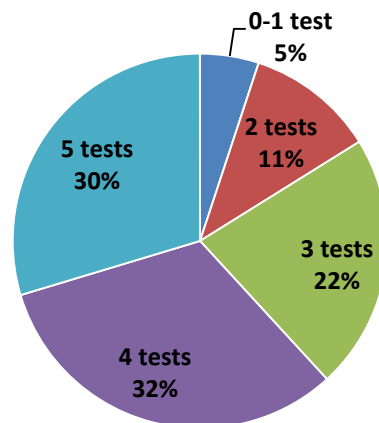
Among students in the KFIT database who completed all five fitness measures (n=22,128), 29.7 percent met the HFZ standard on all five fitness measures while 5.1 percent met the HFZ standard on fewer than two fitness measures (Table 3, Figure 3).

**Table 3. Percentage of students in K-FIT database who met FITNESSGRAM Healthy Fitness Zone standards for 0-1, 2, 3, 4 or all 5 fitness tests, Kansas 2012-2013 school year**

Number of fitness tests for which HFZ standards were met	N	%
0-1 test	1,120	5.1%
2 tests	2,450	11.1%
3 tests	4,880	22.1%
4 tests	7,115	32.2%
5 tests	6,563	29.7%

Source: 2011/2012 K-FIT database, KSDE

**Figure 3. Percentage of students in K-FIT database who met FITNESSGRAM Healthy Fitness Zone standards for 0-1, 2, 3, 4 or all 5 fitness tests, Kansas 2012-2013 school year**



Among students in the K-FIT database, 72.7 percent met the HFZ standard for aerobic capacity (Table 4). The percentage of students who met this standard is 80.7 percent among boys and 64.7 percent among girls; 77.9 percent among non-Hispanic white students, 67.2 percent among Non-Hispanic African-American students and 64.5 percent among Hispanic students; 64.2 percent among students who are English for Speakers of

Other Languages program (ESOL) eligible and 74.6 percent among students who are not ESOL eligible.

**Table 4. Percentage of students in K-FIT database who met and did not meet aerobic capacity fitness standards, by selected demographic characteristics, Kansas 2012-2013 school year**

	N	Met standard	Did not meet standard
Total	25,920	72.7%	27.3%
<b>Gender</b>			
Girls	13,020	64.7%	35.3%
Boys	12,900	80.7%	19.3%
<b>Grade</b>			
4	2,787	78.4%	21.6%
5	7,055	75.7%	24.3%
6	3,802	72.1%	27.9%
7	5,403	71.8%	28.2%
8	3,337	70.0%	30.0%
9	3,536	66.6%	33.4%
<b>Race/ethnicity</b>			
Non-Hispanic (NH) white	13,800	77.9%	22.1%
NH African-American	2,606	67.2%	32.9%
NH Asian	865	78.4%	21.6%
NH other/multiracial	1,458	70.0%	30.0%
Hispanic	7,191	64.5%	35.5%
<b>ESOL Eligibility Status</b>			
Not ESOL eligible	21,035	74.6%	25.4%
ESOL eligible	4,885	64.2%	35.8%

Source: 2012/2013 K-FIT database, KSDE

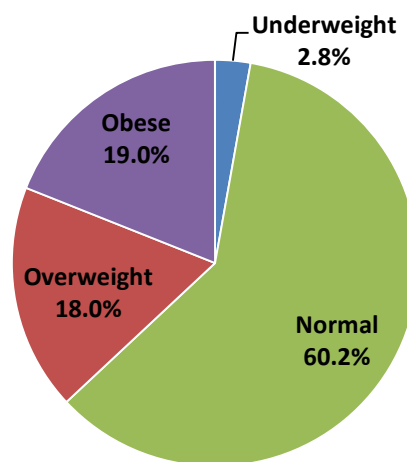
The odds of not meeting the HFZ standard for aerobic capacity were significantly higher among girls compared with boys (OR=2.27, 95% CI: 2.14-2.41); among students in grade 9 compared with students in grade 4 (OR=1.85; 95% CI: 1.50-2.29); among Hispanic compared with non-Hispanic white students (OR=1.56; 95% CI: 1.44-1.68); among non-Hispanic African-American compared with non-Hispanic white students (OR=1.48; 95% CI: 1.33-1.65); and among ESOL program eligible compared with non-ESOL program eligible students (OR=1.25; 95% CI: 1.15-1.35).

# Body Mass Index

Body mass index (BMI) is a convenient, indirect measure of body composition that correlates highly with body fat in most people and is a useful tool to estimate body weight status at the population level. BMI is calculated as weight in kilograms divided by height in meters-squared. Among youth, BMI is age- and sex-specific and is often referred to as BMI-for-age. For children and adolescents, BMI is plotted on Centers for Disease Control and Prevention (CDC) BMI-for-age growth charts for either boys or girls to obtain a percentile ranking. The percentile allows comparison of the child's BMI to youth of the same sex and age. Categories and associated ranges for BMI percentiles among youth are as follows: underweight (<5<sup>th</sup> percentile), normal weight (5<sup>th</sup> to less than 85<sup>th</sup> percentile), overweight (85<sup>th</sup> to less than 95<sup>th</sup> percentile) and obese (95<sup>th</sup> percentile or greater).

Among students in the KFIT database, 37.0 percent are overweight or obese (18.0% overweight and 19.0% obese) (Figure 4). The percentage of students who are overweight or obese is 36.4 percent among girls and 37.6 percent among boys; 31.1 percent among non-Hispanic white students, 42.4 percent among Non-Hispanic African-American students and 47.5 percent among Hispanic students; 48.0 percent among students who are English for Speakers of Other Languages program (ESOL) eligible and 34.5 percent among students who are not ESOL eligible (Table 5).

**Figure 4. Percentage of students in K-FIT database who are underweight, normal weight, overweight or obese, Kansas 2012-2013 school year**



**Table 5. Percentage of students in K-FIT database who are underweight, normal weight, overweight or obese, by selected demographic characteristics, Kansas 2012-2013 school year**

	N	Underweight	Normal	Overweight	Obese
<b>Gender</b>					
Total	34,885	2.8%	60.2%	18.0%	19.0%
Girls	17,809	2.4%	61.2%	18.3%	18.1%
Boys	17,076	3.2%	59.2%	17.7%	19.9%
<b>Grade</b>					
4	7,150	2.7%	60.2%	17.8%	19.4%
5	8,373	3.3%	58.2%	18.4%	20.1%
6	4,601	2.9%	59.3%	18.7%	19.2%
7	6,422	2.9%	61.3%	17.8%	18.0%
8	3,939	2.7%	60.5%	17.8%	19.0%
9	4,400	2.1%	63.5%	17.2%	17.3%
<b>Race/ethnicity</b>					
Non-Hispanic (NH) white	18,886	3.5%	65.5%	16.5%	14.6%
NH African-American	3,500	1.7%	55.9%	19.4%	23.0%
NH Asian	1,178	3.7%	66.7%	18.4%	11.1%
NH other/multiracial	1,957	2.5%	59.3%	17.8%	20.4%
Hispanic	9,364	1.9%	50.6%	20.5%	27.0%
<b>ESOL Eligibility Status</b>					
Not ESOL eligible	28,588	3.0%	62.5%	17.3%	17.2%
ESOL eligible	6,297	1.9%	50.1%	21.1%	26.9%

Source: 2011/2012 K-FIT database, KSDE

The odds of being overweight/obese were significantly higher among non-Hispanic African-American as compared non-Hispanic white students (OR=1.41; 95% CI: 1.29-1.53); Hispanic compared with non-Hispanic white students (OR=1.64; 95% CI: 1.54-1.74); and ESOL program eligible compared with non-ESOL program eligible students (OR=1.36; 95% CI: 1.27-1.44). The odds of being overweight/obese were significantly lower among girls compared with boys (OR=0.92; 95% CI: 0.88-0.97). The odds of being overweight/obese did not differ significantly among students in grade 9 compared with students in grade 4 (OR=0.86; 95% CI: 0.73-1.01).

Note: due to the relatively small proportion of students who were underweight, underweight and normal weight categories were combined into a single category for subsequent analyses.

Among students in the K-FIT database, 96.4 percent of normal/underweight students met the Healthy Fitness Zone (HFZ) standard for aerobic capacity while only 8.0 percent of obese students did (Table 6). Additional percentages of students who met HFZ standards by BMI category are as follows:

- 88.0% of normal/underweight students met the HFZ standard for curl-ups while 69.1% of obese students did;
- 77.3% of normal/underweight students met the HFZ standard for trunk lift while 81.9% of obese students did;
- 78.0% of normal/underweight students met the HFZ standard for 90 degree push-ups while 45.9% of obese students did; and
- 68.5% of normal/underweight students met the HFZ standard for back-saver sit and reach while 58.4% of obese students did.

**Table 6. Percentage of students in K-FIT database who met and did not meet FITNESSGRAM Healthy Fitness Zone standards, by BMI category, Kansas 2012-2013 school year**

		<b>Aerobic Capacity</b>	
		Met standard	Did not meet standard
	N		
Normal/underweight	16,451	96.4%	3.6%
Overweight	4,596	52.5%	47.5%
Obese	4,503	8.0%	92.0%
		<b>Curl-Up</b>	
		Met standard	Did not meet standard
	N		
Normal/underweight	21,334	88.0%	12.0%
Overweight	6,097	82.5%	17.5%
Obese	6,367	69.1%	30.9%
		<b>Trunk Lift</b>	
		Met standard	Did not meet standard
	N		
Normal/underweight	19,563	77.3%	22.7%
Overweight	5,562	79.5%	20.5%
Obese	5,881	81.9%	18.1%
		<b>90 degree push-up</b>	
		Met standard	Did not meet standard
	N		
Normal/underweight	20,807	78.0%	22.0%
Overweight	5,957	63.3%	36.7%
Obese	6,134	45.9%	54.1%



	N	Back-saver sit and reach	
		Met standard	Did not meet standard
Normal/underweight	20,441	68.5%	31.5%
Overweight	5,854	64.5%	35.5%
Obese	6,126	58.4%	41.6%

Source: 2012/2013 K-FIT database, KSDE

The odds of meeting the HFZ standard for aerobic capacity, curl-ups, 90 degree push-up and back-saver sit and reach were significantly higher among normal/underweight students compared with overweight/obese students. The following are the specific odds ratios (OR) for each standard for normal/underweight students compared with overweight/obese students:

- Aerobic capacity OR=75.28 (95% CI: 68.0-83.4)
- Curl-ups OR=2.44 (95% CI: 2.29-2.60)
- 90 degree push-up OR=3.20 (95% CI: 3.04-3.38)
- Back-saver sit and reach OR=1.36 (95% CI: 1.29-1.43)



# Student Fitness and Academic Performance

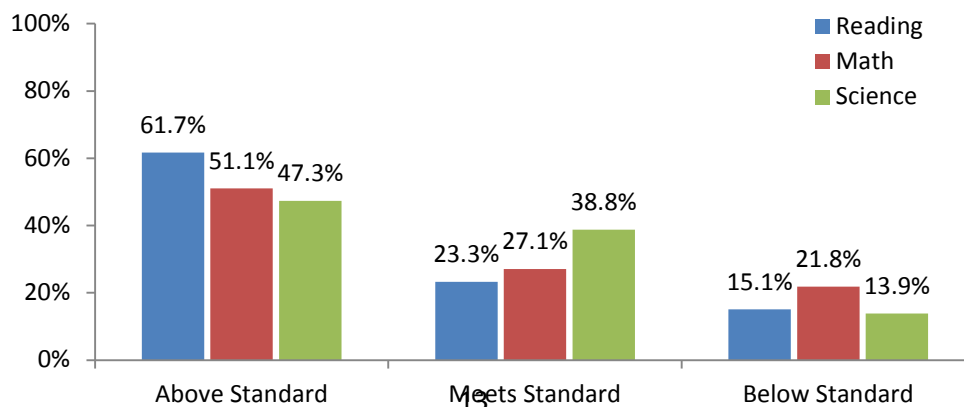
Among students in the K-FIT database, nearly two-thirds of students in grades 4 through 8 were above standards (i.e. exceeds standard or exemplary) for reading performance (61.7%) on Kansas State Assessments, while half were above standards for math performance (51.1%). Nearly half (47.3%) of students in grades 4 and 7 were above standards for science performance. Approximately 15.1 percent were below reading performance standards and 21.8 percent were below math performance standards (i.e. academic warning or approaches standard) (Table 7, Figure 5).

**Table 7. Reading, math and science performance levels of students in K-FIT database, Kansas 2012-2013 school year**

	N	%
<b>Reading Performance Level (grades 4 - 8)</b>		
Above Standard	20,672	61.7%
Meets Standard	7,802	23.3%
Below Standard	5,046	15.1%
<b>Math Performance Level (grades 4 - 8)</b>		
Above Standard	17,110	51.1%
Meets Standard	9,073	27.1%
Below Standard	7,307	21.8%
<b>Science Performance Level (grades 4 &amp; 7 only)</b>		
Above Standard	6,863	47.3%
Meets Standard	5,626	38.8%
Below Standard	2,017	13.9%

Source: 2012/2013 K-FIT database, KSDE

**Figure 5. Reading, math and science performance levels of students in K-FIT database, Kansas 2012-2013 school year**



## Aerobic Capacity

Among students in grades 4 through 8 in the K-FIT database who met the HFZ standard for aerobic capacity, 64.1 percent were above reading performance standards (i.e. exceeds standard or exemplary) while 13.9 percent were below reading performance standards (i.e. academic warning or approaches standard) (Table 8). Among students in grades 4 through 8 in the K-FIT database who did not meet the HFZ standard for aerobic capacity, 55.8 percent were above reading performance standards while 18.4 percent were below reading performance standards.

Among students in grades 4 through 8 in the K-FIT database who met the HFZ standard for aerobic capacity, 54.1 percent were above math performance standards while 20.1 percent were below math performance standards. Among students in grades 4 through 8 in the K-FIT database who did not meet the HFZ standard for aerobic capacity, 42.2 percent were above math performance standards while 27.9 percent were below math performance standards.

Among students in grades 4 and 7 in the K-FIT database who met the HFZ standard for aerobic capacity, 50.7 percent were above science performance standards while 13.2 percent were below science performance standards. Among students in grades 4 and 7 in the K-FIT database who did not meet the HFZ standard for aerobic capacity, 36.3 percent were above science performance standards while 20.4 percent were below science performance standards.

**Table 8. Reading, math and science performance levels of students in K-FIT database, by aerobic capacity Healthy Fitness Zone (HFZ) status, Kansas 2012-2013 school year**

	Reading Performance Level (grades 4 - 8)			
	N	Below Standard	Meets Standard	Above Standard
<b>Met HFZ standard for aerobic capacity</b>	16,308	13.9%	22.0%	64.1%
<b>Did not meet HFZ standard for aerobic capacity</b>	5,859	18.4%	25.9%	55.8%

	Math Performance Level (grades 4 – 8)			
	N	Below Standard	Meets Standard	Above Standard
<b>Met HFZ standard for aerobic capacity</b>	16,305	20.1%	25.8%	54.1%
<b>Did not meet HFZ standard for aerobic capacity</b>	5,852	27.9%	29.9%	42.2%

	Science Performance Level (grades 4 & 7 only)			
	N	Below Standard	Meets Standard	Above Standard
<b>Met HFZ standard for aerobic capacity</b>	6,000	13.2%	36.1%	50.7%
<b>Did not meet HFZ standard for aerobic capacity</b>	2,100	20.4%	43.3%	36.3%

Source: 2012/2013 K-FIT database, KSDE

The odds of being above reading performance standards were significantly higher among students in grades 4 through 8 who met the HFZ standard for aerobic capacity compared with those who did not (OR=1.15; 95% CI: 1.08-1.23). This association remained statistically significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.30; 95% CI: 1.16-1.46).

The odds of being above math performance standards were significantly higher among students in grades 4 through 8 who met the HFZ standard for aerobic capacity compared with those who did not (OR=1.32; 95% CI: 1.23-1.41). This association remained statistically significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.32; 95% CI: 1.18-1.49).

The odds of being above science performance standards were significantly higher among students in grades 4 and 7 who met the HFZ standard for aerobic capacity compared with those who did not (OR=1.46; 95% CI: 1.31-1.64). This association remained statistically significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.45; 95% CI: 1.19-1.78).

## Curl-ups

Among students in grades 4 through 8 in the K-FIT database who met the HFZ standard for curl-ups, 64.3 percent were above reading performance standards (i.e. exceeds standard or exemplary) while 13.4 percent were below reading performance standards (i.e. academic warning or approaches standard) (Table 9). Among students in grades 4 through 8 in the K-FIT database who did not meet the standard for curl-ups, 50.3 percent were above reading performance standards while 22.1 percent were below reading performance standards.

Among students in grades 4 through 8 in the K-FIT database who met the HFZ standard for curl-ups, 54.1 percent were above math performance standards while 19.6 percent were below math performance standards. Among students in grades 4 through 8 in the K-FIT database who did not meet the HFZ standard for curl-ups, 37.5 percent were above

math performance standards while 32.0 percent were below math performance standards.

Among students in grades 4 and 7 in the K-FIT database who met the HFZ standard for curl-ups, 50.0 percent were above science performance standards while 12.5 percent were below science performance standards. Among students in grades 4 and 7 in the K-FIT database who did not meet the HFZ standard for curl-ups, 36.3 percent were above science performance standards while 20.5 percent were below science performance standards.

**Table 9. Reading, math and science performance levels of students in K-FIT database, by curl-up Healthy Fitness Zone (HFZ) status, Kansas 2012-2013 school year**

	Reading Performance Level (grades 4 - 8)			
	N	Below Standard	Meets Standard	Above Standard
Met HFZ standard for curl-ups	26,754	13.4%	22.3%	64.3%
Did not meet HFZ standard for curl-ups	5,553	22.1%	27.6%	50.3%

	Math Performance Level (grades 4 - 8)			
	N	Below Standard	Meets Standard	Above Standard
Met HFZ standard for curl-ups	26,730	19.6%	26.4%	54.1%
Did not meet HFZ standard for curl-ups	5,548	32.0%	30.5%	37.5%

	Science Performance Level (grades 4 & 7 only)			
	N	Below Standard	Meets Standard	Above Standard
Met HFZ standard for curl-ups	11,543	12.5%	37.6%	50.0%
Did not meet HFZ standard for curl-ups	2,415	20.5%	43.2%	36.3%

Source: 2012/2013 K-FIT database, KSDE

The odds of being above reading performance standards (i.e. exceeds standard or exemplary) were significantly higher among students in grades 4 through 8 who met the HFZ standard for curl-ups compared with those who did not (OR=1.44; 95% CI: 1.34-1.54). This association remained statistically significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.48; 95% CI: 1.37-1.59).

The odds of being above math performance standards were significantly higher among students in grades 4 through 8 who met the HFZ standard for curl-ups compared with those who did not (OR=1.64; 95% CI: 1.53-1.75). This association remained statistically

significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.59; 95% CI: 1.47-1.72).

The odds of being above science performance standards were significantly higher among students in grades 4 and 7 who met the HFZ standard for curl-ups compared with those who did not (OR=1.41; 95% CI: 1.27-1.57). This association remained statistically significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.37; 95% CI: 1.22-1.54).

## Trunk Lift

Among students in grades 4 through 8 in the K-FIT database who met the HFZ standard for trunk lift, 63.3 percent were above reading performance standards (i.e. exceeds standard or exemplary) while 13.8 percent were below reading performance standards (i.e. academic warning or approaches standard) (Table 10). Among students in grades 4 through 8 in the K-FIT database who did not meet the standard for trunk lift, 55.6 percent were above reading performance standards while 19.0 percent were below reading standards.

Among students in grades 4 through 8 in the K-FIT database who met the HFZ standard for trunk lift, 52.9 percent were above math performance standards while 20.2 percent were below math performance standards. Among students in grades 4 through 8 in the K-FIT database who did not meet the HFZ standard for trunk lift, 44.8 percent were above math performance standards while 26.5 percent were below math performance standards.

Among students in grades 4 and 7 in the K-FIT database who met the HFZ standard for trunk lift, 48.7 percent were above science performance standards while 12.9 percent were below science performance standards. Among students in grades 4 and 7 in the K-FIT database who did not meet the HFZ standard for trunk lift, 42.4 percent were above science performance standards while 17.1 percent were below science performance standards.

**Table 10. Reading, math and science performance levels of students in K-FIT database, by trunk lift Healthy Fitness Zone (HFZ) status, Kansas 2012-2013 school year**

	Reading Performance Level (grades 4 - 8)			
	N	Below Standard	Meets Standard	Above Standard
Met HFZ standard for trunk lift	22,909	13.8%	22.9%	63.3%
Did not meet HFZ standard for trunk lift	6,558	19.0%	25.3%	55.6%

	Math Performance Level (grades 4 - 8)			
	N	Below Standard	Meets Standard	Above Standard
Met HFZ standard for trunk lift	22,892	20.2%	26.9%	52.9%
Did not meet HFZ standard for trunk lift	6,546	26.5%	28.7%	44.8%

	Science Performance Level (grades 4 & 7 only)			
	N	Below Standard	Meets Standard	Above Standard
Met HFZ standard for trunk lift	10,338	12.9%	38.4%	48.7%
Did not meet HFZ standard for trunk lift	2,592	17.1%	40.5%	42.4%

Source: 2012/2013 K-FIT database, KSDE

The odds of being above reading performance standards (i.e. exceeds standard or exemplary) were significantly higher among students in grades 4 through 8 who met the HFZ standard for trunk lift compared with those who did not (OR=1.19; 95% CI: 1.11-1.27). This association remained statistically significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.22; 95% CI: 1.13-1.31).

The odds of being above math performance standards were significantly higher among students in grades 4 through 8 who met the HFZ standard for trunk lift compared with those who did not (OR=1.20; 95% CI: 1.12-1.29). This association remained statistically significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.28; 95% CI: 1.19-1.37).

The odds of being above science performance standards were significantly higher among students in grades 4 and 7 who met the HFZ standard for trunk lift compared with those who did not (OR=1.15; 95% CI: 1.04-1.29). This association remained statistically significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.15; 95% CI: 1.03-1.29).

## 90 Degree Push-up

Among students in grades 4 through 8 in the K-FIT database who met the HFZ standard for 90 degree push-up, 63.4 percent were above reading performance standards (i.e. exceeds standard or exemplary) while 13.9 percent were below reading performance standards (i.e. academic warning or approaches standard) (Table 11). Among students in grades 4 through 8 in the K-FIT database who did not meet the standard for 90 degree push-up, 57.1 percent were above reading performance standards while 18.2 percent were below reading performance standards.



Among students in grades 4 through 8 in the K-FIT database who met the HFZ standard for 90 degree push-up, 53.8 percent were above math performance standards while 19.7 percent were below math performance standards. Among students in grades 4 through 8 in the K-FIT database who did not meet the HFZ standard for 90 degree push-up, 44.6 percent were above math performance standards while 26.9 percent were below math performance standards.

Among students in grades 4 and 7 in the K-FIT database who met the HFZ standard for 90 degree push-up, 48.3 percent were above science performance standards while 12.9 percent were below science performance standards. Among students in grades 4 and 7 in the K-FIT database who did not meet the HFZ standard for 90 degree push-up, 43.9 percent were above science performance standards while 16.6 percent were below science performance standards.

**Table 11. Reading, math and science performance levels of students in K-FIT database, by 90 degree push-up Healthy Fitness Zone (HFZ) status, Kansas 2012-2013 school year**

	Reading Performance Level (grades 4 - 8)			
	N	Below Standard	Meets Standard	Above Standard
Met HFZ standard for 90 degree push-up	21,793	13.9%	22.7%	63.4%
Did not meet HFZ standard for 90 degree push-up	9,646	18.2%	24.7%	57.1%

	Math Performance Level (grades 4 - 8)			
	N	Below Standard	Meets Standard	Above Standard
Met HFZ standard for 90 degree push-up	21,773	19.7%	26.5%	53.8%
Did not meet HFZ standard for 90 degree push-up	9,636	26.9%	28.6%	44.6%

	Science Performance Level (grades 4 & 7 only)			
	N	Below Standard	Meets Standard	Above Standard
Met HFZ standard for 90 degree push-up	9,478	12.9%	38.8%	48.3%
Did not meet HFZ standard for 90 degree push-up	3,992	16.6%	39.5%	43.9%

Source: 2012/2013 K-FIT database, KSDE

The odds of being above reading performance standards (i.e. exceeds standard or exemplary) were significantly higher among students in grades 4 through 8 who met the HFZ standard for 90 degree push-up compared with those who did not (OR=1.14; 95% CI: 1.08-1.20). This association remained statistically significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.17; 95% CI: 1.10-1.24).

The odds of being above math performance standards were significantly higher among students in grades 4 through 8 who met the HFZ standard for 90 degree push-up compared with those who did not (OR=1.33; 95% CI: 1.26-1.41). This association remained statistically significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.29; 95% CI: 1.21-1.37).

The odds of being above science performance standards did not differ significantly for students in grades 4 and 7 who met the HFZ standard for 90 degree push-up compared with those who did not (OR=1.10; 95% CI: 1.00-1.20). This association remained statistically non-significant after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.05; 95% CI: 0.96-1.16).

## Back-Saver Sit and reach

Among students in grades 4 through 8 in the K-FIT database who met the HFZ standard for back-saver sit and reach, 63.0 percent were above reading performance standards (i.e. exceeds standard or exemplary) while 14.1 percent were below reading performance standards (i.e. academic warning or approaches standard) (Table 12). Among students in grades 4 through 8 in the KFIT database who did not meet the standard for back-saver sit and reach, 59.1 percent were above reading performance standards while 16.3 percent were below reading performance standards.

Among students in grades 4 through 8 in the K-FIT database who met the HFZ standard for back-saver sit and reach, 52.3 percent were above math performance standards while 20.5 percent were below math performance standards. Among students in grades 4 through 8 in the KFIT database who did not meet the HFZ standard for back-saver sit and reach, 48.4 percent were above math performance standards while 23.9 percent were below math performance standards.

Among students in grades 4 and 7 in the K-FIT database who met the HFZ standard for back-saver sit and reach, 48.8 percent were above science performance standards while 13.0 percent were below science performance standards. Among students in grades 4 and 7 in the KFIT database who did not meet the HFZ standard for back-saver sit and reach, 44.6 percent were above science performance standards while 14.6 percent were below science performance standards.

**Table 12. Reading, math and science performance levels of students in K-FIT database, by back-saver sit and reach Healthy Fitness Zone (HFZ) status, Kansas 2012-2013 school year**

	<b>Reading Performance Level (grades 4 - 8)</b>			
	N	Below Standard	Meets Standard	Above Standard
<b>Met HFZ standard for back-saver sit and reach</b>	19,793	14.1%	22.9%	63.0%
<b>Did not meet HFZ standard for back-saver sit and reach</b>	10,659	16.3%	24.6%	59.1%

	<b>Math Performance Level (grades 4 - 8)</b>			
	N	Below Standard	Meets Standard	Above Standard
<b>Met HFZ standard for back-saver sit and reach</b>	19,780	20.5%	27.2%	52.3%
<b>Did not meet HFZ standard for back-saver sit and reach</b>	10,646	23.9%	27.8%	48.4%

	<b>Science Performance Level (grades 4 &amp; 7 only)</b>			
	N	Below Standard	Meets Standard	Above Standard
<b>Met HFZ standard for back-saver sit and reach</b>	8,842	13.0%	38.2%	48.8%
<b>Did not meet HFZ standard for back-saver sit and reach</b>	4,262	14.6%	40.8%	44.6%

Source: 2012/2013 K-FIT database, KSDE

The odds of being above reading performance standards (i.e. exceeds standard or exemplary) were significantly higher among students in grades 4 through 8 who met the HFZ standard for back-saver sit and reach compared with those who did not (OR=1.11; 95% CI: 1.05-1.18). This association remained statistically significant even after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.17; 95% CI: 1.10-1.24).

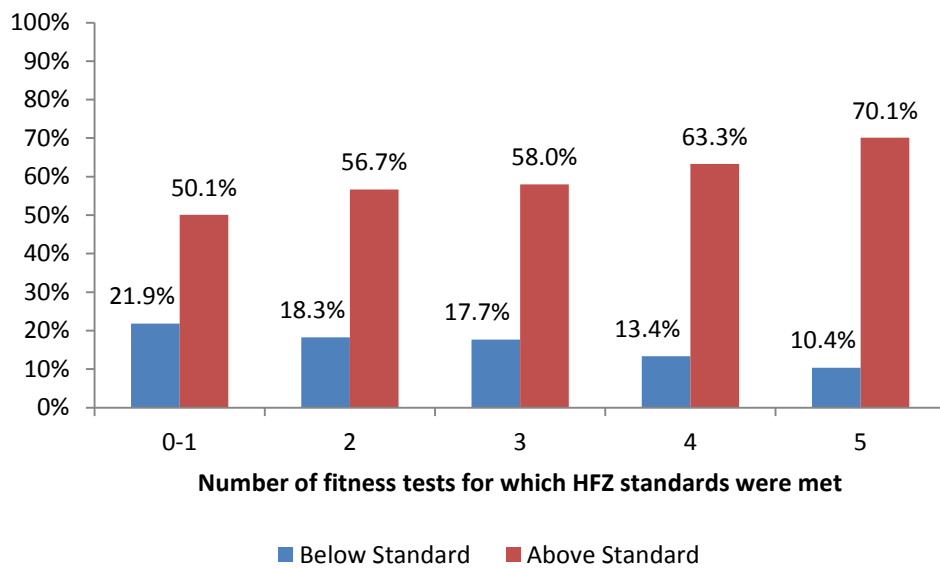
The odds of being above math performance standards were significantly higher among students in grades 4 through 8 who met the HFZ standard for back-saver sit and reach compared with those who did not (OR=1.19; 95% CI: 1.13-1.26). This association remained statistically significant even after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.23; 95% CI: 1.16-1.31).

The odds of being above science performance standards were significantly higher among students in grades 4 and 7 who met the HFZ standard for back-saver sit and reach compared with those who did not (OR=1.12; 95% CI: 1.03-1.22). This association remained statistically significant even after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.19; 95% CI: 1.09-1.31).

## Met HFZ Standards for All Five Fitness Tests

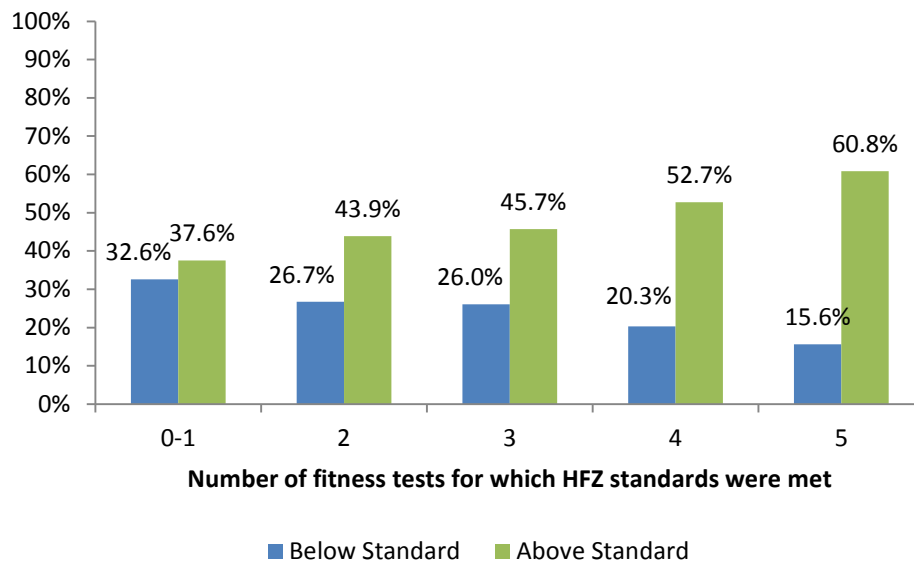
Among students in grades 4 through 8 in the KFIT database who completed all five fitness measures, 70.1 percent of those who met HFZ standards for all five fitness tests were above reading performance standards (i.e. exceeds standard or exemplary) while only 50.1 percent of those who met HFZ standards for fewer than two fitness tests were above standards (Figure 6) (Table 13).

**Figure 6. Reading performance levels of students in grades 4 - 8 in K-FIT database, by number of fitness tests for which HFZ standards were met, Kansas 2012-2013 school year**



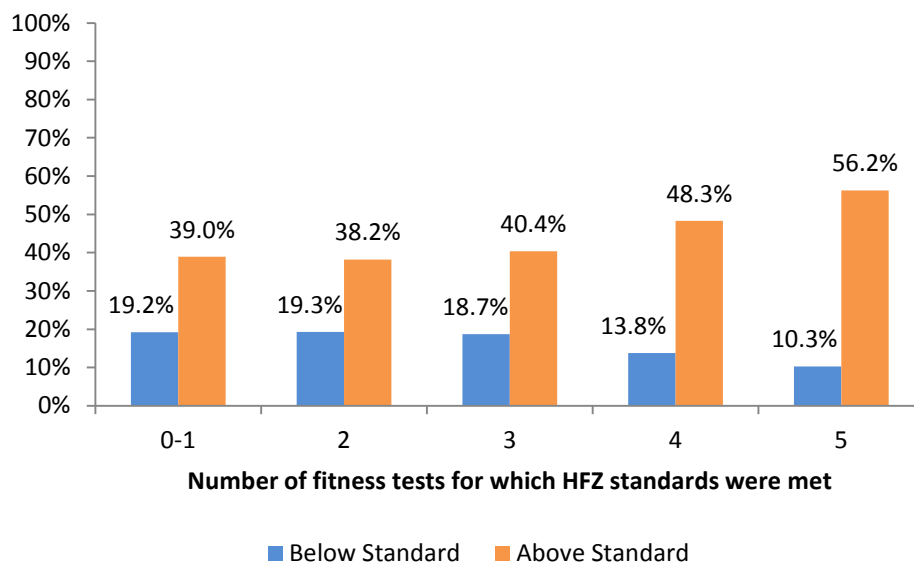
Among students in grades 4 through 8 in the KFIT database who completed all five fitness measures, 60.8 percent of those who met HFZ standards for all five fitness tests were above math performance standards while only 37.6 percent of those who met HFZ standards for fewer than two fitness tests were above standards (Figure 7).

Figure 7. Math performance levels of students grades 4 - 8 in K-FIT database, by number of fitness tests for which HFZ standards were met, Kansas 2012-2013 school year



Among students in grades 4 and 7 in the KFIT database who completed all five fitness measures, 56.2 percent of those who met HFZ standards for all five fitness tests were above science performance standards while only 39.0 percent of those who met HFZ standards for fewer than two fitness tests were above standards (Figure 8).

Figure 8. Science performance levels of students in grades 4 and 7 in K-FIT database, by number of fitness tests for which HFZ standards were met, Kansas 2012-2013 school year



The odds of being above reading performance standards (i.e. exceeds standard or exemplary) were significantly higher among students in grades 4 through 8 who met the HFZ standard for all five fitness tests compared with those who did not (OR=1.34; 95% CI: 1.24-1.45). This association remained statistically significant even after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.38; 95% CI: 1.27-1.49).

The odds of being above math performance standards were significantly higher among students in grades 4 through 8 who met the HFZ standard for all five fitness tests compared with those who did not (OR=1.45; 95% CI: 1.35-1.57). This association remained statistically significant even after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.42; 95% CI: 1.32-1.54).

The odds of being above science performance standards were significantly higher among students in grades 4 and 7 who met the HFZ standard for all five fitness tests compared with those who did not (OR=1.42; 95% CI: 1.26-1.61). This association remained statistically significant even after controlling for sex, race/ethnicity, grade level and weight status (Adjusted OR=1.40; 95% CI: 1.23-1.59).

**Table 13. Reading, math and science performance levels of students in K-FIT database, by number of fitness tests for which HFZ standards were met, Kansas 2012-2013 school year**

Number of fitness tests for which HFZ standards were met		Reading Performance Level (grades 4-8 only)			
		N	Below Standard	Meets Standard	Above Standard
0-1	1,007		21.9%	28.1%	50.1%
2	2,181		18.3%	25.1%	56.7%
3	4,307		17.7%	24.3%	58.0%
4	6,211		13.4%	23.4%	63.3%
5	5,438		10.4%	19.5%	70.1%

Number of fitness tests for which HFZ standards were met		Math Performance Level (grades 4-8 only)			
		N	Below Standard	Meets Standard	Above Standard
0-1	1,004		32.6%	29.9%	37.6%
2	2,180		26.7%	29.4%	43.9%
3	4,310		26.0%	28.3%	45.7%
4	6,204		20.3%	27.0%	52.7%
5	5,432		15.6%	23.6%	60.8%

Number of fitness tests for which HFZ standards were met	Science Performance Level (grades 4 & 7 only)			
	N	Below Standard	Meets Standard	Above Standard
0-1	344	19.2%	41.9%	39.0%
2	751	19.3%	42.5%	38.2%
3	1,634	18.7%	40.9%	40.4%
4	2,323	13.8%	37.9%	48.3%
5	2,067	10.3%	33.5%	56.2%

Source: 2012/2013 K-FIT database, KSDE



# Student Fitness and Attendance

Students in the K-FIT database who met the standard for aerobic capacity were absent significantly fewer days (6.6 days), on average, than students who did not meet the standard for aerobic capacity (8.0 days) ( $p < .0001$ ). On average, normal/underweight students in the K-FIT database were absent significantly fewer days (6.8 days) than overweight/obese students (7.8 days) ( $p < .0001$ ). Among students in the K-FIT database who completed all five fitness measures, those who met the HFZ standards on all five fitness tests were absent significantly fewer days (6.2 days), on average, than students who met the HFZ standards on fewer than two fitness tests (8.1 days) ( $p = 0.01$ ) (Table 14, Figure 9).

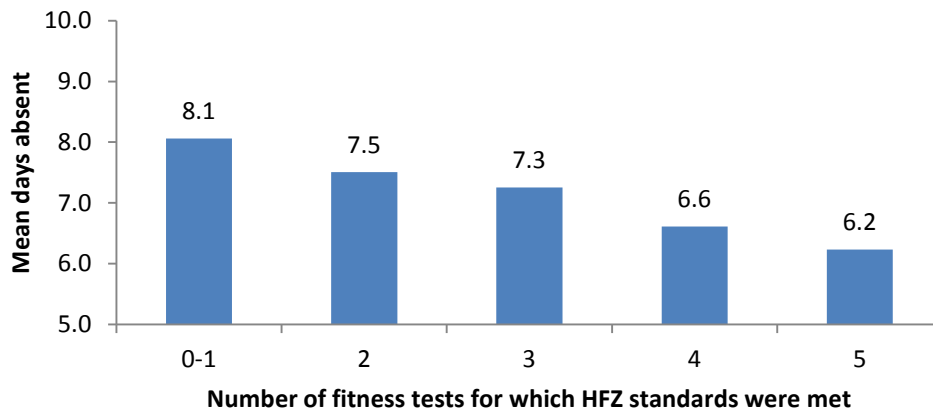
Note, analyses of student attendance data were restricted to students who were enrolled for more than 170 school days during the 2012-2013 school year ( $n = 12,808$ ).

**Table 14. Mean number of days absent among students in K-FIT database, by number of fitness tests for which HFZ standards were met, Kansas 2012-2013 school year**

Number of fitness tests for which HFZ standards were met	Mean Days	Standard Error
0-1	8.1	0.24
2	7.5	0.18
3	7.3	0.15
4	6.6	0.14
5	6.2	0.14

Source: 2012/2013 K-FIT database, KSDE

**Figure 9. Mean number of days absent among students in K-FIT database, by number of fitness tests for which HFZ standards were met, Kansas 2012-2013 school year**



# Technical Notes

## Fitness Measures

Five student fitness tests were administered using the FITNESSGRAM: aerobic capacity, curl-up, trunk lift, 90 degree push-up, and the back-saver sit and reach. Following is a brief description of how each test is scored. For more information about how each test is conducted and scored, please refer to the *FITNESSGRAM/ACTIVITYGRAM Test Administration Manual* (The Cooper Institute, 2010).

- Aerobic Capacity: The Progressive Aerobic Cardiovascular Endurance Run (PACER) is the default aerobic capacity test in FITNESSGRAM. The PACER score is the total number of laps completed by the student. A lap is defined as one 20-meter distance. A 15-meter version of the PACER is also available for use in smaller facilities. PACER laps are converted to an aerobic capacity score as follows:

Step 1: 15-meter PACER scores are converted to 20-meter PACER scores (PACER20) using the conversion table on page 98 of *the FITNESSGRAM/ACTIVITYGRAM Test Administration Manual*.

Step 2: PACER20 laps are converted to an equated mile time.

- PACER20 laps 10 – 142 are converted according to Zhu et al. (2010).
- PACER20 laps 143-190 use this equation:

$$\text{Equatedmile time} = 3.177 \times \text{LN}(\text{PACER laps}) + 20.669$$

Step 3: Aerobic capacity ( $\text{VO}_2$  max) is then calculated using the following equation:

$$\text{VO}_2\text{max} = (.21 * (\text{age} * \text{sexcode})) - (.84 * \text{BMI}) - (8.41 * \text{Equatedmile}) + (.34 * \text{Equatedmile} * \text{Equatedmile}) + (108.94)$$

where sexcode=1 for boys and =0 for girls

Note: aerobic capacity is not calculated for PACER20 laps less than 10 or greater than 190.

- Curl-up: The score is the number of curl-ups performed by the student (maximum=75).
- Trunk lift: The score is the number of inches the upper body is lifted off the ground while the student is facedown (maximum=12 inches).
- 90 degree push-up: The score is the number of 90 degree push-ups performed by the student.
- Back-saver sit and reach: The score is the number of inches on each side the student can reach on the test apparatus (maximum=12 inches).

For each test, students were categorized based on whether or not their score met the FITNESSGRAM Healthy Fitness Zone (HFZ) standard as outlined in the

*FITNESSGRAM/ACTIVITYGRAM Test Administration Manual*. Additionally, a HFZ score was computed to sum the total number of fitness tests for which students met the HFZ standard. The HFZ score values were fewer than two, two, three, four, or five HFZ standards met.

## Body Mass Index (BMI) Measure

Student height and weight was measured as part of the FITNESSGRAM. Body mass index (BMI) percentile rankings were computed using the Centers for Disease Control and Prevention (CDC) *SAS Program for the CDC Growth Charts*. Categories and associated ranges for BMI percentiles among youth are as follows: underweight (<5<sup>th</sup> percentile), normal weight (5<sup>th</sup> to less than 85<sup>th</sup> percentile), overweight (85<sup>th</sup> to less than 95<sup>th</sup> percentile) and obese (95<sup>th</sup> percentile or greater). Biologically implausible values of weight, height and BMI were also calculated to identify records to exclude from analyses (see Inclusion/Exclusion Criteria below).

## Academic Performance Measures

Academic performance measures for reading, math and science are based on Kansas State Assessments and are categorized as academic warning, approaches standard, meets standard, exceeds standard or exemplary. In this report, academic warning and approaches standard were collapsed into a single 'below standard' category, while exceeds standard and exemplary were collapsed into a single 'above standard' category. Academic performance measures for reading and math are only available for students in grades 4 through 8 while academic performance measures for science are only available for students in grades 4 and 7.

## Exclusion Criteria

A total of 56,253 student records were entered into the K-FIT data system during the 2011/2012 school year. A total of 38,843 student records in the K-FIT database were used for subsequent analyses based on the following exclusion criteria:

- First, records of students in grades K through 3 and 10 through 12 (n=9,446) were excluded based on the following rationale:
  - Per the *FITNESSGRAM Test Administration Manual*, performance standards are not available for aerobic capacity for students younger than 10 years of age and the other fitness tests are conducted among students younger than 10 years of age to instruct proper technique and do not emphasize performance level.
  - Physical education is not a required course in grades 10-12 and students who enroll in physical education in these grades are demographically different than students who do not.

- Records of students with physical, mental, emotional or developmental disabilities (n=5,615) were subsequently excluded from analyses because their performance on fitness and academic performance tests is not comparable to students without disabilities.
- Records with missing sex or race/ethnicity were excluded next (n=1,472) to ensure that the number of students within each demographic sub-group summed to the total number of student records within a given table.
- Finally, records with missing first or second measures were excluded (n=877) to ensure that description of student demographics (e.g. Table 1) truly reflected K-FIT participants.
- Note, a minimum of 5,231 records without at least one academic performance score are excluded from analyses that include academic performance data.

Analyses of student record data related to fitness test results and body mass index (BMI) category were also subject to the following exclusion criteria:

- Records of fitness tests with scores of zero were excluded from analyses to avoid misclassification of students with missing data. The percentage of students who did not meet standards for aerobic capacity is thus likely underestimated.
- Records with invalid height, weight or BMI were excluded from analyses. Table T1 summarizes the frequency of valid, invalid and missing records for weight, height and BMI among students in the KFIT database. A measure is considered invalid if it falls within a range of biologically implausible values as defined by the World Health Organization. BMI validity is computed separately from weight and height validity.

Figure T1. Application of exclusion criteria for K-FIT Year 2

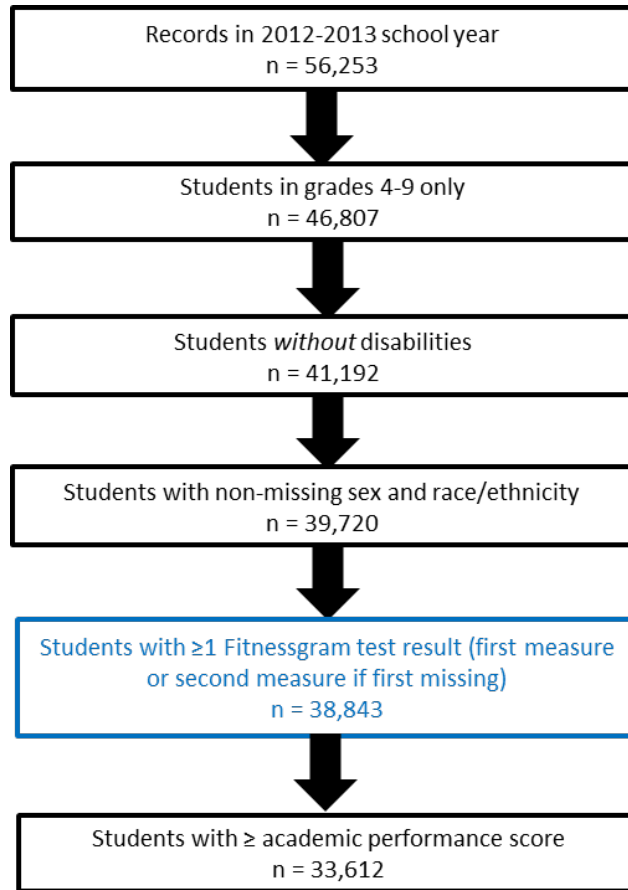


Table T1. Valid weights, height and BMIs of students in K-FIT database, Kansas 2012-2013 school year

Valid weight	N	%
Valid	35,500	91.4%
Not valid	154	0.4%
Missing	3,189	8.2%
Valid height		
Valid	35,321	90.9%
Not valid	396	1.0%
Missing	3,126	8.0%
Valid BMI		
Valid	35,325	90.9%
Not valid	93	0.2%
Missing	3,425	8.8%

Finally, analyses of student attendance data were restricted to students who were enrolled for more than 165 school days during the 2012-2013 school year (n=35,944).

## Statistical Analysis

SAS version 9.3 software was used for all statistical analyses.

Odds ratios and 95 percent confidence intervals were computed to determine statistically significant differences in percentages between groups. T-tests and p-values were computed to determine statistically significant mean differences between groups. Statistically significant mean differences were indicated at the  $\alpha < .05$  level. Due to the hierarchical nature of the student data in the K-FIT database (i.e. student level data is nested within schools), hierarchical generalized logistic (or linear) regression models were constructed using the SAS GLIMMIX procedure with school modeled as a random effect. Overweight and obese BMI categories were combined for all regression models that included BMI category as an independent or dependent variable.

For selected models examining the association between meeting fitness standards and academic performance, logistic regression models were adjusted to control for sex (boys, girls), race/ethnicity (seven levels: NH white, NH African America, NH American Indian, NH Asian, NH Native Hawaiian, NH multiracial and Hispanic), grade level (4, 5, 6, 7, 8 or 4, 7) and weight status (underweight, normal weight, overweight, obese).

## Generalizability

Results are based on a convenience sample of schools. Results only reflect students who were assessed at participating K-FIT schools and are not generalizable to all Kansas students.

