2012 Mississippi Prevalence of Fitness Study

Prepared for

The Center for Mississippi Health Policy

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Executive Summary

This study provides weighted prevalence estimates reflecting the fitness of Mississippi public school students (elementary, middle, and high school-aged) enrolled in Physical Education (PE). During Spring Semester, 2012, a total of 84 randomly selected schools were contacted and invited to participate in the study. A total of 62 schools participated. A total of 3,539 students were eligible and data were collected on 2,911 students.

To objectively assess physical fitness, researchers used the *Fitnessgram*, which is a physical fitness test battery that provides suggested tests for six components of health-related fitness: Aerobic Capacity, Abdominal Strength, Upper Body Strength, Flexibility, Trunk Lift, and Body Composition. Each fitness component has a Healthy Fitness Zone (HFZ). These HFZ are criterion-referenced standards and considered to be the minimal level of performance associated with good health or decreased risk. Participants' overall fitness level was determined by the number of HFZ they achieved on the test battery, ranging from zero to six.

The study received Institutional Review Board approval through the Human Subjects Committee at The University of Southern Mississippi (USM). Principals and superintendents from the 84 randomly selected schools were first contacted by mail. Once approval for conducting the study was obtained, then the PE teacher designated by the school principal was the contacted by phone, mail or email. All of the PE teachers were invited to one of two training sessions. Between March and April, 2012, representatives from each of the participating schools from across the state received training on the use of the *Fitnessgram* software by certified trainers. Participants received the *Fitnessgram* software, the study protocol and forms, and the equipment necessary to conduct the fitness tests.

During the remaining months of the spring semester of 2012, the PE teachers in each of the schools were to conduct the fitness tests, and to collect, record, and submit their data through the *Fitnessgram* software. Test administration was handled by the PE teachers at each school who had received the training to ensure that the *Fitnessgram* would be administered in a consistent manner.

The participating PE teachers input all demographic, bio-statistical, and fitness data into the *Fitnessgram* software as instructed in the training sessions and then exported the data directly from the software. All data files submitted by the schools were checked to determine if the required information was included. The researchers then created an Excel *Fitnessgram* template from the exported data to confirm that necessary variables had been properly recorded and reported. All data from all schools were combined and submitted to Westat, Inc., for weighting and initial analysis. SAS 9.2 was used for all statistical analysis. Chi-square analyses were used to assess the statistical significance of observed differences by gender, race, or educational level. All reported p-values were two-sided.

The highest percentage of students achieved a HFZ in the Trunk Lift (75.2%), followed by Abdominal Strength (60.6%), Flexibility (59.5%), Upper Body Strength (59.0%), Aerobic Capacity (55.7%), and Body Composition (54.6%). Approximately 12% of the students were able to achieve HFZ in all six areas. When assessed by gender, race and grade levels, achievement of all six HFZ was significantly higher among males and White students.

The Trunk Lift, which assesses trunk extensor strength, flexibility and endurance varied significantly by grade level, with the lowest percentages of achieving a HFZ among middle school students. Percentages of students within the HFZ for Abdominal Strength, as assessed by the Curl Up, significantly declined as grade levels increased. Flexibility, as measured by the Sit-and-Reach, was significantly higher among males than females. Upper Body Strength, which was assessed by the Push Up, was the only test in which there were no significant differences by gender, race or grade level. Aerobic Capacity, which the schools used the PACER test to assess, significantly declined as grade levels increased. Body Composition, determined by student Body Mass Index (BMI) differed significantly by race and grade level. Higher percentages were in the HFZ among White students and the percentage of students in the HFZ increased by grade level.

Of the six fitness components, the only one for which there was a significant difference by race was Body Composition, where 50.4% of black students reached a Healthy Fitness Zone compared to 59.3% of white students. When fitness levels were examined with BMI omitted (using the other five measures only), no significant differences were found by race. Achievement of all five HFZ was still significantly higher among males than female students. Unlike when all six components were included, with the exclusion of Body Composition, a significantly higher percentage of elementary students achieved a HFZ than did older students.

Fitness assessment is possible among all students in PE, but is unlikely to be conducted as such with the current state policy requiring it only in Grade 5 and the grade in which they received their half Carnegie Unit of PE in high school for graduation. Providing the *Fitnessgram* software to schools equips them in generating student and parent reports, teaching their students about health-related fitness testing (e.g., non-competitive testing), and producing statistical reports at class, school, and district levels. In addition, a growing number of schools across the state now have staff members who are trained/certified in fitness testing. We also believe that a benefit of this study was the increased exposure of students to fitness that is fitting with the goal of assisting students in establishing healthy lifestyle habits. Fitness assessment is now more possible among all students in PE, whereas the policy requiring it only in Grade 5 and once again in high school might have limited a students' exposure to fitness testing and awareness of the importance of health-related fitness.

This assessment structure that is now established will also provide the state with a valuable foundation for tracking changes in fitness levels of children within the state. Moreover, we believe these data may also assist the state in competing for federal funding of programs supporting physical education, physical activity and fitness. Additionally, these data provide a more complete picture of the state's health, subsequently influencing the legislature's decision-making on funding priorities, and better equipping various state and local initiatives with data in which to compare their findings.

Another outcome of this study is the realization that more research is needed to better understand the impact of interventions on physical fitness and student performance. It is suggested that a baseline measure of current policy, practice, and perception be developed, data collected and analyzed. This will help to better understand the need areas in Mississippi and help practitioners to develop more effective practices. Other states have reported findings where students, teachers, health care providers, policy makers, and parents were surveyed to help better understand the "lay of the land" and help improve their children's health and fitness. Taking a similar approach in Mississippi could decrease the risk of future pitfalls and help define best practices within the state.

Finally, while these findings are insightful, we should be reminded that fitness testing alone cannot paint the entire picture. Precaution should be taken as the appropriate use of fitness testing data is always important. For example, the data cannot be used to determine the quality of the school, teacher, or an assessment program by itself. Data from fitness testing are not the same as a cognitive standardized state test, but other factors need to be considered when attempting to make comparisons. Physical fitness is only one aspect of a physical education program. Cognitive, affective and other psychomotor aspects must be considered along with physical fitness to truly be able to make comparisons with content related standardized tests.

Introduction and Background

The purpose of the 2012 Mississippi Prevalence of Fitness Study (MPOFS) was to collect fitness data on a weighted, representative sample of public school students enrolled in PE in Mississippi. The study was to proceed essentially in the same manner as the 2003 - 2011 Child and Youth Prevalence of Obesity Surveys (CAYPOS) by Kolbo and associates (Kolbo et al., 2006; Kolbo et al., 2008; Harbaugh et al., 2009; Molaison et al., 2010; Harbaugh et al., 2011; Kolbo et al., 2012).

The CAYPOS data have established baseline figures of obesity and are currently being used by the Center for Mississippi Health Policy to assess the effectiveness of the 2007 Mississippi Healthy Students Act (MHSA, SB. 2369, 2007). The CAYPOS evaluation is funded by the Bower Foundation and the Robert Wood Johnson Foundation. Since 2005, the CAYPOS suggest that the prevalence of obesity has leveled off and even dropped significantly among White students and all elementary level students in the public school system. While continued monitoring of obesity rates is critical, especially as additional educational initiatives continue to be implemented, it became increasingly clear that another line of research was needed.

Between 2008 and 2010, a number of elementary and middle schools from across the state of Mississippi participated in the Health is Academic Quality Physical Education Program. As a part of the program, the schools implemented the Physical Best curriculum in their PE classes. During each of the three spring semesters, the participating schools conducted fitness tests, and collected, recorded, and submitted their data through *Fitnessgram* software. The research by Blom et al. (2011) found statistically significant correlations between fitness and both Language Arts and Math scores, as well as in school attendance. While a trend towards fitness and fewer disciplinary incidents was observed, the findings were not statistically significant.

Additional analysis over time indicated statistically significant increases in the percentage of students in these schools that had higher Language Arts and Math scores and that achieved more *Fitnessgram* healthy fitness zones (Hudson et al., 2012). Also, this research observed statistically significant decreases in absences and disciplinary incidents over the three years. These findings suggested that investments in fitness and increasing the number of Mississippi students who are fit may likely result in improved test scores, fewer absences, and fewer disciplinary incidents in schools.

While fitness appears to correlate with academic performance and academic behavior, to date there has been no information available as to the percentages of students in Mississippi who are fit or fit at different levels. Just as establishing and monitoring prevalence rates of obesity have been useful for state legislators and policy makers so too would be the information on student fitness.

Many important lessons were learned in the evaluation of the Health is Academic Quality Physical Education Program. One was that providing the *Fitnessgram* software to schools also equips them in generating student and parent reports, teaching their students about health-related fitness testing (e.g., is non-competitive), and producing statistical reports at class, school, and district levels. In addition, a growing number of schools across the state have staff members who are trained/certified in fitness testing.

The recently published findings from within Mississippi (Blom et al., 2011; Hudson et al. 2012) support the growing body of research finding a clear link between fitness and academics (Castelli, Hillman, Buck, & Erwin, 2007; Chomitz, et al., 2009; Coe, Pivarnick, Womack, Reeves, & Malina, 2007; Dwyer, Sallis, Blizzard, Lazarus, & Dean, 2001; Eveland-Sayers, Farley, Fuller, Morgan, & Caputo, 2009; Roberts, Freed, & McCarthy, 2010; Sallis, et al., 1999; Stevens, To, Stevenson, Lochbaum, 2008; Welk, et al., 2010). However, with the exception of only a few states like Texas and California, the prevalence of fitness among students remains unknown. As with obesity data, obtaining these fitness data would provide new insight into the high levels of obesity that remain in our state, the academic performance and academic behavior of students, and whether new initiatives provide real and sustainable impacts across the state.

Related Literature

Physical fitness can be divided into two categories that are measurable: a) health-related physical fitness, which includes characteristics related to disease prevention, health promotion, and skill, or b) performance-related physical fitness, which includes characteristics related to performing motor skills. Health-related physical fitness, as is the focus of this study, includes the components of cardiovascular fitness, body composition, flexibility, strength, and endurance.

Health-related physical fitness has grown in importance as society has become more sedentary and chronic disease risk has become more prominent. The reason for the emphasis on fitness is the beneficial health outcomes received by being involved in activities associated with health-related fitness (ACSM, 2010; Garber et al., 2011; ODPHP, 2008; Faigenhaum, Gipson-Jones, & Myer, 2012). The benefits of achieving adequate physical fitness have been well established (Faigenhaum, Gipson-Jones, & Myer, 2012) as well as the risks associated with not being fit. Some of the benefits include decreased risk of coronary heart disease, diabetes, depression, obesity, and stroke. As a result of health-related physical fitness' association with positive health benefits, guidelines for the quantity and quality of activity required to receive a health benefit have been developed and published by the Office of Disease Prevention and Health Promotion and the American College of Sports Medicine (ACSM). These guidelines notify teachers and policy makers about the amount and type of activity needed to receive a health benefit.

Physical fitness testing requirements at the state level have increased in recent years. The 2012 Shape of the Nation Report by the National Association for Sport and Physical Education (NASPE) surveyed the Departments of Education for all 50 states and Washington D.C. The results suggested approximately 53% of states reporting required some form of fitness testing. However, only 14 of these states reported state mandated fitness testing. Of those, five reported mandated fitness testing where local school districts chose which nationally recognized assessment they would use. Two of the states developed their own fitness assessment system, using *Fitnessgram*™ as its foundation, and seven states legislated fitness testing using *Fitnessgram*™ as the assessment tool. At the time of the report, only California, Georgia, Texas, and West Virginia were aggregating data at the state level.

Related Policy and Legislation in Mississippi

In response to documented increases in the rates of childhood obesity and the impact on student health, well-being and academic performance, a mix of state and federal legislation were recently enacted and implemented in Mississippi. In 2004, Congress enacted the Child Nutrition and WIC Reauthorization Act (Section 204 of Public Law 108-265) mandating any local education agency participating in a program authorized by the Richard B. Russell National School Lunch Act (NSLA) or the Child Nutrition Act of 1966 (CNA) to establish a school wellness policy no later than the first day of the school year beginning after June 30, 2006. The primary objective of the law was to prevent inactivity and obesity among children. The law established that, at a minimum, the local wellness policies shall contain: goals for nutrition education and physical activity; nutrition guidelines for foods available at each school; assurance that guidelines for the wellness policy are not less restrictive than those set forth by the NSLA or the CNA; plans for measuring implementation of the local wellness policy; and involvement of a representative group of community and school stakeholders in the development of the school wellness policy.

In 2007, the Mississippi Code of 1972 was amended (The Mississippi Healthy Students Act, SB. 2369, 2007) and the Mississippi Public School Accountability Standards were revised establishing stricter nutrition, physical activity, and physical education standards for Mississippi schools. Based on this legislation, MDE created two interpretive documents: 1) Nutrition Standards and 2) Physical Education/Comprehensive Health Education Rules and Regulations.

The Nutrition Standards established specific requirements for food choices offered in the cafeteria and on campus, how food is prepared at schools, marketing of healthy foods to students and staff, minimum and maximum time allotments for students' and staff meal periods, and methods for increasing participation in the child nutrition school breakfast and lunch programs. The Physical Education/ Comprehensive Health Education Rules and Regulations provided time requirements, sample curriculum, and schedules for physical education, physical activity, and activity-based instruction for students in grades K-8; fitness testing for fifth grade students; and guidelines for physical education, comprehensive health education, and fitness testing for students in grades 9-12. More specifically, the Mississippi Code mandated 150 minutes of physical activity for elementary students and 225 minutes for secondary students. Further, the State Board of Education Policy (4012) required all students be fitness tested in 5^{th} grade and the grade in which they received their half Carnegie Unit of PE for graduation.

Methods

Subjects

Fitness data were collected from 2,911 Mississippi public school students enrolled in PE in grades 3 – 12. A total of 3,539 students were sampled from 60 of the 84 randomly selected elementary, middle and high schools. Characteristics of the study participants are in Table 1.

Sampling

The sampling procedure was conducted by Westat, Inc. Westat employed a two-stage stratified probability design. The first stage was the random selection of schools. A systematic sample of schools was drawn with probability proportional to the enrollment in the target grades. The second stage of sampling was the random selection of PE classes within the sampled schools. PE classes were selected using equal probability systematic sampling.

Three separate samples were selected for each school type: elementary, middle, and high school. The elementary school sampling frame consisted of 500 public schools offering any of grades 3 through 5 or grades 3 through 6, depending on the grade span of the school. If the highest grade was 6, then the target grades were 3 through 6. Otherwise, the target grades were 3 through 5. The middle school sampling frame contained 286 schools offering any of grades 6 through 8 (schools with grade 6 only were included in the middle school frame). The high school frame contained 247 schools offering any of grades 9 through 12.

The overall response rate was then calculated as the product of the school response rate and the student response rate. For the fitness study, the school response rate was 74% (62 participating schools/84 sampled schools), the student response rate is 82% (2911 usable surveys/3539 sampled students). Thus, the overall response rate was 61% (62/84 * 2911/3539), which exceed 60%, a hurdle rate set for a sample to be representative.

Instruments

To objectively assess physical fitness, researchers used the *Fitnessgram*, which is a physical fitness test battery developed by the Cooper Institute (Cooper Institute for Aerobic Research, 2007). The test battery was used in tandem with the Physical Best curriculum developed by the National Association for Sport and Physical Education (NASPE), the latter being used as a guide for best practice for developing health-related physical fitness in the K-12 physical education setting. The *Fitnessgram* test battery provides suggested tests for six components of health-related fitness, PACER (Progressive Aerobic Cardiovascular Endurance Run), curl-up, push-up, trunk lift, sit and reach, and skinfold/Body Mass Index (BMI), with each fitness component having a Healthy Fitness Zone (HFZ). These HFZ are criterion-referenced standards and considered to be the minimal level of performance associated with good health or decreased risk (Welk & Meredith, 2008). Participants' overall fitness level was determined by the number of HFZ they achieved on the test battery, ranging from zero to six.

Procedures

The study received Institutional Review Board approval through the Human Subjects Committee at The University of Southern Mississippi (USM). Principals and superintendents from the 84 randomly selected schools were first contacted by mail. Once approval for conducting the study was obtained, then the PE teacher designated by the school principal was contacted by phone, mail or email. All of the PE teachers were invited to one of two training sessions. Between March and April, 2012, representatives from each of the participating schools from across the state received training on the use of the *Fitnessgram* software by certified trainers. Participants received the *Fitnessgram* software, the study protocol and forms, and the equipment necessary to conduct the fitness tests.

During the remaining months of the spring semester of 2012, the PE teachers in each of the schools were to conduct the fitness tests, and to collect, record, and submit their data through the *Fitnessgram* software. Test administration was handled by the PE teachers at each school who had received the training to ensure that the *Fitnessgram* would be administered in a consistent manner.

Data Treatment

The participating PE teachers input all demographic, bio-statistical, and fitness data into the *Fitnessgram* software as instructed in the training sessions and then exported the data directly from the software. All data files submitted by the schools were checked to determine if the required information was included. The researchers then created an Excel *Fitnessgram* template from the exported data to confirm that necessary variables had been properly recorded and reported. All data from all schools were combined and submitted to Westat, Inc., for weighting and initial analysis.

Data Analysis

SAS 9.2 was used for all statistical analysis. Sample sizes by subcategories were reported as the “unweighted count”, while the “estimates” were weighted percentages. Also, valid percentages were used for reporting when the associated subcategories have missing values. Chi-square analyses were used to assess the statistical significance of observed differences by gender, race, or educational level. All reported p-values were two-sided.

Findings

A total of 2,911 students participated in the study (see Table 1). Just over half (51.2%) were male and 48.8% were female. Approximately the same percentage of White and Black students (47%) participated in the study. The sample consisted of students in grades 3 – 12, but students were placed into three grade levels (elementary 3-5, middle 6-8, and high 9-12). Approximately a third of the students were within each of the three grade levels.

Table 1. Characteristics of the Participants

Gender	Estimate	Unweighted Count
Male	51.2%	1496
Female	48.8%	1415
Total	100.0%	2911
Race	**Estimate**	**Unweighted Count**
White	47.5%	1280
Black	47.2%	1383
Other	5.3%	133
Total	100.0%	2796
Grade Level	**Estimate**	**Unweighted Count**
Grades 3-5	35.3%	1050
Grades 6-8	33.8%	1163
Grades 9-12	30.9%	698
Total	100.0%	2911

Percent of Students Achieving Each of the Six Healthy Fitness Zones

The percent of students in PE achieving each of the six HFZ were assessed by gender, race and grade levels (refer to Figures 1-3). Three-quarters of the students achieved a HFZ in trunk lift, followed by Abdominal Strength (60.6%), Flexibility (59.5%), Upper Body Strength (59.0%), Aerobic Capacity (55.7%), and Body Composition (54.6%).

Figure 1.Percent of Students Achieving Each Healthy Fitness Zone by Gender

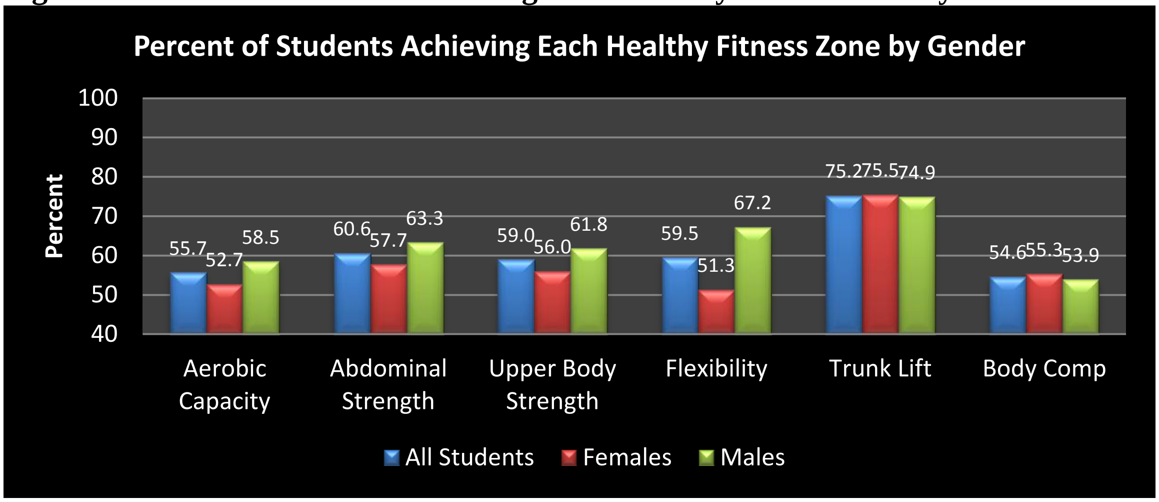


Figure 2.Percent of Students Achieving Each Healthy Fitness Zone by Race

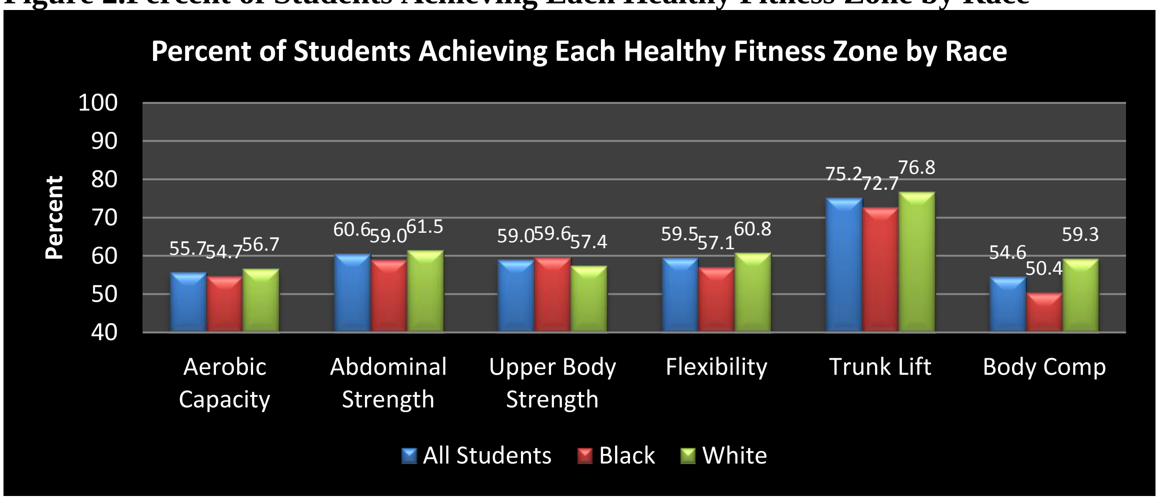
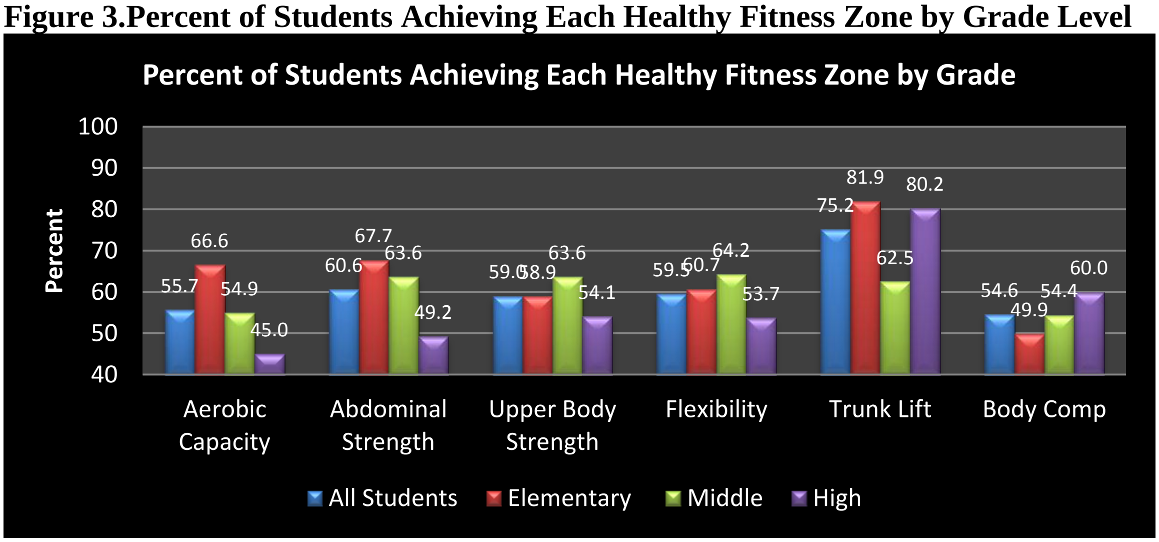


Figure 3.Percent of Students Achieving Each Healthy Fitness Zone by Grade Level



Percent of Students Achieving all Six Healthy Fitness Zones by Gender

Approximately 12 percent (11.9%) of Mississippi students enrolled in PE achieved all six HFZ. Refer to Figure 4. When analyzed by gender, the percent of males achieving all six HFZ is significantly higher than females (p = 0.008). The percent of students achieving 0 – 6 HFZ by gender is presented in Figure 5.

Figure 4. Percent of Students Achieving all Six Healthy Fitness Zones by Gender

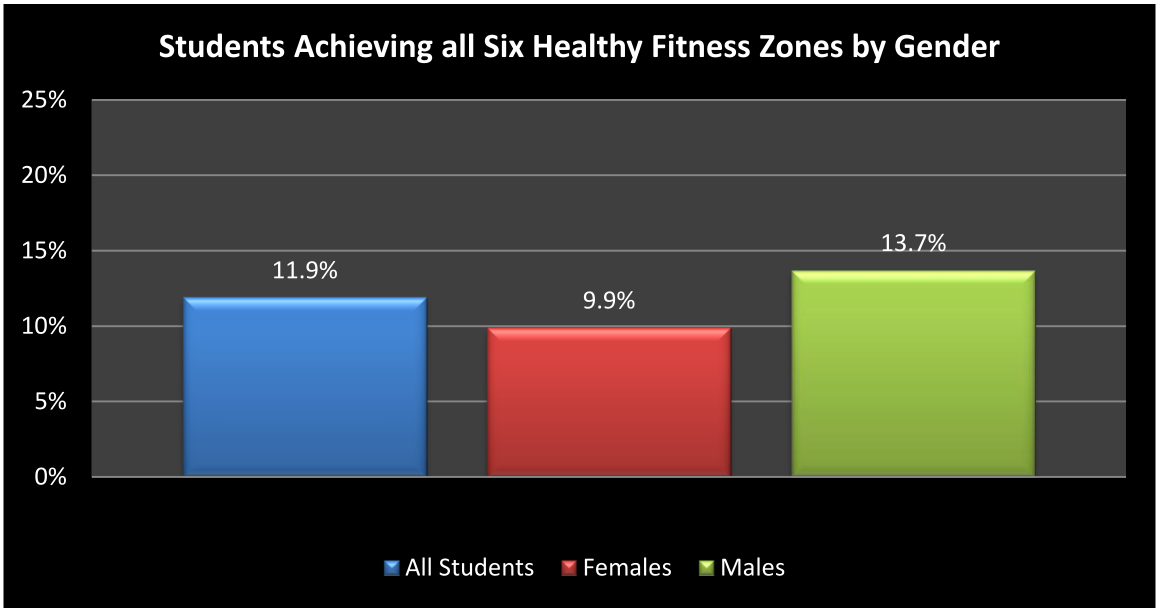
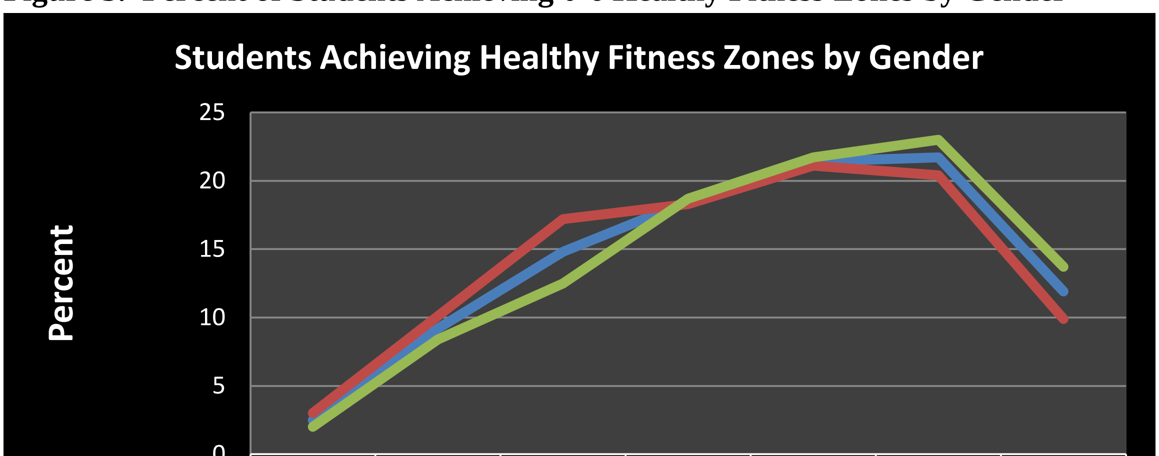


Figure 5. Percent of Students Achieving 0-6 Healthy Fitness Zones by Gender



	0	1	2	3	4	5	6
All Students	2.5	9.2	14.8	18.5	21.4	21.7	11.9
Females	3.0	10.1	17.2	18.3	21.1	20.4	9.9
Males	2.0	8.4	12.5	18.7	21.7	23.0	13.7

Percent of Students Achieving all Six Healthy Fitness Zones by Race

Approximately 14 percent (14.2%) of White students enrolled in PE achieved all six HF, compared to 9.2% of Black students. Refer to Figure 6. This difference is statistically significant (p = 0.037). The percent of students achieving 0 – 6 HFZ by race is presented in Figure 7.

Figure 6. Percent of Students Achieving all Six Healthy Fitness Zones by Race

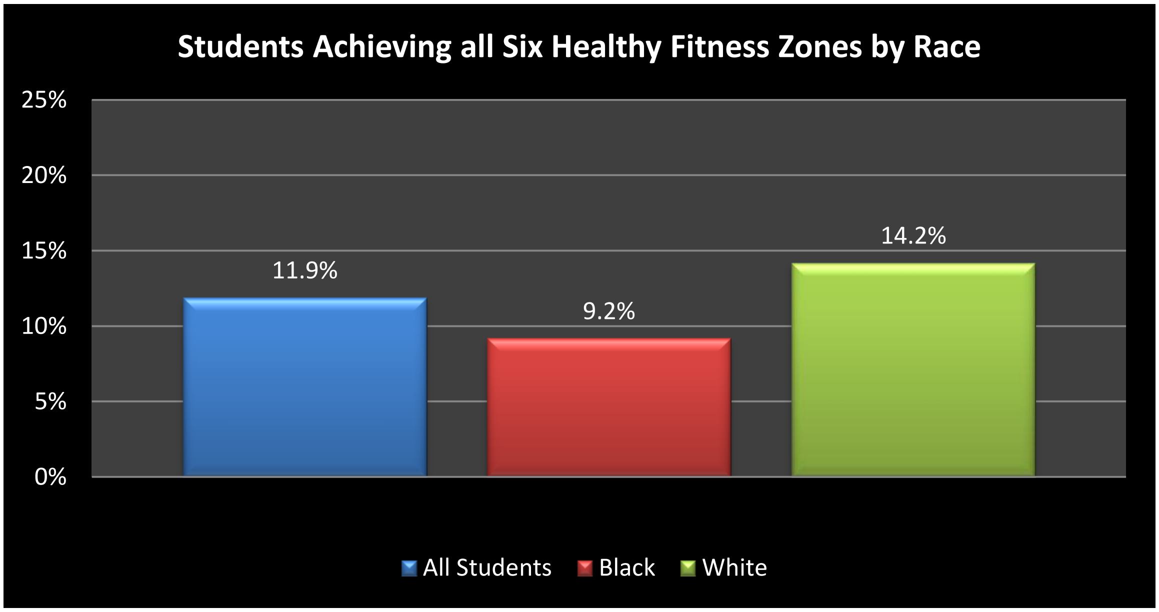
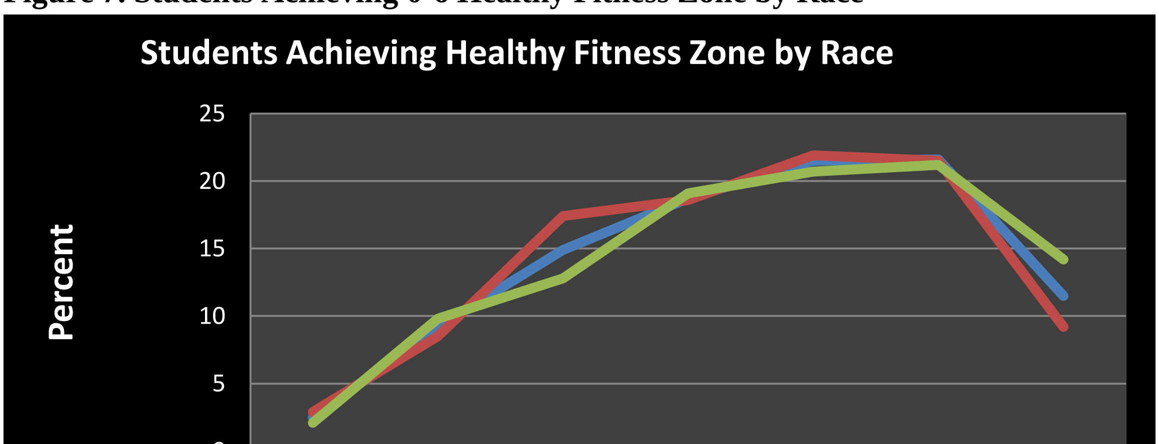


Figure 7. Students Achieving 0-6 Healthy Fitness Zone by Race



	0	1	2	3	4	5	6
All Students	2.5	9.2	14.9	18.7	21.5	21.6	11.5
Black	2.9	8.5	17.4	18.6	21.9	21.5	9.2
White	2.1	9.8	12.8	19.1	20.7	21.2	14.2

Percent of Students Achieving all Six Healthy Fitness Zones by Grade Level

Fifteen percent elementary school students enrolled in PE achieved all six HF, compared to 11.9% of middle school students and 8.6% of high school students. Refer to Figure 8. There is no significant difference by grade level. The percent of students achieving 0 – 6 HFZ by grade level is presented in Figure 9.

Figure 8. Percent of Students Achieving all Six Healthy Fitness Zones by Grade

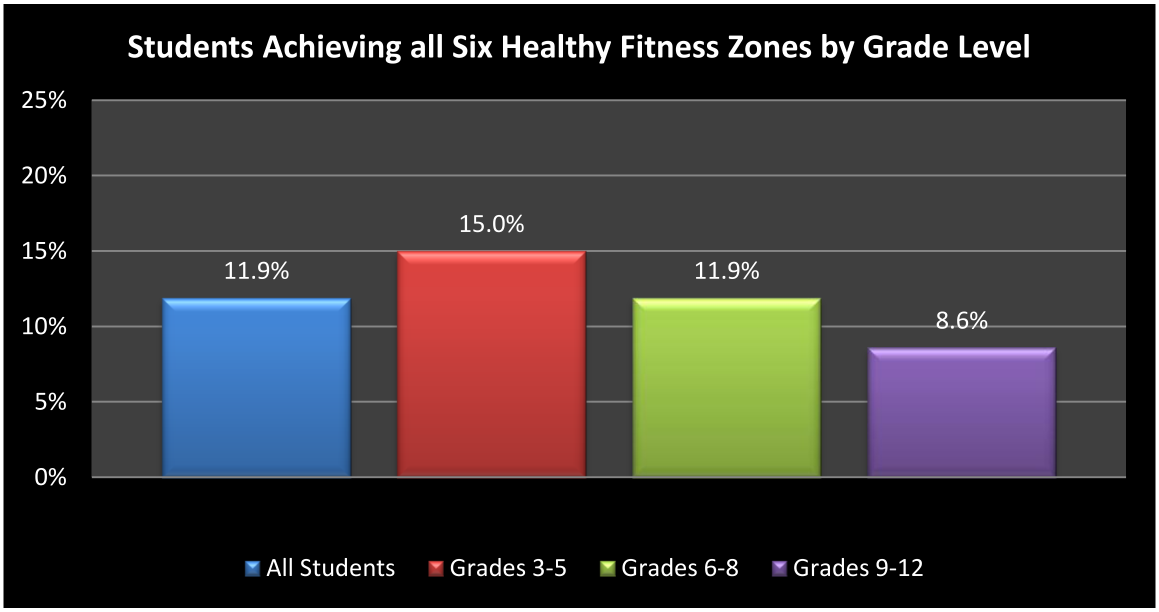
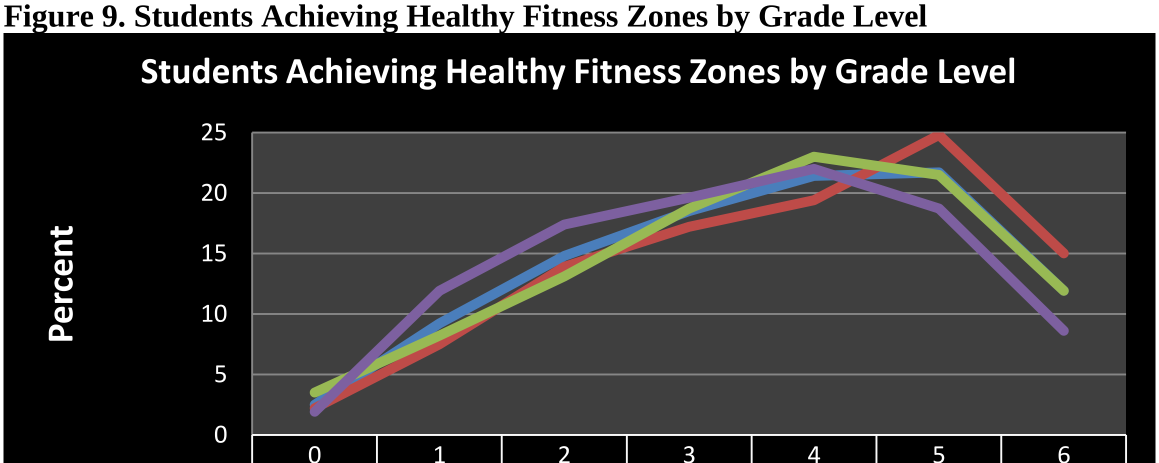


Figure 9. Students Achieving Healthy Fitness Zones by Grade Level



	0	1	2	3	4	5	6
All Students	2.5	9.2	14.8	18.5	21.4	21.7	11.9
Grades 3-5	2.2	7.5	13.9	17.2	19.4	24.8	15.0
Grades 6-8	3.5	8.2	13.1	18.7	23.0	21.5	11.9
Grades 9-12	1.9	11.9	17.4	19.6	22.0	18.7	8.6

Comparisons of Aerobic Capacity HFZ by Gender, Race, and Grade Level

Approximately 56% of the students achieved the HFZ for Aerobic Capacity. There were no significant differences by gender or race. However, there was a significant difference on the percent of students in the HFZ by grade level ($p = 0.03$). It decreased while the grade level increased. Refer to Figures 10-12.

Figure 10. Percent of Students Achieving HFZ in Aerobic Capacity by Gender

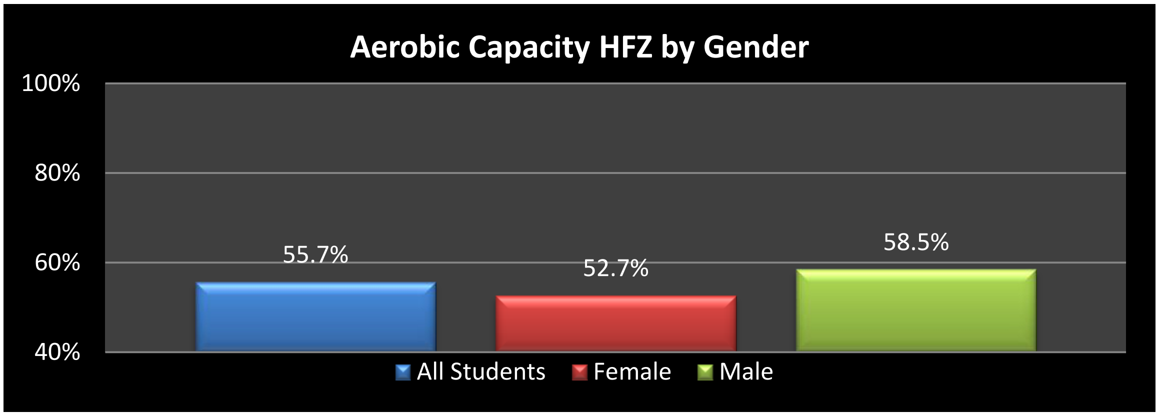


Figure 11. Percent of Students Achieving HFZ in Aerobic Capacity by Race

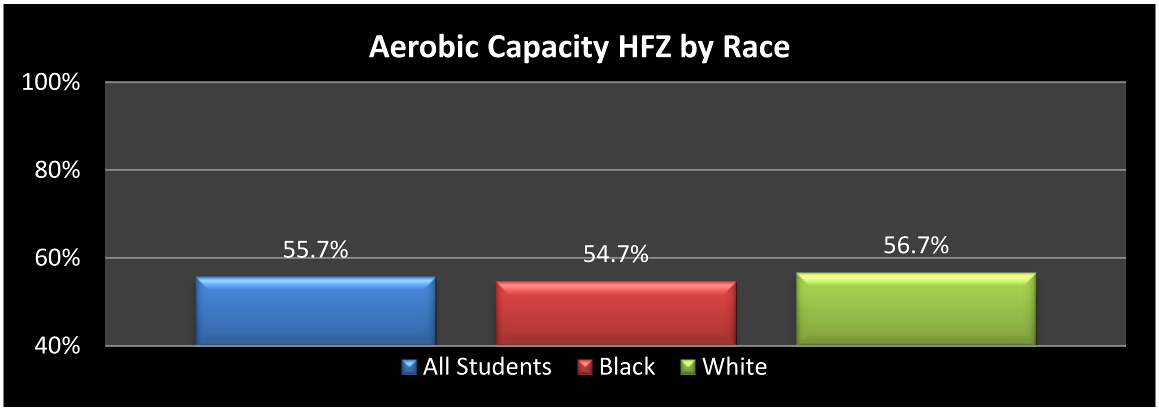
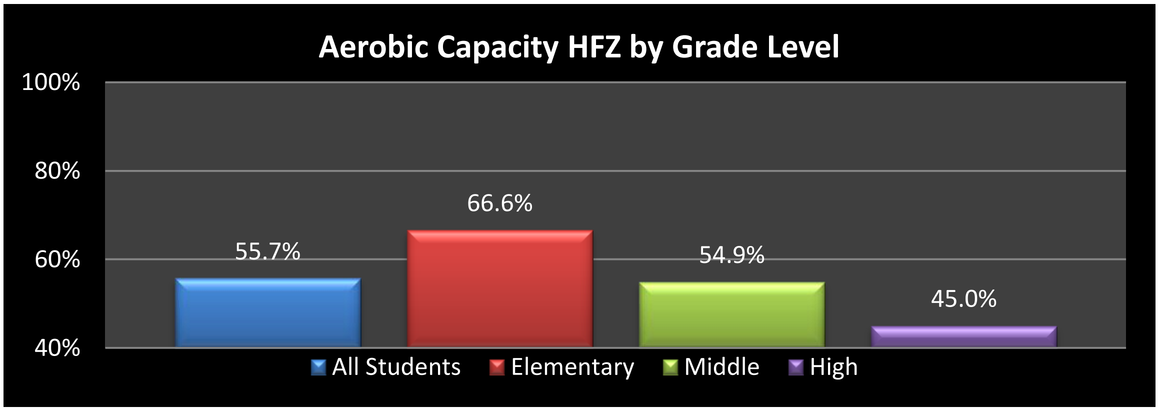


Figure 12. Percent of Students Achieving HFZ in Aerobic Capacity by Grade Level



Comparisons of Abdominal Strength HFZ by Gender, Race, and Grade Level

Over 60% of the students achieved the HFZ for Abdominal Strength. There were no significant differences by gender or race. However, there was a significant difference on the percent of students in the HFZ by grade level (p = 0.039). It decreased while the grade level increased. Refer to Figures 13-15.

Figure 13. Percent of Students Achieving HFZ in Abdominal Strength by Gender

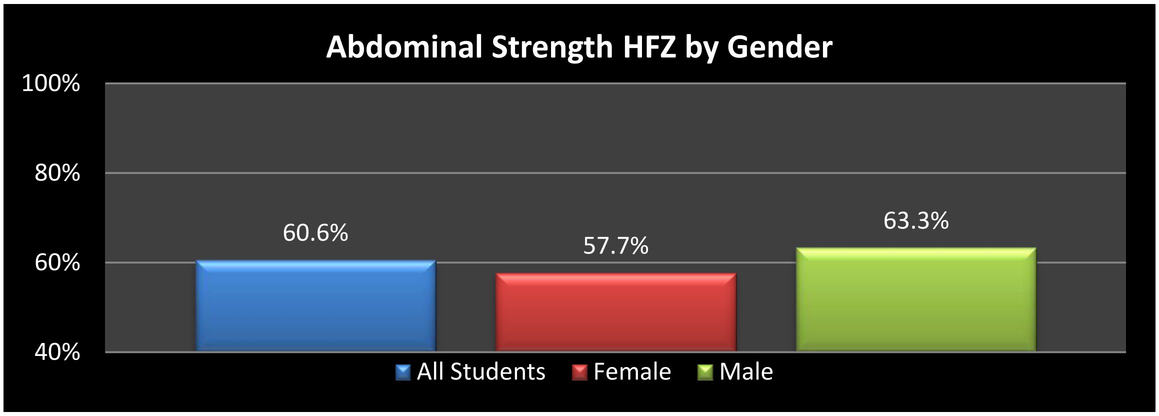


Figure 14. Percent of Students Achieving HFZ in Abdominal Strength by Race

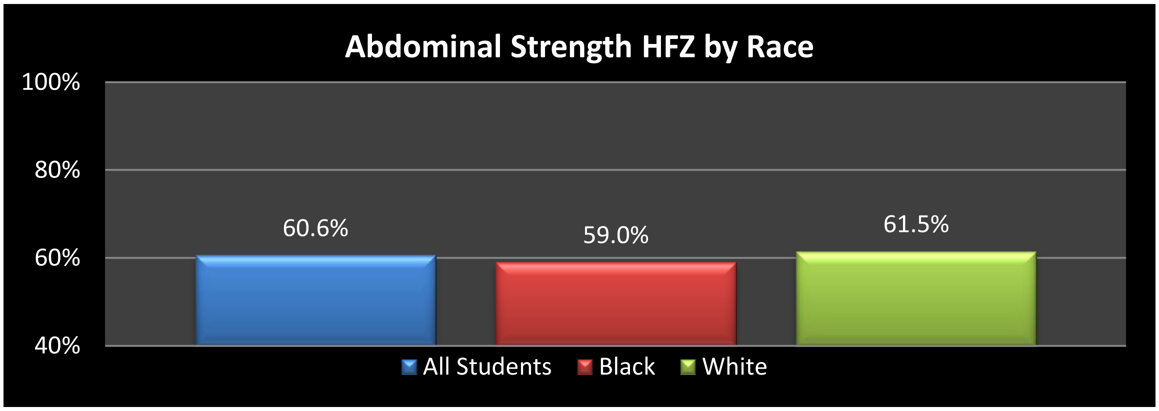
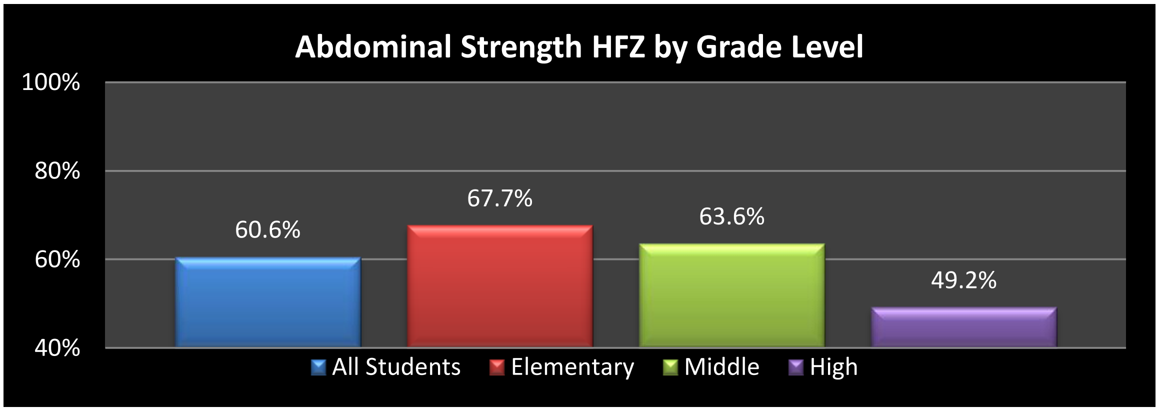


Figure 15. Percent of Students Achieving HFZ in Abdominal Strength by Grade Level



Comparisons of Upper Body Strength HFZ by Gender, Race, and Grade Level

Fifty-nine percent of the students achieved the HFZ for Upper Body Strength. There were no significant differences by gender, race or grade level. Refer to Figures 16-18.

Figure 16. Percent of Students Achieving HFZ in Upper Body Strength by Gender

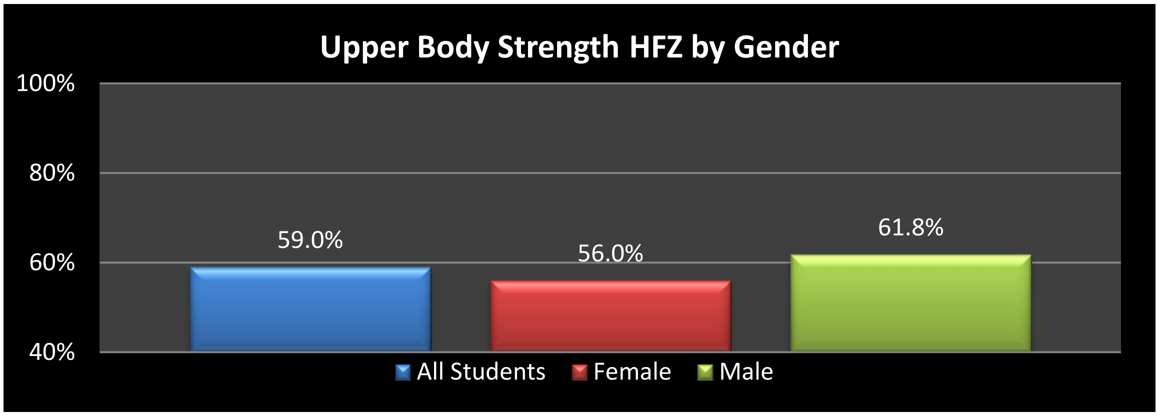


Figure 17. Percent of Students Achieving HFZ in Upper Body Strength by Race

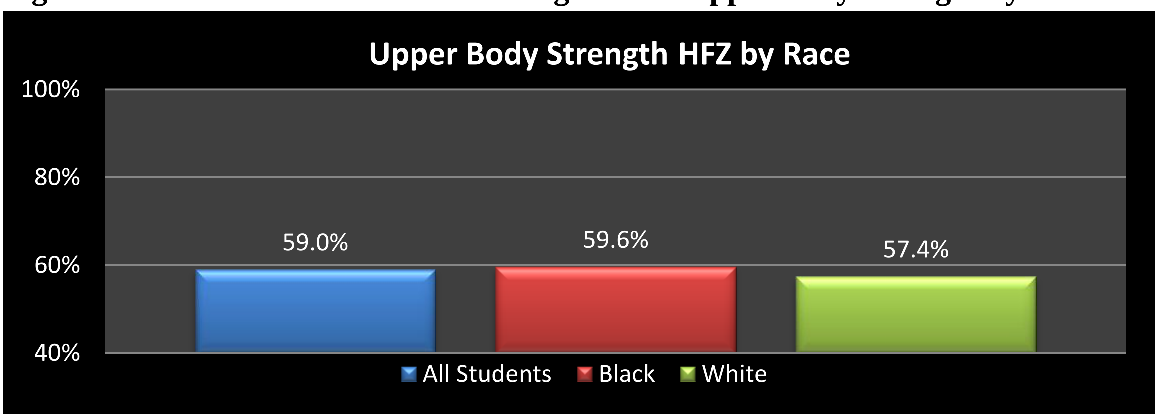
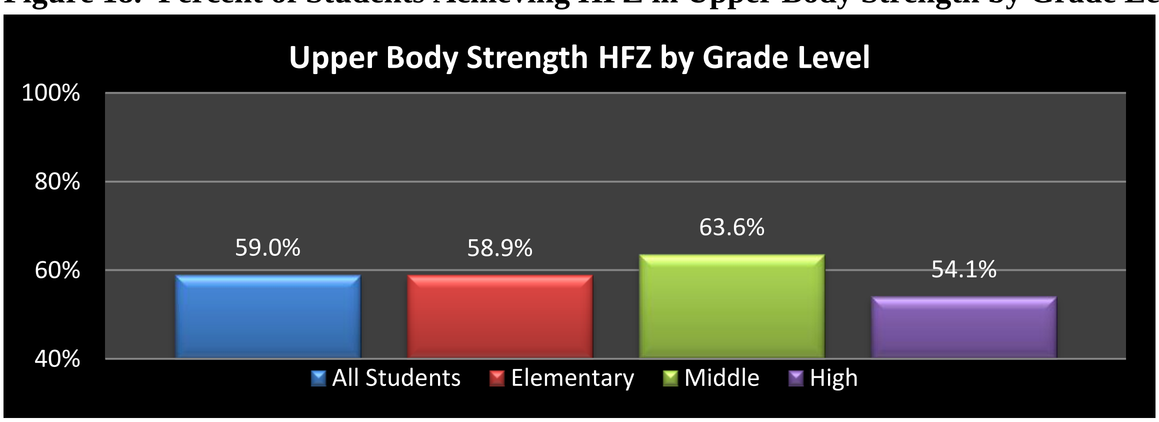


Figure 18. Percent of Students Achieving HFZ in Upper Body Strength by Grade Level



Comparisons of Flexibility HFZ by Gender, Race, and Grade Level

Approximately 60% of the students achieved the HFZ for Flexibility. There were no significant differences by race or grade level. There was a significant difference on the percent of students in the HFZ by gender ($p < 0.001$). Males were much more likely to achieve the HFZ for flexibility than females. Refer to Figures 19-21.

Figure 19. Percent of Students Achieving HFZ in Flexibility by Gender

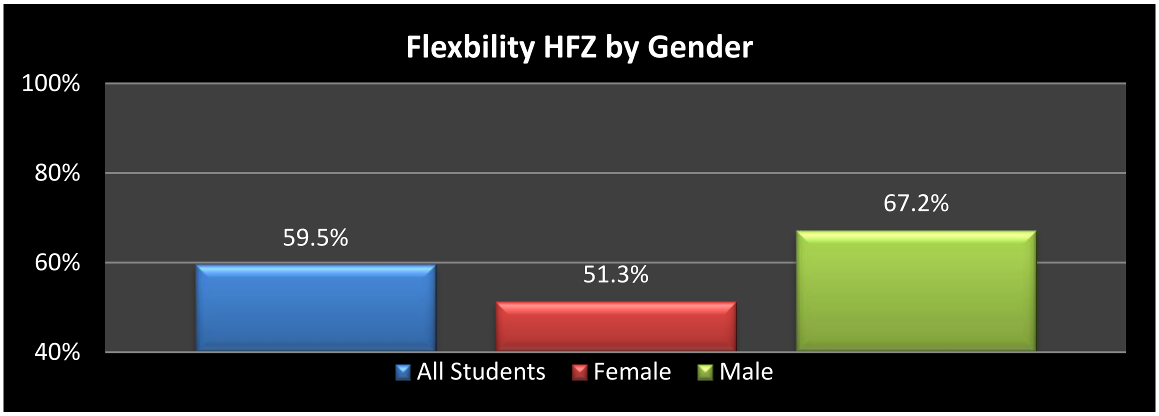


Figure 20. Percent of Students Achieving HFZ in Flexibility by Race

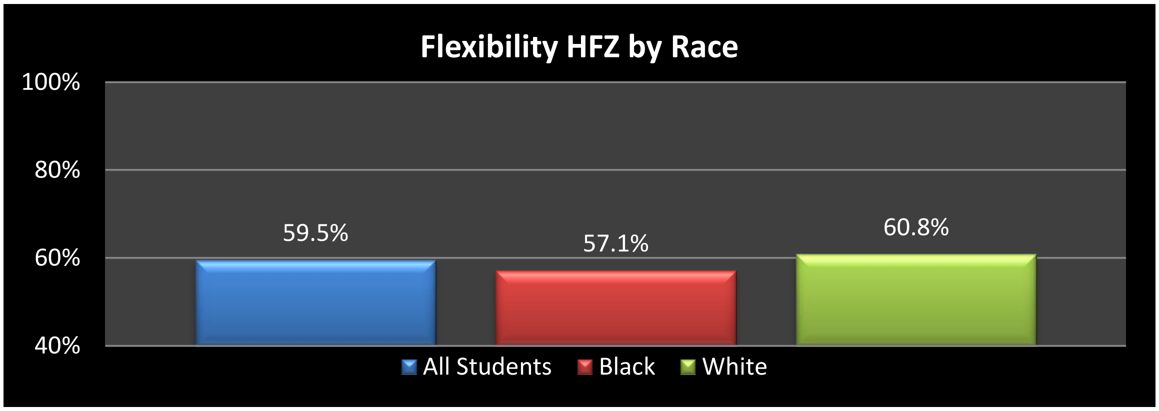
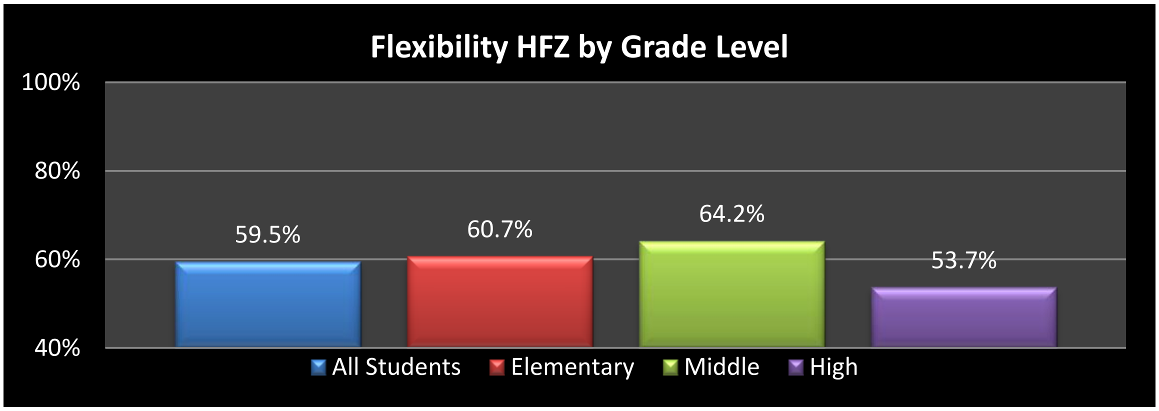


Figure 21. Percent of Students Achieving HFZ in Flexibility by Grade Level



Comparisons of Trunk Lift HFZ by Gender, Race, and Grade Level

Three-quarters (75.2%) of the students achieved the HFZ for Trunk Lift. There were no significant differences by gender or race. However, there was a significant difference on the percent of students in the HFZ by grade level (p = 0.001) with the lowest among the middle schools students. Refer to Figures 12-24.

Figure 22. Percent of Students Achieving HFZ in Trunk Lift by Gender

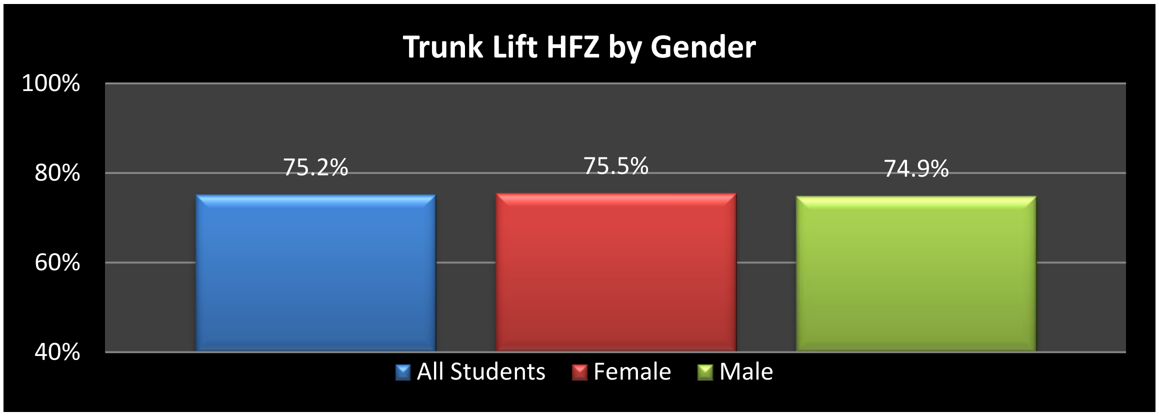


Figure 23. Percent of Students Achieving HFZ in Trunk Lift by Race

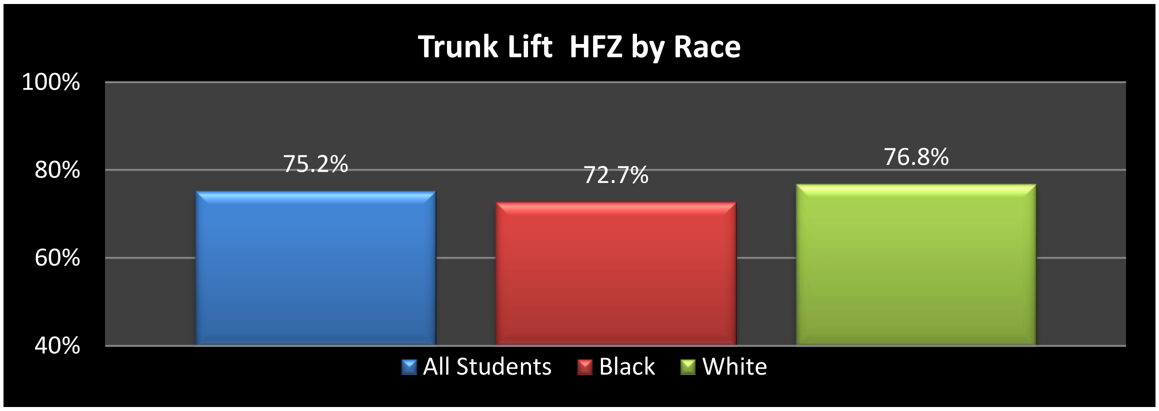
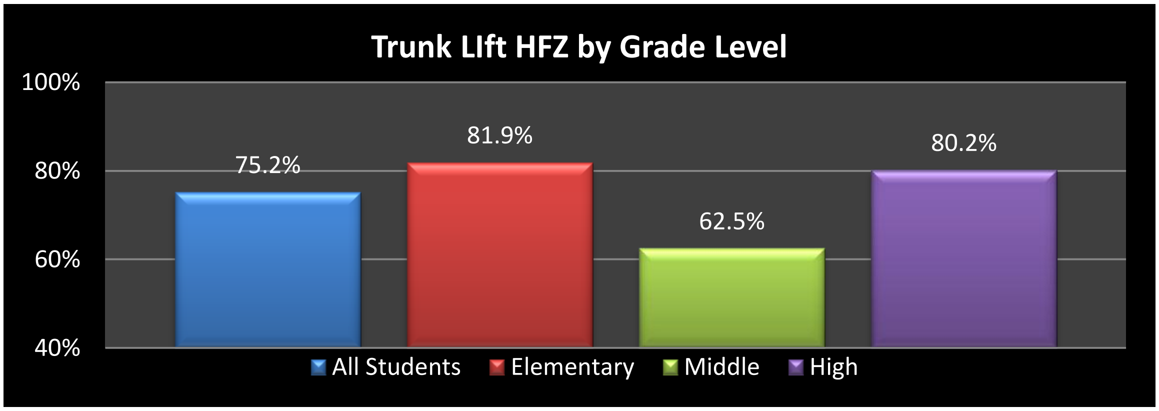


Figure 24. Percent of Students Achieving HFZ in Trunk Lift by Grade Level



Comparisons of Body Composition HFZ by Gender, Race, and Grade Level

Fifty-five percent of the students achieved the HFZ for Body Composition. While there were no significant differences by gender, there was a significant difference on the percent of students in the HFZ by race ($p = 0.004$) and grade level ($p = 0.008$). Percentages in the HFZ were higher for White students and it increased as grade levels increased. See Figures 25-27.

Figure 25. Percent of Students Achieving HFZ in Body Composition by Gender

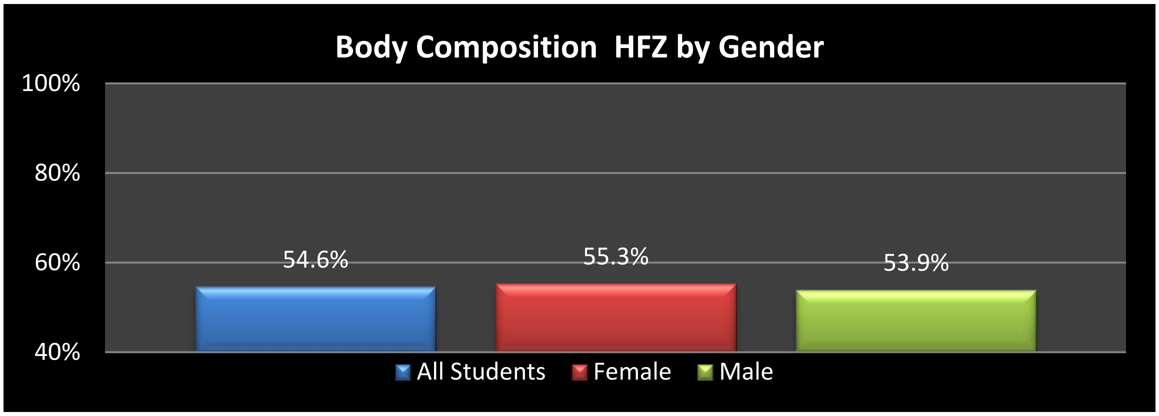


Figure 26. Percent of Students Achieving HFZ in Body Composition by Race

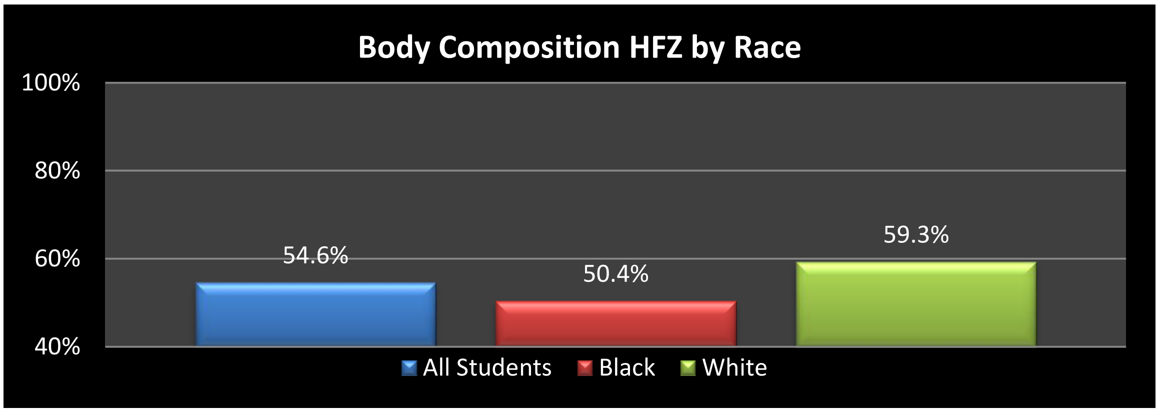
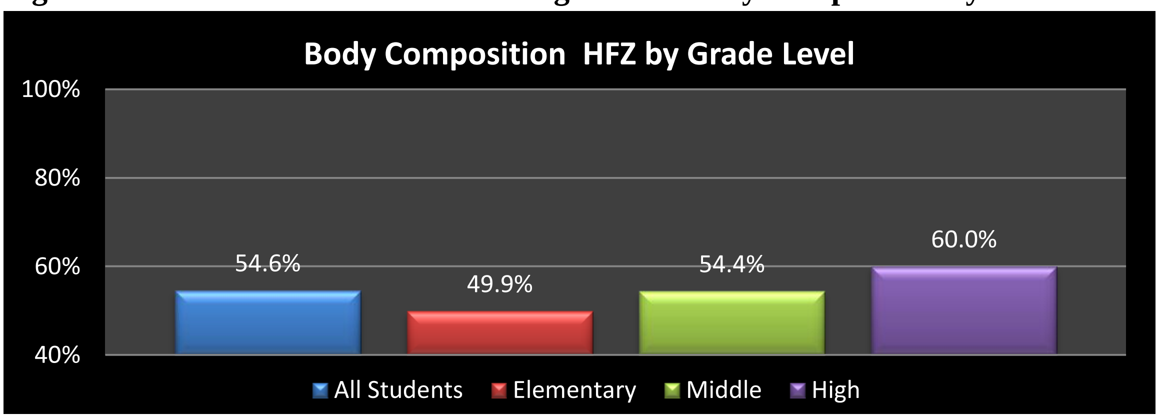


Figure 27. Percent of Students Achieving HFZ in Body Composition by Grade Level



Overweight and Obesity by Gender, Race, and Grade Level

In addition to determining the HFZ for Body Composition, the data allowed for the determining of the weight status (overweight and obese) and the BMI for each student. Figures 28-30 include the percentages of student who were found to be overweight or obese. Weight status deferred to gender (p = 0.028), race (p = 0.021), and grade level (p = 0.045), being higher among males, Black students and lower grade levels.

Figure 28. Weight Status of Students by Gender

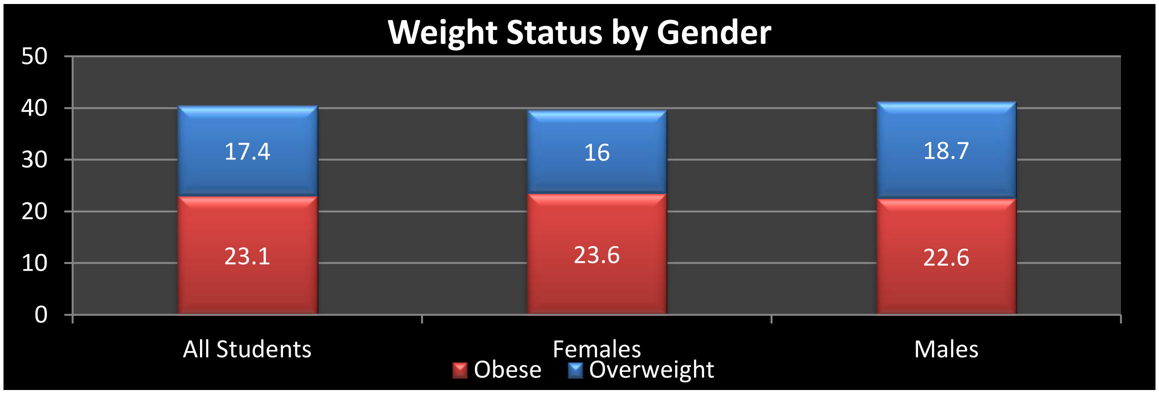


Figure 29. Weight Status of Students by Race

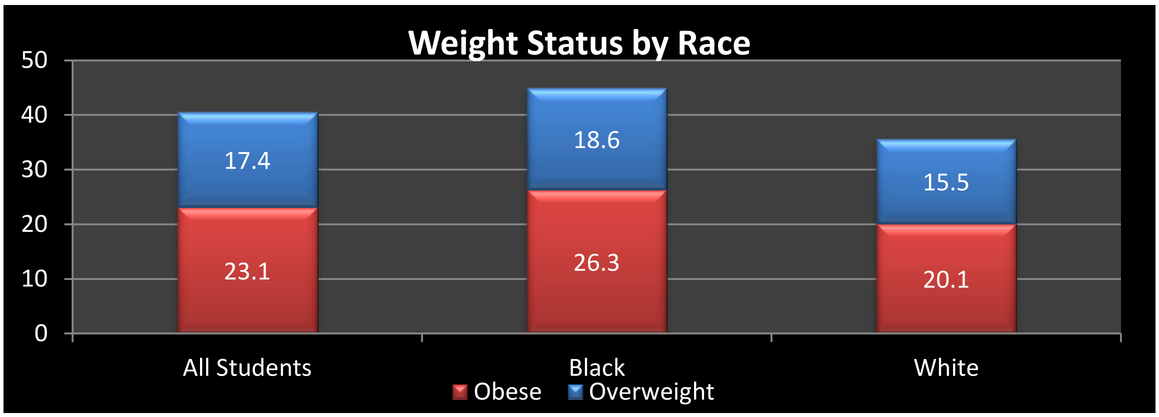
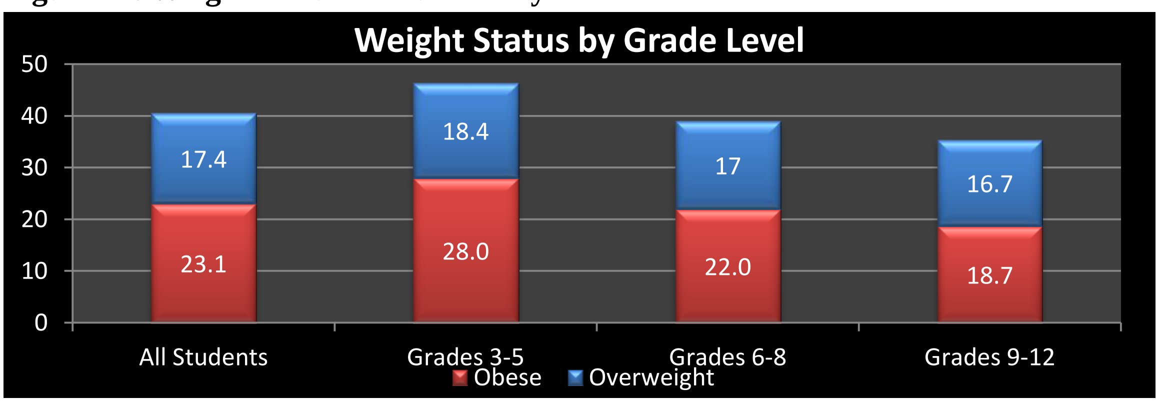


Figure 30. Weight Status of Students by Grade Level



Comparisons of Five HFZ without Body Composition

Of the six fitness components, the only one for which there was a significant difference by race was Body Composition, where 50.4% of black students reached a Healthy Fitness Zone compared to 59.3% of white students. When fitness levels were examined with BMI omitted (using the other five measures only), no significant differences were found by race. Achievement of all five HFZ was still significantly higher among males than female students. Unlike when all six components were included, with the exclusion of Body Composition, a significantly higher percentage of elementary students achieved a HFZ than did older students.

Figure 31. Percent Achieving HFZ on Five Components (Excluding BMI) by Gender

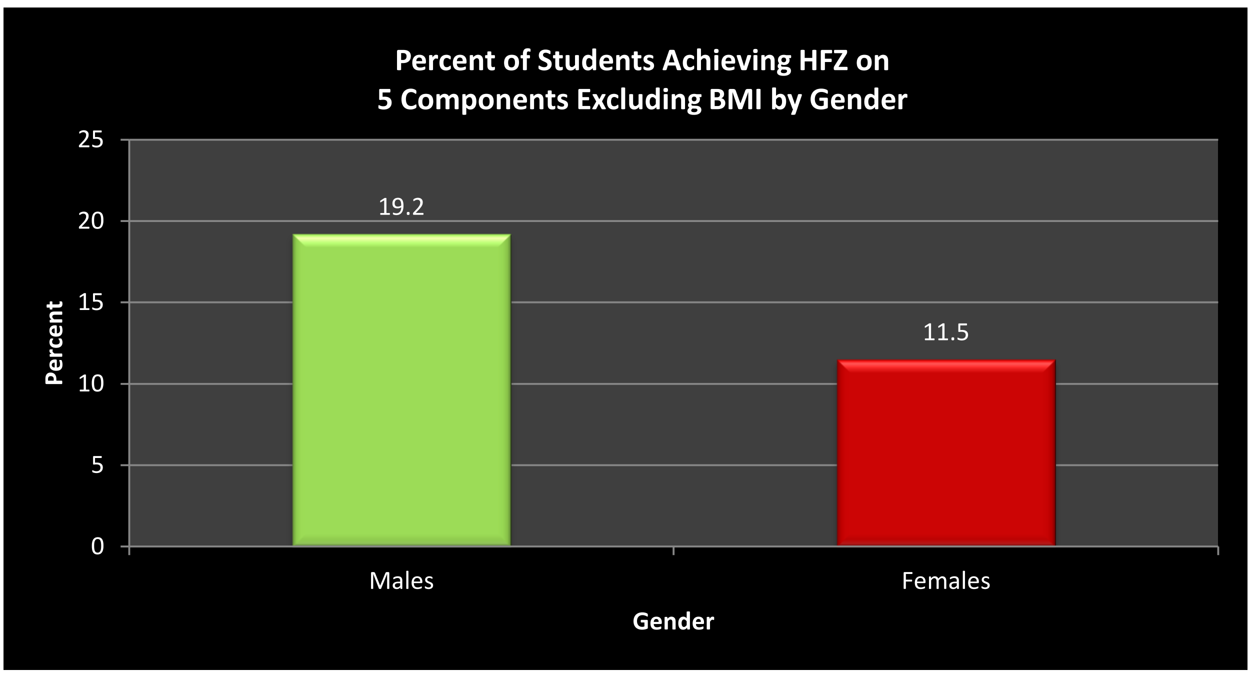


Figure 32. Percent Achieving HFZ on Five Components (Excluding BMI) by Race

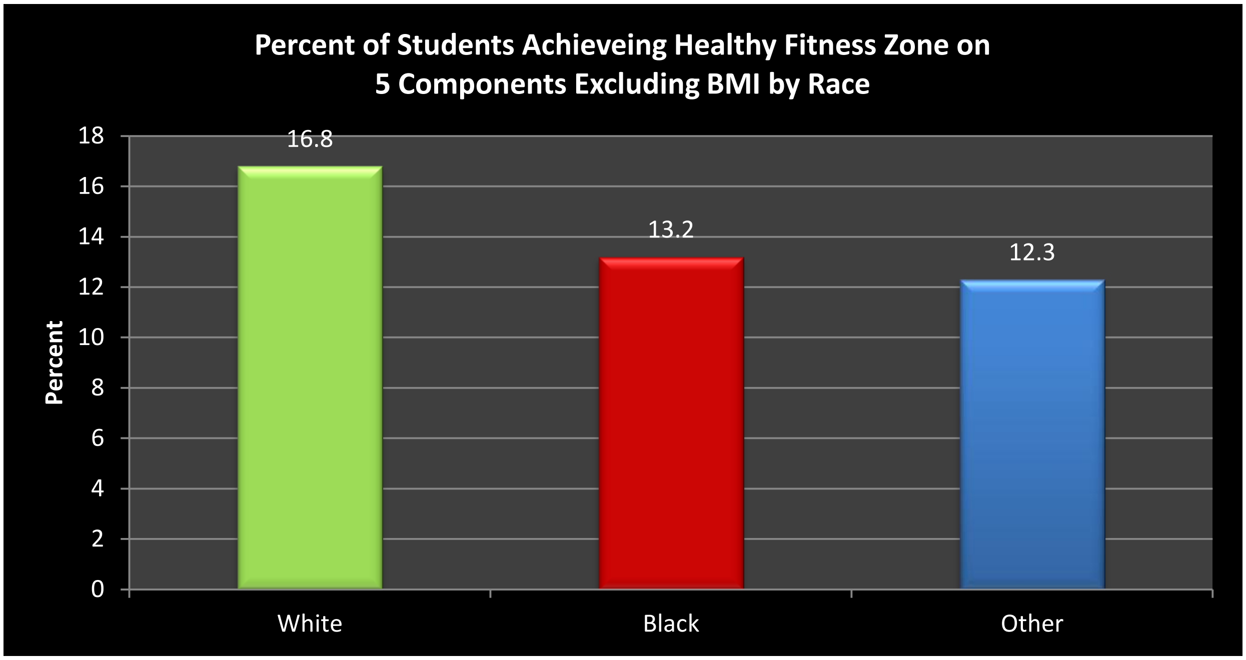
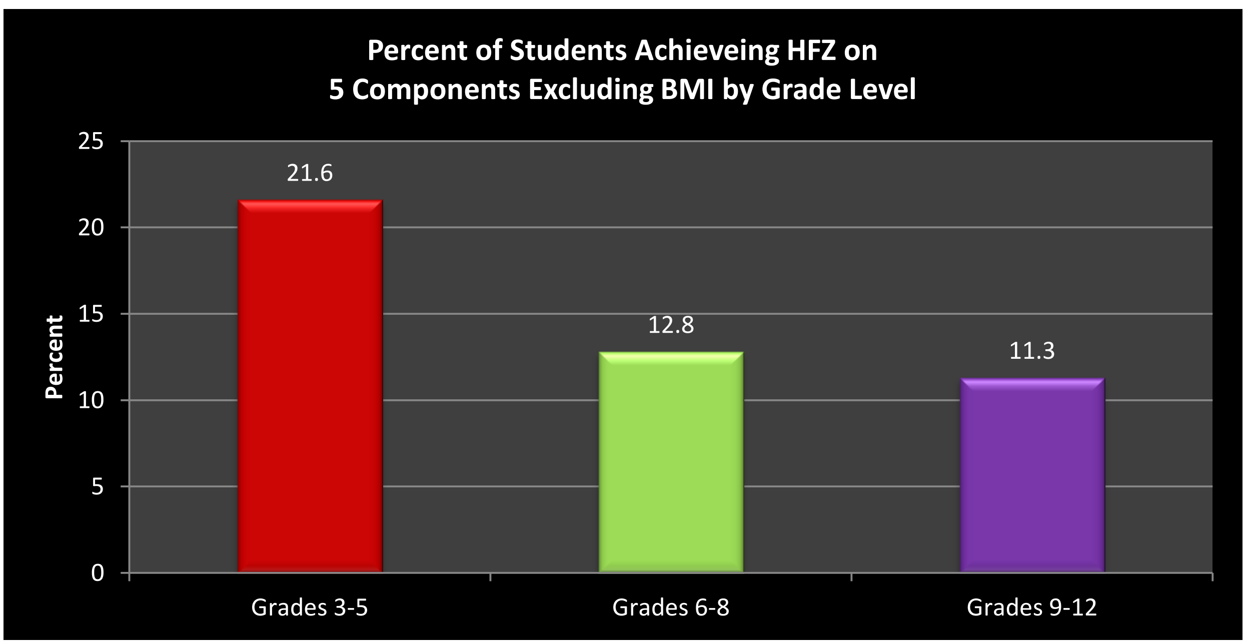


Figure 33. Percent Achieving HFZ on Five Components (Excluding BMI) by Grade Level



Discussion

Study findings are based on weighted, representative data from Mississippi public school students enrolled in PE. The highest percentage of students achieved a HFZ in the Trunk Lift (75.2%), followed by Abdominal Strength (60.6%), Flexibility (59.5%), Upper Body Strength (59.0%), Aerobic Capacity (55.7%), and Body Composition (54.6%). All of these percentages are below those reported by recent statewide assessments in California, Georgia, Texas, and West Virginia (California Department of Education, 2012; Powell, 2009; Welk, Meredith, Ihmels, & Seeger, C. 2010; West Virginia Health Lifestyles Act, 2009). It should be noted that Texas includes all students in grades 3 – 12. West Virginia includes students in grades 4-8 and one year of high school. California only includes students in grades 5, 7, and 9 while Georgia tested grades 5 and 7. As such, their study participants do not equally match those in this study by grade level. Nevertheless, the percentage of students achieving HFZs in these studies were higher in all grades reported when compared to those in Mississippi. Another important note is the fact that the current study is using the updated HFZ criterion standards (Welk, 2008). There have been significant changes in determining HFZs especially for cardiorespiratory fitness and body composition/BMI (Welk, 2011). This change in criterion-referenced standards also makes comparisons to these previous studies difficult.

Approximately 12% of the students were able to achieve HFZ in all six areas. When assessed by gender, race and grade levels, achievement of all six HFZ was significantly higher among males, White students, and elementary grade students. Texas reported the percentage of all students in grades 3-12 who achieved HFZ in all six areas. Across the board, their percentages were higher ranging from 33% in 3rd grade to 8.8% in 12th grade (Texas Education Agency, 2010). Similar to our study, the percentages declined as grade levels increased. Unlike our findings, females had higher percentages than males in the Texas state fitness assessment (Texas Education Agency, 2010). California and West Virginia did not report percentages based on achieving HFZ in all six areas. Unlike gender and age, race-related differences in HFZs achieved cannot be compared as none of the previous studies compared all six HFZs by race.

The Trunk Lift, which assesses trunk extensor strength, flexibility and endurance varied significantly by grade level, with the lowest percentages achieving a HFZ among middle school students. Percentages of students within the HFZ for Abdominal Strength, as assessed by the Curl Up, significantly declined as grade levels increased. Flexibility, as measured by the Sit-and-Reach, was significantly higher among males than females. Upper Body Strength, which was assessed by the Push Up, was the only test in which there were no significant differences by gender, race or grade level. Aerobic Capacity, which the schools used the PACER test to assess, significantly declined as grade levels increased. Body Composition, determined by student BMI differed significantly by race and grade level. Higher percentages were in the HFZ among White students and the percentage of students in the HFZ increased by grade level. Babey and colleagues (2011) used data from California's state fitness assessment to look at longitudinal changes in overweight and obesity using BMI values collected during the assessment. The researchers found that the number of students in the HFZ was not consistent over the state or among subpopulations. They suggest that the fluctuations are the result of societal, economical, and environmental characteristics. They also suggest that differences among groups may be due to "local policies and programs" (Babey, 2011).

This study provides a baseline level of fitness among Mississippi public school students in PE, yet it does not represent all students in public school or all children and youth in the state. The participating students were selected from PE classes and the study was administered by PE teachers, however, we do not know if all the schools had a coordinated PE program or curriculum, were implementing the state policy on physical education and physical activity as intended, or whether classes were taught by a qualified/certified physical educator. The majority of the data in this study indicate that the students' fitness level deteriorates as they matriculate through grade school as evidenced by the older children achieving fewer HFZs in Trunk Lift, Abdominal Strength and Aerobic Capacity. The only exception was the body composition and weight status, which seems to be improving with age. Nonetheless, another interpretation of the data could be that the majority of the older students' time in school preceded the Healthy Students Act. Only a more closely examined intervention would be able to evaluate the impact of these increased physical activity standards.

As with the evaluation of the Health is Academic Quality Physical Education Program (Blom et al., 2011; Hudson et al., 2012), we believe that another benefit of this study was the increased understanding and awareness of fitness. Providing the *Fitnessgram* software to schools equips them in generating student and parent reports, teaching their students about health-related fitness testing (e.g., non-competitive testing), and producing statistical reports at class, school, and district levels. In addition, a growing number of schools across the state now have staff members who are trained/certified in fitness testing. We also believe that a benefit of this study was the increased exposure of students to fitness that is fitting with the goal of assisting students in establishing healthy lifestyle habits. Fitness assessment is now more possible among all students in PE, whereas the policy requiring it only in Grade 5 and once again in high school might have limited a students' exposure to fitness testing and awareness of the importance of health-related fitness.

This assessment structure that is now established will also provide the state with a valuable foundation for tracking changes in fitness levels of children within the state. Moreover, we believe these data may also assist the state in competing for federal funding of programs supporting physical education, physical activity and fitness. Additionally, these data provide a more complete picture of the state's health, subsequently influencing the legislature's decision-making on funding priorities, and better equipping various state and local initiatives with data in which to compare their findings.

Next steps in Mississippi should be to promote the increase of physical activity in the schools. That means, emphasize the importance of recess, physical education, and classroom activity breaks. Current literature in the school setting, (Greenleaf, 2010; Murray, 2012) supports this notion. Greenleaf (2010) found that attaining HFZ improves self-esteem, body image, and lowers levels of depression. Murray (2012) used baseline data as a tool to develop an intervention program for middle school students. The investigators increased focus on physical activity for students and had once a week "fitness' days. The result was a 15.5% increase in females passing all six of the *Fitnessgram* tests and a 19% increase in males passing all six components of the test. Furthermore, Katz (2010) and colleagues implemented activity breaks in the classroom and found the increased activity improved physical fitness, decreased the need for medication, and did not negatively affect academic performance.

Another outcome of this study is the realization that more research is needed to better understand the impact of interventions on physical fitness and student performance. It is suggested that a baseline measure of current policy, practice, and perception be developed, data collected and analyzed. This will help to better understand the need areas in Mississippi and help practitioners to develop more effective practices. Texas (Zhu et al., 2010) and West Virginia (Harris et al., 2010) have reported findings where students, teachers, health care providers, policy makers, and parents were surveyed to help better understand the "lay of the land" and help improve their children's health and fitness. Taking a similar approach in Mississippi could decrease the risk of future pitfalls and help define best practices within the state.

Finally, while these findings are insightful, we should be reminded that fitness testing alone cannot paint the entire picture. Precaution should be taken as the appropriate use of fitness testing data is always important. For example, the data cannot be used to determine the quality of the school, teacher, or an assessment program by itself. Data from fitness testing are not the same as a cognitive standardized state test, but other factors need to be considered when attempting to make comparisons (Corbin, 2010). Physical fitness is only one aspect of a physical education program. Cognitive, affective and other psychomotor aspects must be considered along with physical fitness to truly be able to make comparisons with content related standardized tests.

Cooper (2010) states that changing the direction of childhood obesity is necessary and that there is no time for hesitation. The present study and potential interventions that follow are essential to changing the culture of the state and positively effecting public health. Cooper goes on to say that adult overweight and obesity statistics are at an all time high and that the number is continuing to increase. He also states that the best effort to change this is to "educate children and provide them with the school, family, and home environment to build healthy lifetime habits. If we hold the number of overweight and obese children to no more than 40% (as it is currently) and work toward a reduction in this percentage, it would have a dramatic effect on the cost of health care and longevity in our country's future. Physical education teachers in the schools are ideally positioned to play an important role in this transformation." With that in mind, the implications from the current study are significant. Understanding that a very large percentage of our students are not achieving healthy levels of fitness is a reason for concern for policy makers at the state and community level. Six years ago, with the passing of the amendment to the Mississippi Healthy Student Act requiring physical activity for all students, there began a process to improve the quality of life for Mississippi students. This study is the culmination of the efforts of policy makers, schools, and communities making the beginning steps of changing the culture of the state to a more active and healthier place. This baseline data is a new starting point to allow us to evaluate what the next steps need to be in setting policy and practice in helping our students meet their physical activity and physical fitness needs.

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