Original Research

FitnessGram Assessment Results in Five Rural Counties of Georgia

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ABSTRACT

Background: Childhood obesity continues to be more prevalent in the United States (US) than ever before. Youth who reside in rural areas tend to experience higher risks of obesity and overweight status, mainly due to barriers to physical activity. Even though the US federal government has mandated a daily requirement of physical activity for all school-age children, the majority of youth from rural communities tend to not achieve the recommended Health Fitness Zone (HFZ) goals.

Methods: The FITNESSGRAM is the instrument that has been used to measure and report students' physical activity and body mass index (BMI) based on the Georgia Student Health and Physical Education Partnership (SHAPE) program recommendations. We examined BMI and aerobic activity measurements for students in 8 schools located in rural middle Georgia to determine their HFZ participation rates and achievement. The total students who participated in the aerobic capacity assessment was 1,068 (from 6 middle schools and 2 high schools) and the total who participated in the BMI assessment was 1,097 (from 5 middle schools and 2 high schools).

Results: Overall, the majority of the schools were below 50% of the recommended goals.

Conclusions: Additional initiatives are needed to address rural school compliance with federal and state policy recommendations and the low levels of physical activity among rural school-age children.

Keywords: Rural, FitnessGram, physical activity, obesity, BMI, aerobic capacity

INTRODUCTION

In the United States (US) many individuals who live in rural communities continue to serve the nation "as an "agricultural and resource basket" providing people with needed crops and raw resources for an increasingly hungry nation and the world" (Bolin et al., 2015). Significant economic, institutional, and social changes in the US since the mid-20th century fundamentally transformed the lives of individuals in rural communities and presented both opportunities and challenges (Brown & Schafft, 2011; "Strengthening the Rural Economy - The Current State of Rural America," n.d.). Some of these challenges are seen in lower and steadily declining levels of access to quality healthcare (U.S. Department of Health and Human Services, 2015). For instance, in 2011, 15% of the total US population lived in rural areas, "yet, only 9% of doctors and 16% of registered nurses practice in rural areas" (Council of State Governments, 2011). Currently many rural communities, especially in the southern part of the country, have no functioning hospitals/clinics or healthcare providers (Weber & Miller, 2017; Wishner, Solleveld, Rudowitz, Paradise, & Antonisse, 2016). Other health-related challenges experienced in rural areas include higher rates of chronic disease prevalence and obesity, and lower overall individual and community health outcomes (Bolin et al., 2015). Of concern to researchers are indicators of rural child health outcomes as reports have shown "higher rates of obesity and overweight in rural children aged 10-17, compared to the US as a whole" (U.S. Department of Health and Human Services, 2014). Another concern stems from the significant racial/ethnic disparities in the prevalence of obesity and overweight among rural school-age children. Recent reports indicate that "obesity and overweight are more common among rural black and Hispanic children than white children" (U.S. Department of Health and Human Services, 2014). For the purpose of this research, rural is defined as "all population, housing, and territory not included within an urbanized area or urban cluster" (Ratcliffe, Burd, Holder, & Fields, 2016).

According to the US Census Bureau, approximately 13.4 million school-age children under the age of 18 lived in rural communities (US Census Bureau, n.d.). Many of these children face significant challenges which increase their risks of obesity and overweight. These challenges include lack of available organized sports, lack of safe playground facilities, and other determinants that contribute to decreased motivation to be physically active. Long distance to a gymnasium/fitness center or recreational park, lack of public transportation, lack of swimming facilities, cost of utilizing available recreational facilities, extreme weather conditions, concerns about safety, or the lack of a YMCA facility were also barriers (McWhinney et al., 2011a). It is conceivable that other factors that negatively impact physical activity and increase the risks of obesity and overweight among US children are also found in rural communities. For instance, studies have shown that female gender (Pate et al., 1997; Sallis, Patterson, Buono, & Nader, 1988; Sallis, Prochaska, & Taylor, 2000a), lower levels of maternal education (Gordon-Larsen, McMurray, & Popkin, 2000; Pratt, Macera, & Blanton, 1999), parents who are not physically active (Sallis, Prochaska, & Taylor, 2000b), and low income (Gay, Dowda, Saunders, & Evans, 2011) contribute to the prevalence of childhood obesity. With no significant positive change in a number of these variables, the prevalence of child obesity has been steadily increasing in the US over the past 30 years (Hedley et al., 2004; Ogden, Carroll, & Flegal, 2008; Shriver et al., 2011). Recent reports have indicated that almost one in three of American children are overweight or obese (Children's Defense Fund, 2012; McWhinney et al., 2011b; Ogden et al., 2008), and that these negative health outcomes are more acute among rural school-age children (U.S. Department of Health and Human Services, 2014).

For a number of years, low levels of physical activity among youth in the US have been a great concern to health policy makers, public health professionals, and healthcare providers. This is mainly due to the demonstrable strong associations between lack of physical activity and obesity during youth and a number of older-age chronic diseases (Health & Services, 2008; National Physical Activity Plan Alliance, 2014; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Furthermore, the rising costs of pharmaceutical treatment and healthcare for individuals living with chronic diseases directly associated with childhood obesity and lack of physical activity (i.e., diabetes, hypertension, heart disease, arthritis, and obesity-related cancer) have become a primary challenge to many healthcare providers, health policy makers, and public health professionals. The total healthcare costs of preventable chronic diseases that are directly associated with obesity has been steadily increasing, and is currently estimated to range from $147 billion to nearly $210 billion per year (Cawley & Meyerhoefer, 2012; Lee, Sheer, Lopez, & Rosenbaum, 2010). Between 22 and 55 percent of state-level obesity-related healthcare costs are financed by Medicare and Medicaid (Dodd & Gleason, 2013; Trogdon, Finkelstein, Feagan, & Cohen, 2012).. For all of these reasons, obesity is currently considered one of the greatest threats to children's health in the US and a primary cause of significant increases in the risks of a range of costly preventable chronic diseases, and the costs associated with their treatment (Cawley & Meyerhoefer, 2012; Finkelstein, Trogdon, Cohen, & al., 2009; Segal, Rayburn, & Martin, 2016).

The Problem of Childhood Obesity and Overweight in Georgia

In the State of Georgia (henceforward, Georgia), the prevalence of obesity among children 10-17 years old has been consistently high. In 2011, children in Georgia aged 10-17 years had the 17th highest rate of obesity in the US (Trust for America's Health and Robert Wood Johnson Foundation, 2017). In 2016, 32.2% of children living in Georiga aged 10-17 years were identified as obese/overweight and had the 18th highest rate of obesity in the US (Trust for America's Health and Robert Wood Johnson Foundation, 2017). Due to this growing trend of unprecedented prevalence of obesity combined with a lack of physical activity opportunities in many rural areas, researchers and healthcare advocates were tasked with identifying the contributing factors to this problem and proposing solutions (Kibbe et al., 2016). A key outcome of effort in this area has been the development and passing of the Georgia Student Health and Physical Education (GA SHAPE) Act (Act 54, O.C.G.A. Section 20-2-776) by the Georgia General Assembly effective July 1, 2009 (Richerson, Ewing, & Cagle, n.d.). The GA SHAPE Act was implemented by the Governor's office in 2010 (Georgia Department of Education, 2014). Among other things, the GA SHAPE Act required schools to collect fitness assessment data from students in grades 1 through 12 using the FitnessGram youth fitness assessment system. Data collection started in the 2011-2012 school year (Georgia Department of Education, 2014). There were a number of significant reasons which caused the State to choose the FitnessGram system as an assessment platform. The FitnessGram instrument is "a comprehensive health-related physical fitness and activity assessment and computerized reporting system developed by The Cooper Institute, and is used by tens of thousands of schools nationwide" (Georgia Department of Education, 2014). FitnessGram utilizes criterion-referenced standards to determine Healthy Fitness Zones (HFZ) across five areas: Aerobic Capacity, Muscular Strength, Muscular Endurance, Flexibility, and Body Composition. Fitness scores in the HFZ indicate a fitness level associated with positive health benefits. Scores not in the HFZ over a sustained period of time may indicate some health risk (Georgia Department of Education, 2014). The FitnessGram system stratifies fitness levels using three primary zones: HFZ, Needs Improvement Zone, and Needs Improvement-Health Risk Zone. The latter classification is reserved for use with measurements of body composition and aerobic capacity. It is believed the majority of students engaged in moderate amounts of physical activity can reach a score placing them in the HFZ. When children perform in a manner to reach the HFZ, they are considered to have sufficient fitness for good health. Conversely, a score in the Needs Improvement (NI) denotes potential for future health risk if their present level of activity continues. Finally, a score of Needs Improvement-Health Risk is used to indicate clear potential for future health problems. The use of three zones allows for clear indicators of risk and clear indicators of good fitness and low risk (Institute, 2010). The purpose of this study was to analyze the results of FitnessGram data from five rural counties in Georgia (Crawford, Hancock, Peach, Twiggs, and Wilkinson) to determine [1] the percentages of students who met State-mandated physical fitness thresholds, and [2] if there were variations in student fitness achievement by gender. Two fitness measures were chosen for analysis: body mass index (BMI) and aerobic capacity (AC). This study was conducted by an interdisciplinary team of researchers and was initiated following a dialogue among one of the researchers, community health stakeholders, and public health practitioners in Georgia's North Central Health District. The study aligns with the aims of this Special Issue. Its findings point to practice gaps at rural schools as indicated by lack of compliance with data reporting mandates issued by the State of Georgia. The study findings also indicate practice gaps at the state level that are implied by the State's failure to enforce its reporting mandates among a number of rural high school administrators. Finally, by addressing physical fitness among school-aged rural children, this study will contribute to the evidence base that will inform dialogues among public health practitioners and community health stakeholders about the health and welfare of rural children.

METHODS

AC and BMI data will be examined in this descriptive correlation study. The data came from 6 middle schools (MS) [Crawford County MS, Hancock Central MS, Byron MS, Fort Valley MS, Twiggs MS, and Wilkinson County MS] and 5 high schools (HS) [Crawford County HS, Hancock Central HS, Peach County HS, Twiggs County HS, and Wilkinson County HS]. Data for the total number of students who participated in the AC and BMI assessments in each school were used. A total of 1,068 students participated in the AC assessment. The total who participated in the BMI assessment was 1,097. BMI was calculated as weight in kilograms divided by height in meters squared, rounded to one decimal place. AC was indicated by one of two tests. One is a Progressive Aerobic Cardiovascular Endurance Run test in which a student runs 20 meters distance segments with increasing pace each minute until he/she can no longer sustain the pace. The number of segments are recorded for each student. In the other test, the time for a standard one mile run will be recorded. Equations specifically developed for these tests give measures of AC for each student (Meredith & Welk, 2014). According to the Georgia Department of Education "for grades 1-3, it was determined that students should be familiarized with the aerobic capacity, flexibility, muscular strength, and endurance tests. Data should be collected on height/weight, with individual reports optional, and aggregate data reported. Grades 4-12 should participate in a full battery of assessments and both individual and aggregate student data reported and recorded in all areas of the assessment" (Georgia Department of Education, 2014). With the collection of only anthropometric measures for grades 1 to 3, the AC and BMI datasets for each county elementary schools were incomplete. Therefore, we excluded county elementary schools from the analysis. We used IBM SPSS version 22.0 to compute statistical estimates (IBM Corp., 2013). For each school included in the analysis, we estimated percentages of children in the HFZ variables (AC and BMI) over a 3 year period (2012-2014) and percentage means. Means for percentages were only calculated when AC test results and BMI measures were reported for two years or more. Estimates for each school were categorized by student gender to produce two samples of distinct (unpaired) analysis subjects. We used Student's t-test for unpaired samples to obtain t-test and associated probability (p) values to determine whether or not the sample means were significantly different from each other.

RESULTS

Middle Schools: Aerobic Capacity (AC)

Figures in Table 1 show variation in the schools' AC fitness program performance. Only three of the six middle schools (Crawford County MS; Hancock Central MS; Twiggs MS) had consistent increases in the percentages of female and male students in the HFZ for aerobic capacity (AC). Data for two schools (Byron MS; Fort Valley MS) show no improvement in the first two years of reporting (2011-12 and 2012-13) and noticeable declines in the third year (2013-14) in the percentages of female and male students in the HFZ for AC. One school (Wilkinson County MS) did not report assessment data for the 2013-2014 academic school year. However, data from the preceding years indicate a decrease in the percentage of the school's female students within HFZ for AC, and an increase in the percentage of male students within the HFZ for AC.

The data in Table 1 also indicate a general movement towards gender-associated AC fitness achievement disparity: overall, larger percentages of male students in each county middle school were within the HFZ for AC than percentages of female students in the same school. The percentages of female students in the HFZ for AC ranged well below 50%. Four of the six middle schools had more than 50% of their male students in the HFZ for AC. The two schools (Byron MS and Wilkinson MS) with less than 50% of male students in the HFZ for AC still had more male students than female students in the HFZ for AC.

Furthermore, annual percentage mean estimates show modest annual increases in the percentages of female students within the HFZ for AC. Over the three study years, slightly more than one third of female students in the six county middle schools were within the HFZ for AC. However, over the same period, approximately one-half of the male students in the six county middle schools were in the HFZ for AC. In each of the three study years,

Table 1
Means and Percentage Distributions of Female and Male Middle School Students within the HFZ for Aerobic Capacity (AC) and Body Mass Index (BMI), 2012-2014

Middle School	**Female Students** 2011-12	2012-13	2013-14	**School Mean[1]**	**Male Students** 2011-12	2012-13	2013-14	**School Mean**	***t* Value**	***p* Value[4]**
Aerobic Capacity										
Crawford County Middle School	35.8	41.4	47.0	**41.4**	41.3	59.2	62.0	**54.2**	1.7705	0.1514
Hancock Central Middle School	19.4	42.1	77.0	**46.2**	53.3	71.9	84.0	**69.7**	1.2378	0.2835
Byron Middle School	58.0	52.9	1.0	**37.3**	NR[2]	75.7	11.0	**43.4**	0.1814	0.8677
Fort Valley Middle School	26.6	26.3	17.0	**23.3**	53.2	53.2	46.0	**50.8**	6.8829	0.0023**[5]
Twiggs Middle School	28.0	28.7	58.0	**38.2**	39.1	56.5	60.0	**51.9**	1.1608	0.3103
Wilkinson County Middle School	32.7	18.0	NR	**25.4**	43.6	52.4	NR	**48.0**	2.6397	0.1185
Annual Mean[2]	**33.4**	**34.9**	**40.0**		**46.1**	**61.5**	**52.6**			
Body Mass Index										
Crawford County Middle School	41.4	47.6	54.0	**47.7**	47.8	42.5	47.0	**45.8**	0.4745	0.6599
Hancock Central Middle School	40.9	49.1	75.0	**55.0**	62.8	54.7	74.0	**63.8**	0.7519	0.4939
Byron Middle School	45.9	60.0	58.0	**54.6**	NR	54.0	63.0	**58.5**	0.5915	0.5958
Fort Valley Middle School	39.2	44.3	44.0	**42.5**	48.5	49.3	63.0	**53.6**	2.2104	0.0916[6]
Twiggs Middle School	50.9	49.0	38.0	**46.0**	40.7	36.1	NR	**38.4**	1.3819	0.2609
Wilkinson County Middle School	NR	48.3	NR	**NC[3]**	40.0	53.7	NR	**46.9**	NC	NC
Annual Mean[2]	**43.7**	**49.7**	**53.8**		**48.0**	**48.4**	**61.8**			

[1] Means were computed for reported percentages only
[2] NR stands for Not Reported
[3] NC stands for Not Calculated (due to insufficient data)
[4] Two-tailed
[5] Statistically significant at 0.01 level
[6] Marginal statistical significance at the 0.1000 level

the percentage of male students in HFZ for AC was higher than the percentage of female students. We statistically tested these observable differences. Test results indicate that differences in the means for AC were significant only for Fort Valley MS where the percentage of male students in the HFZ for AC is significantly higher than that for their female counterparts. Differences in the remaining schools were not statistically significant.

Middle Schools: Body Mass Index (BMI)

Figures in Table 1 show that only two of the six middle schools (Crawford County MS; Hancock Central MS) had consistent increases in the percentages of female students in the HFZ for BMI over the study period. One school (For Valley MS) had consistent increases in the percentages of male students in the HFZ for BMI. Two schools (Byron MS; Fort Valley MS) showed increases in the percentages of female students in the HFZ for BMI in 2012-2013 followed by small declines in 2013-2014. One school (Twiggs MS) showed a small decline in the percentages of female students in the HFZ for BMI in 2012-2013, followed by a large decline in 2013-2014. Although Twiggs MS did not report data for male students in the 2013-14 school year, the estimate for the 2012-13 percentage of male students in the HFZ for BMI also shows a decline. One school (Wilkinson County MS) failed to report data for female students in two of the three study years, and as such we could not describe the direction of movement in which the percentages of female students within the HFZ for BMI. However, this school reported two years of data for male students which show an upward trend in the percentage of male students in the HFZ for BMI. With the exception of Fort Valley MS where Student's t-test results show marginal significance of mean differences, t-test results for the rest of the county middle schools indicate that there were no statistically significant differences in the percentage means for male and female students who were within the HFZ for BMI.

High Schools: Aerobic Capacity (AC)

The top panel in Table 2 includes data for aerobic capacity (AC) achievement for female and male students in 5 county high schools in rural Georgia over the 2011-2014 academic school years. The panel reveals a significant lack of data reporting for high school students in the HFZ for AC during the study period. Only Hancock Central High School reported sufficient AC data for both male and female students which enabled them to compute means and t-test mean differences. It is the only high school that reported data for all students for the three study years. High schools in two counties, Twiggs and Wilkinson, did not report any data for students for the entire study period. Crawford County and Peach County high schools reported data for students for only one year. The lack of annual data does not allow us to compute annual mean estimates for all high schools.

Table 2

Means and Percentage Distributions of Female and Male High School Students within the HFZ for Aerobic Capacity (AC) and Body Mass Index (BMI), 2012-2014

Aerobic Capacity

High School	**Female Students** 2011-12	2012-13	2013-14	**School Mean[1]**	**Male Students** 2011-12	2012-13	2013-14	**School Mean**	***t* Value**	***p* Value[4]**
Crawford County High School	30	NR[2]	NR	**NC[3]**	60	NR	NR	**NC**	NC	NC
Hancock Central High School	19	24.3	44	**29.1**	53.3	53.2	88	**64.8**	2.5714	0.0619[1]
Peach County High School	NR	NR	19	**NC**	NR	NR	25	**NC**	NC	NC
Twiggs High School	NR	NR	NR	**NC**	NR	NR	NR	**NC**	NC	NC
Wilkinson County High School	NR	NR	NR	**NC**	NR	NR	NR	**NC**	NC	NC
Annual Mean[2]	**24.5**	**24.3**	**44.0**		**56.7**	**53.2**	**56.5**			

Body Mass Index

High School	**Female Students** 2011-12	2012-13	2013-14	**School Mean[1]**	**Male Students** 2011-12	2012-13	2013-14	**School Mean**	***t* Value**	***p* Value[4]**
Crawford County High School	30	NR	NR	**NC**	40	NR	NR	**NC**	NC	NC
Hancock Central High School	34.7	35.1	70	**46.6**	62.5	54.1	68	**61.5**	1.2019	0.2957
Peach County High School	NR	54.9	53	**54**	NR	47	48	**47.5**	6.2259	0.0248*[5]
Twiggs County High School	NR	48	NR	**NC**	NR	48	NR	**NC**	NC	NC
Wilkinson County High School	NR	42	NR	**NC**	NR	45.8	NR	**NC**	NC	NC
Annual Mean[2]	**32.4**	**45.0**	**61.5**		**51.3**	**48.7**	**58.0**			

[1] Means were computed for reported percentages only
[2] NR stands for Not Reported
[3] NC stands for Not Calculated (due to insufficient data)
[4] Two-tailed
[5] Statistically significant at 0.05 level
[1] Marginal statistical significance at the 0.1000 level

In Hancock County HS, the percentage of female students in the HFZ for aerobic capacity (AC) increased after 2011-2012. However, figures in Table 2 show that by 2013-2014 only 44% of female students reached the HFZ for AC. In contrast, the figures in the table show that from 2011 to 2013, about 53.25% of the male students were within the HFZ for AC. The following year (2013-14), the percentage of male students in the HFZ for AC increased to 88%. The school mean estimates for the three academic school years show that less than one third (29.1%) of the female students were within the HFZ for AC. During the same period, close to two thirds (64.8%) of the male students were within the HFZ for AC. The school mean percentages point to a potential for an overall AC fitness achievement gender-associated disparity where more male students are represented in the AC fitness zone than female students. Student's t-test results show marginal statistical significance for mean differences at the 0.1000 level.

High Schools: Body Mass Index (BMI)

The bottom panel in Table 2 includes data for HFZ BMI achievement for female and male students in the same 5 county high schools over the 2011-2014 academic school years. Although the panel reveals slightly increased reporting of FitnessGram data for high school students in the HFZ for BMI during the study period, it also reveals considerable data reporting gaps. This is specifically in the case of Crawford, Twiggs and Wilkinson county high schools. Each of these schools reported data only for one academic school year. Improved reporting is seen in Peach County HS which reported BMI data for two years. As in the case of AC, Hancock Central HS reported data for all students for the three study years. The slight increase in data enabled us to compute annual means for 2011-2013 and school means for Hancock Central and Peach County high schools.

The figures in the bottom panel in Table 2 show an overall upward trend in the percentages of Hancock Central HS female students in the HFZ for BMI. From 2011 to 2013, slightly more than one third of female students were in the HFZ for BMI. The increase from 2011-12 to 2012-13 in the percentage of female students in the HFZ for BMI was non-significant. However, the increase from 2012-13 to 2013-14 in the percentage of female students in the HFZ for BMI was large. Over the year, 70% of female students were reported to be in the HFZ for BMI. Despite the large increase in the percentage of female students in the HFZ for BMI during 2013-2014, the overall estimate of the school mean for the three study years shows that less than half (46.6%) of the school's female students were within the HFZ for BMI. In contrast, annual and school mean percentages indicate that more than half of Hancock Central HS male students were in the HFZ for BMI in each of the three study years. As in the case of AC fitness achievement, the school mean percentages show a potential for a gender-associated BMI fitness achievement disparity. However, student's t-test results did not indicate statistically significant differences in the school means for the percentages of male and female students in the HFZ for BMI.

The figures for Peach County HS show that for both female and male students, the annual increases from 2012-2013 to 2013-2014 in the percentage of students in the HFZ for BMI were small. However, Student's t-test results indicate statistically significant differences in the school mean estimates for male and female students at Peach County HS. Significantly higher percentages of female students were in the HFZ for BMI than male students.

DISCUSSION

FitnessGram data revealed that approximately 60% of rural female middle and high school students and slightly less than half of their male counterparts did not reach the HFZ for AC and BMI. The data also revealed potential for gender-associated disparities in AC achievement among middle school students in the rural counties. More male students in each middle school tend to be in the HFZ for AC. Data for Hancock Central HS indicate a potential for gender-associated disparities in AC achievement in this particular school. However, since data for AC achievement came only from this particular school, we cannot assume that the same potential for gender-associated AC achievement disparity could be observed across all county high schools. To be able to make such an assumption requires the availability of AC data from the remaining county high schools for two years or more, which we did not have at the time of data analysis. With only three exceptions (Crawford County MS, Twiggs MS and Peach County HS), data show a potential for an overall disparity where higher percentages of male students tend to be in the HFZ for BMI than their female counterparts. Exact causes of the failure of large numbers of rural school children to reach HFZs for AC and BMI fitness, and the observed potential for gender-associated disparities are difficult to determine from the data used in this study. FitnessGram individual data sheets and dataset did not include behavioral variables or responses. Therefore, explaining overall lower fitness achievement and gender-associated disparities in fitness achievement among the students requires extrapolations from a number of behavioral patterns observed among rural populations in previous studies. Potential explanations also require us to assume that fitness and other health behaviors among the students are more likely to be context-determined and should be seen as processes "nested in contexts rather than as a static attribute of individuals" (McLaren & Hawe, 2005).

Environments that lack or have limited facilities for recreational physical activity, decreased access to healthcare and nutritious food exert obesogenic influences that adversely impact the entire population (Boehmer TK et al., 2006; Schetzina KE et al., 2009; Tovar Alison et al., 2012; Wilcox, Castro, King, Housemann, & Brownson, 2000; Zook, Saksvig, Wu, & Young, 2014). Previous studies have shown that residing in rural areas decreases access to recreational facilities, healthcare services and healthy foods, thereby, significantly increasing the prevalence rates of leisure-time physical inactivity and obesity among rural populations compared to urban and suburban populations (Boehmer TK et al., 2006; Schetzina KE et al., 2009; Tovar Alison et al., 2012; Wilcox et al., 2000; Zook et al., 2014). Despite suggestions in a number of studies that the nexus between risky health behaviors and rural environments is not clearly defined (Parks, 2003; Wilcox et al., 2000), evidence from rural Georgia indicated strong links between rural environments and greater body mass indices among rural people (Lewis et al., 2006). For instance, Lewis et al. (2006) found higher prevalence of overweight among populations in rural areas in Georgia than in the State's urban or suburban areas. Higher overweight prevalence was observed in rural areas experiencing either "growth" or "decline" (Lewis et al., 2006). Another contextual variable that distinctly affects rural school districts and students in Georgia is poverty. Due to a smaller tax base and continued State education budget cuts, rural public schools are underfunded. Lack of financial resources has undermined the instructional and programmatic capacities of the State's rural public schools (Showalter, Johnson, Klein, & Hartman, 2017). It may have also undermined their capacity to comply with State mandates for student physical fitness. Also, child poverty is highly concentrated in rural Georgia. In Georgia, "the rate of rural students in low-income families is among the highest" in the US (Showalter et al., 2017), and the State (along with Mississippi) is "in the highest quartile for percent of students eligible for subsidized meals and also in the quartile with the lowest rural poverty graduation rates"(Showalter et al., 2017). Poverty is a strong cause for childhood overweight and obesity (Rogers et al., 2015). Also, children living in poverty are more likely to be less active than children in higher income households (Singh, Siahpush, & Kogan, 2010; Tandon et al., 2012).

Rural lifestyles appear to have more negative impact on rural women than men. Wilcox et al. (2000) determined that rural women were more likely than rural men to be physically inactive and to have greater body mass indices, and that both inactivity and higher BMI status among rural women were related to rural lifestyles. Rural women are often caregivers for school-age children. Children often adopt behaviors modeled to them by their parents and caregivers, including a sedentary lifestyle (Alexander, Alfonso, & Hansen, 2015; Polley, Spicer, Knight, & Hartley, 2005). Furthermore, physical inactivity or failure to meet recommendations for physical activity may be outcomes of gendered physical activity beliefs and behaviors, perceptions of femininity and body fat, and psychological predispositions (e.g., avoidance of getting dirty or sweaty) among female students (Cook, McCormick, Mickiewicz, Davidson, & Main, 2017; Evans, 2006; Spencer, Rehman, & Kirk, 2015; Zook et al., 2014). Recent research suggested that "gender norms, body image, and social influence are important factors linked to girls' physical activity beliefs and behaviors" (Spencer et al., 2015). Therefore, the large numbers of female students in Georgia's rural counties public school who failed to reach AC and BMI thresholds for fitness could be attributed to gender effects and the physical inactivity modeled after their caregivers.

Finally, the data presented in this study indicated considerable lack of reporting compliance among rural high schools in central Georgia. This was an unexpected finding. However, we could not determine from the FitnessGram dataset the cause(s) of the schools' failure to report fitness data to the State. Also, we could not determine the causes of the State's failure to enforce compliance.

CONCLUSION

The US federal government mandates that schools engage students in at least 60 minutes of physical activity each day, but some schools are not meeting this requirement (Brenner, Chriqui, O'Toole, Schwartz, & McManus, 2011). The federal mandate is based on scientific evidence which shows that physical activity causes a variety of positive health outcomes in children and adolescents. These include decreased risks of cardiovascular disease, obesity, type 2 diabetes, and improved psychological and emotional health (Fakhouri et al., 2014; Health & Services, 2008; Sallis et al., 1988). Despite the known benefits of physical activity, only 24.8% of US adolescents between the ages 12 and 19 years meet the current recommendations of 60 minutes or more of moderate to vigorous physical activity on all days of the week. The children and adolescents in the schools located in rural communities included in this study face all of the known barriers to recommended levels of physical activity and body weight (Garcia et al., 2016; Health & Services, 2008). Despite the limitations noted below, the findings of this study indicate failures of rural county high school administrators to comply with State mandates for reporting HFZ data as well as the State's failure to enforce compliance. Although we do not know the cause of these failures, we consider them to be persuasive evidence for remedial action. The results of this study suggest that increasing the numbers of young rural school-age children who are physically active is an important public health goal. Achieving this goal requires exploring a number of new policy initiatives and community engagement. These tasks could include measures to increase the involvement of the children's parents/guardians and friends in programs promoting physical activity. Recent research findings support this type of initiative measure. For instance, Springer, Kelder, & Hoelscher, (2006) found that "both family and friend social support were significantly correlated with physical activity in a sample of 718 6th-grade girls". Additional initiatives could include measures such as more financial allocations/appropriations for rural families and public schools in order to increase the resources needed to improve levels of physical activity among school-age children in rural communities. Finally, this study has a number of limitations. The most important among these is lack of AC and BMI data for a number of high schools, which reduced our ability to make any reasonable assumptions about HFZ achievement among both male and female high school students. Overall, the data we used and the statistical methods we used to analyze the data did not allow for the determination of causal links among variables.

Acknowledgement
There were no funding sources or specific organizations associated with this research.

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