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The Role of Policy and the Built Environment on Children's In-School Physical Activity in the Mississippi Delta

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THE ROLE OF POLICY AND THE BUILT ENVIRONMENT ON CHILDREN'S IN-SCHOOL PHYSICAL ACTIVITY IN THE MISSISSIPPI DELTA

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ABSTRACT

School environments provide an ideal setting for children to develop and adopt active living behaviors as a way of life. The primary purpose of this investigation was to describe state, district and school level policy regarding in-school physical activity, the school built environment and in-school physical activity of children ages 6 through 11 years in the Mississippi Delta. A mixed-methods approach was used to garner a rich understanding of how current policy and the built environment influence in-school physical activity and weight status. Eleven public schools in three districts representing two counties in the Mississippi Delta participated in this investigation. The mean physical education class time was 39.2 minutes $\pm$8.13 (range 38.33; 95% CI = 37.66 – 40.75). The mean percent of physical education class time spent in moderate-to-vigorous physical activity (MVPA) was 36.43% $\pm$ 1.5% (95% CI = 33.57 – 39.28), a mean of 13.99 minutes $\pm$ 5.78 (range 27.0; 95% CI = 12.89 – 15.08). A significant relationship was found between children's in-school physical activity and their BMI ($r = 0.629$; $p = 0.05$). There were significant inverse relationships between the presence and quality of amenities to the school built environment and the students BMI ($r = -0.619$; $p = 0.04$), waist-to-height ratio ($r = -0.819$; $p = 0.002$) and total body weight ($r = -0.615$; $p = 0.044$). There was also a significant inverse relationship between the presence and quality of built environment features and waist-to-height ratio ($r = -0.713$; $p = 0.014$). There was no significant relationship between children's in-school physical activity and aspects of the school built environment. If students are given the opportunity for

unstructured daily physical activity it is likely they will meet current physical activity guidelines. Two of the schools in this investigation provided little opportunity for physical activity through recess and physical education classes and had the highest BMI scores. Not surprising, when students in these schools were given the opportunity to be physically activity they were among the most physically active students in this study. Despite Mississippi State law, school districts and schools are failing to adhere to policies that provide students the opportunity to engage in 150-minutes of weekly physical activity and are in violation of current state law.

DEDICATION

My dissertation project is dedicated to the loving memory of a dear friend who will forever be in my heart and who will never be forgotten, Dr. Lavone Lambert (June 22, 1937 – May 22, 2010). As a little girl in pigtails, I began to build a pedestal for two very special men in my life to stand upon. When I reached my early twenties, it became clear to me that the character, morality and values that my father and grandfather personified were something very rare and uniquely special. Within weeks of knowing Lavone, I found myself idealizing him on that same pedestal I had placed my father and grandfather on when I was a little girl. To say that Lavone was a kind, gentle, trustworthy, honest, genuine man only begins to describe his character and to portray the honorable man he was. Lavone provided invaluable advice on many things pertaining to academics and the politics within academia, but the most important advice Lavone shared was on how to be a wise judge of the character in the pursuit of living happily. Throughout this lesson, Lavone was a friend who had faith in me, often times when many others did not, not even myself. He was a solid rock I held onto for strength and support through the most challenging time in my life. He was and always will be, a faithful friend who stands high above the rest, beside my father and grandfather. With all the love in my heart, I thank him.

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Last, but by far not least, I would like to thank my parents, Jeff and Maria Gamble. It is often difficult to have faith in the unseen and it is challenging to place trust in the unknown. Despite the ambiguity my parents felt when it came to understanding my passion for research and pursuit of a doctoral degree, they continued to love and support me through this grueling process. Without their unconditional love, witty advice, and resilient support I would not be where I am today. I am proud to be your daughter and truly honored to have you as my Mom and Dad. You are my heroes and I love you.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter I

Introduction

The cycle of obesity is now clearly visible across the lifespan of humans from infancy to death (Figure 1a). While the obesity epidemic continues to spiral and reach an unprecedented high, the health outcomes associated with being obese are worsening and are evident at earlier stages in life. Subsequent health effects of overweight and obesity place a heavy economic burden on the future of the nation (Brownson et al., 2005). Obesity and related chronic diseases are no longer issues characterized as solely afflicting adults. Specifically, the increasing prevalence of overweight is evident among youth. The behavior patterns and personal factors that characterize the lifestyles of obese adults have vicariously impacted behavior patterns of adolescents and children. Changes to physical and social environmental conditions have altered behavioral settings to encourage and enable sedentary lifestyles which are reinforced by policies which further promote physical inactivity. Consequently, overweight youth are confronted with similar health disparities as obese adults and are suffering similar adverse health outcomes.

Most children and adolescents ages 5 through 17 years are enrolled in school and spend much of their time there. In addition, children are more likely to accumulate physical activity through play, are not able to drive, and are subject to restrictions placed on them by adults (Krizek, Birnbaum & Levinson, 2004). School environments provide an ideal setting for children to develop and adopt active living behaviors as a way of life

Social-Ecological Model

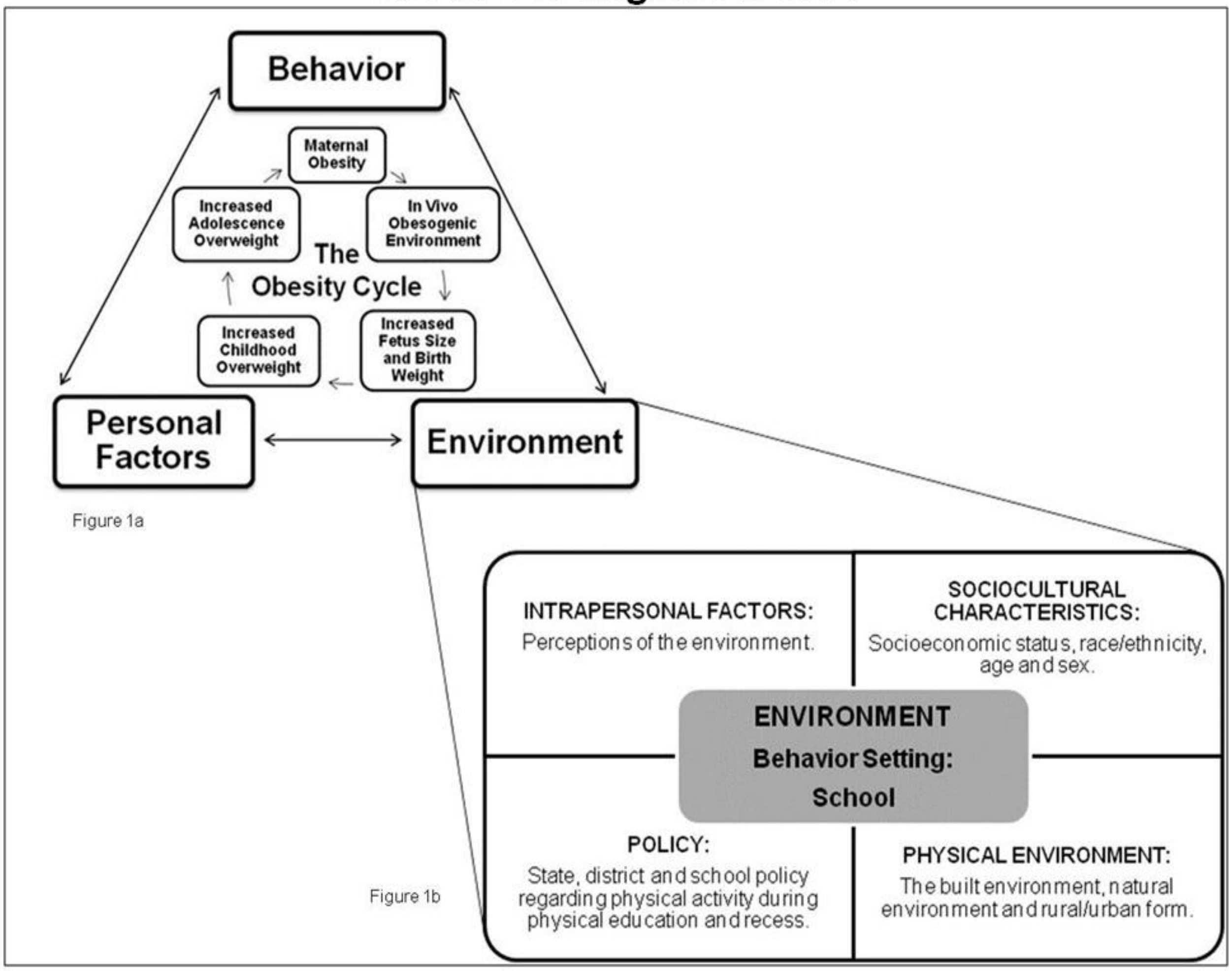

Figure 1a. Social Cognitive Theory to explain behavior patterns in the obesity cycle. An obesogenic environment is created in maternally obese women. Subsequent growth and development occur in environment(s) parent(s) provide. Children vicariously learn from modeled behaviors within their surroundings. Personal factors develop and are carried throughout life.

Figure 1b. Environmental influence on behavior. A social-ecological approach to understanding behavior examines individuals' interactions with their physical, cultural and social surroundings to determine environmental influences.

partly because personal factors are easily influenced and susceptible to change during earlier stages in life. In the Mississippi Delta, where the population is predominantly characterized as low socioeconomic (SES) underprivileged settings, examining the effects of policy and school environments on children's physical activity are an economical approach to providing opportunities for regular physical activity within a safe activity-friendly environment. In physical activity research, ecological models are particularly well suited for interventions because physical activity occurs in specific places (Sallis, Cervero, Ascher, Henderson, Kraft & Kerr, 2006). A modified ecological behavior-specific model developed by Sallis et.al (1997), which includes the Social Cognitive Theory (Bandura, 1986; Figure 1a), is proposed to define how policy and the built environment impact physical activity in youth while at school, and to examine subsequent health and weight status impacts (Figure 1b). It is hypothesized that changes to the built environment and the policies which govern access to physical activity-friendly structures within school settings are the most effective approach to increase physical activity among youth.

Purpose:

The purpose of this investigation was to examine social-ecological determinants of physical activity among youth. The primary objective of this investigation was to describe state, district, and school level policy regarding physical activity, to describe the school built environment and to examine in-school physical activity of children ages 6 through 11 years. The results of this investigation are directly relevant to state, district, and school policy makers and administrators, and the outcomes are used to directly impact children in rural underserved communities. The role of the school built environment and the influence of policy on in-school physical activity of children is more clearly defined. Specifically, researchers now have more knowledge and a better understanding of the social-ecological factors that influence physical activity among children and how these factors are related to the weight status of children between 6 and 11 years-old in the Mississippi Delta. With this knowledge base, school administrators and program coordinators are able to identify key points for intervention, while physical education instructors are better equipped to deliver effective programs to alter children's physical activity.

Statement of the Problem:

Over the past several decades, the prevalence of overweight and obesity among youth has significantly increased (Anderson & Butchner, 2006). Data from the National Health and Nutrition Examination Survey (NHANES) 1976-1980 and 2003-2006 show overweight among children ages 2 through 5 years increased from 5% to 12.4%, ages 6 through 11 years increased from 6.5% to 17% and for those ages 12 through 19 years increased from 5% to 17.6%, respectively (Ogden, Carroll & Flegal, 2008). More specifically, a sample of rural Mississippi youth showed 54% were overweight or at risk for being overweight in 1999-2002 (Hedley, Ogden, Johnson, Carroll, Curtin & Flegal, 2004). The role of physical activity in weight loss and weight maintenance is a protective factor against many chronic diseases and shows many mechanisms that link exercise and fitness level to weight control in adults (Floyd, Crespo & Sallis, 2008). Regular physical activity is likely to provide similar effects in youth as in adults. The problem is that many youth today are physically inactive. An estimated 34.7% of youth in America meet the recommended physical activity levels and an average of 43.6% does not meet the recommended guidelines (CDC, 2008). The prevalence of childhood obesity and levels of physical inactivity is greatest among low SES high minority groups in rural communities in the Southern region of the U.S. (Floyd et al., 2008; Martin et.al, 2005).

Research Question:

1. How do state, district, and school level policy and the built environment of school recreational spaces influence in-school physical activity and weight status of children ages 6 through 11 years in the Mississippi Delta?

Specific Aims:

Specific Aim 1: To describe state, district and school level policy regarding physical activity and the built environment of elementary schools in the Mississippi Delta.

Specific Aim 2: To examine the relationship between the built environment, physical activity and weight status in children ages 6 through 11 years in the Mississippi Delta.

Specific Aim 3: To describe physical activity during physical education (structured) and recess (unstructured) in children ages 6 through 11 years in the Mississippi Delta.

Limitations:

1. The sample consisted of only 11 schools within three school districts from two counties in the Mississippi Delta
2. One of the schools did not offer physical education.
3. Four of the 11 schools offered recess. Therefore, no statistical analysis could be conducted using recess data and these data were used for descriptive purposes only.
4. The principle investigator had no control over school schedules including class cancelations.

5. The principle investigator was not able to contact and schedule an interview with all district and school level personnel.

Delimitations:

1. Only school districts in the Mississippi Delta participated in this investigation.
2. Only three school districts in the Mississippi Delta participated in this investigation.
3. Only schools with children in 1^{st}, 2^{nd}, 3^{rd}, 4^{th} and/or 5^{th} grades participated in this investigation.
4. Only children in 1^{st} through 5^{th} grades participated in this investigation.

Definitions:

<u>Body Mass Index (BMI):</u> a number calculated from a child's weight and height (weight [kg] / [height {m}]2). BMI is a reliable indicator of body fatness for most children and teens. BMI does not measure body fat directly, but research has shown that BMI correlates to direct measures of body fat (CDC, 2008).

<u>Built environment</u>: encompasses all of the buildings, spaces and products created and modified by people, such as buildings (housing, schools, workplaces); land use (industrial or residential); public resources (parks, museums); zoning regulations; transportation systems (Ershow, Hill & Baldwin, 2004).

<u>Environmental intervention</u>: strategies that involve changing the physical surroundings and social, economic or organizational systems in order to promote individual behavior change. The focus of these interventions is on structural changes in the environment

rather than individual-level approaches (Matson-Koffman, Brownstein, Neiner & Greaney, 2005).

Exercise: planned, structured and repetitive bodily movement done to improve or maintain one or more components of physical fitness (Caspersen, Powell & Christenson, 1985); a subset of physical activity (Brownson, Boehmer & Luke, 2005).

Leisure-time physical activity: exercise, sports, recreation, or hobbies that are not associated with activities as part of one's regular job duties, household, or transportation (CDC, 2008).

Physical activity: any bodily movement that is produced by the contraction of skeletal muscle and that substantially increases energy expenditure (U.S. Department of Health and Human Services, 1996).

Obesity (youth): children and adolescents ages 2 through 19 years; having a BMI at or above the 95th percentile for children of the same age and sex. Classifications of obese for children and adolescents are age- and sex- specific because children’s body composition varies as they age and varies between boys and girls. (CDC, 2009).

Obesogenic environment: an environment that promotes obesity on a population level by encouraging physical inactivity and unhealthy food choices (Swinburn, Egger & Raza, 1999).

Overweight (youth): children and adolescents ages 2 through 19 years; having a BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex. Classifications of overweight for children and adolescents are age- and sex-specific because children’s body composition varies as they age and varies between boys and girls. (CDC, 2009).

Policy and/or policy research: provides an organized structure and guidance for collective and individual behavior. May be defined as legislative or regulatory action taken by federal, state, city or local governments, government agencies, or nongovernmental organizations such as schools or corporations. Includes formal and informal rules and design standards that may be explicit or implicit (Schmid, Pratt & Witmer, 2006).

Social-ecological model: in public health, refers to individual's interactions with their physical or sociocultural surroundings (Stokols, 1992). Distinguished by explicit inclusion of environmental and policy variables expected to influence behavior; specifically for physical activity incorporate a wide range of influences at multiple levels such as: intrapersonal, interpersonal or cultural, organizational, community, physical environment and policy as well as interactions among them (Matson-Koffman et al., 2005; Sallis et al., 2006).

Hypotheses:

H_{o1}: There is no relationship between the built environment of school recreational spaces and in-school physical activity of children ages 6 through 11 years in the Mississippi Delta.

$H_{A1:}$ There is a relationship between the built environment of school recreational spaces and in-school physical activity of children ages 6 through 11 years in the Mississippi Delta.

H_{O2}: There is no relationship between in-school physical activity and weight status of children ages 6 through 11 years in the Mississippi Delta.

H_{A2}: There is a relationship between in-school physical activity and weight status of children ages 6 through 11 years in the Mississippi Delta.

H_{O3}: There is no relationship between weight status of children ages 6 through 11 years and the built environment of school recreational spaces in the Mississippi Delta.

H_{A3}: There is a relationship between weight status of children ages 6 through 11 years and the built environment of school recreational spaces in the Mississippi Delta.

Significance of the Problem:

Children who are not physically active are denied positive social and emotional benefits of physical activity including high self-esteem, lower anxiety and lower stress (Calfras & Taylor, 1994). In addition, children with low levels of physical activity have notable health consequences including risk of obesity, low bone density and low fitness levels (Trost, Kerr, Ward & Pate, 2001). Mississippi adults lead the nation in obesity prevalence at 32.8% (CDC, 2009). In addition, Mississippi is ranked first in the nation for prevalence of overweight and obesity among youth. Trust for America's Health (2009) reports the prevalence of overweight and obesity among Mississippi's youth ages 10 through 17 years at 44.4%. The overweight and obesity trend of Mississippians across all age groups does not provide a healthful prospective for the future of its children as they move into adolescences and adulthood. Overweight among youth may have immediate health consequences and may increase risk for obesity related consequences in adulthood (CDC, 2007).

From a public health perspective, addressing the social ecological determinants of physical inactivity and obesity is vital to preventing subsequent chronic disease and promoting increased quality of life throughout the lifespan. In order to prevent the obesity epidemic from continuing on its current path, public health professionals need to understand how the environments where obesity rates are highest, contribute to the behaviors of those that inhabit and interact within these environments. Without a multilevel understanding of obesity determinants, prevention will remain impossible and the treatment of obesity related disease will continue to diminish quality of life and will remain a burden to the nation economically, politically and socially.

Chapter II

Review of Literature

The purpose of this investigation was to examine the social-ecological determinants of physical activity among youth. The primary objective of this investigation was to describe state, district and school level policy regarding physical activity, to describe the school built environment and to examine in-school physical activity of children ages 6 through 11 years.

The purpose of this chapter is to review evidence linking policy and the built environment to physical activity outcomes in children while at school. This review provides evidence to support the claim that social-ecologically based interventions in school settings can increase physical activity while children are at school. Recent overweight and physical inactivity trends show children are growing unhealthier and are increasingly sedentary. Economic and cultural differences combined with observed regional, seasonal and community setting variations add to health disparities and confound lifestyle behaviors in disadvantaged populations. Additional environmental disadvantages place further limitations on youth of low SES, high minority populations by imposed restrictions on access to safe activity-friendly facilities that provide opportunity to for physical activity. School policy development, adoption and enforcement combined with alterations to the physical environment in school settings are likely to influence physical activity in youth of low SES, high minority populations.

There is a need to determine the short- and long-term outcomes of these efforts on physical activity behaviors and weight status of youth over time.

Health and Physical Activity in Youth

Gender, race and poverty are three major risk factors associated with weight-related health burdens. SES and cultural differences among racial and ethnic groups in the U.S. influence patterns of disease, disability and health care use (National Center for Health Statistics [NCHS], 2007). These patterns exist among children, adolescents and adults. Undoubtedly there is no one factor that contributes to the increasing trend of overweight among youth (Anderson & Butcher, 2006). However, the role of physical activity in weight loss and weight maintenance shows a number of mechanisms that link exercise and fitness level to weight control among adults: 1) exercise increases energy expenditure; 2) may help to control and regulate appetite; 3) increases fat free mass; 4) enhances metabolic rate; and 5) appears to have an independent effect on health related outcomes when compared with body weight (Jakicic et.al, 2006; Villanova et.al, 2006; McAuley et.al, 2003; Racette, Deusinger & Deusinger, 2003). Regular physical activity is likely to provide similar effects in youth as in adults.

Strong, Malina, Bumkie, Daniels, Dishman, Gutin, Hergenroeder, Must, Nixon, Pivarnik, Rowland, Trost and Trudeau (2005) reviewed the effects of physical activity on health and behavior outcomes in youth. The results were used to develop evidence-based recommendations for physical activity in youth. An expert panel was convened to review and evaluate 850 identified articles providing evidence of the influence of physical activity in youth ages 8- through 18-years. The panelists were selected on the basis of expertise in the following specific areas: adiposity, cardiovascular health, asthma, several domains of mental health, academic achievement, injury associated with physical activity and muscular health. Most of the interventions reviewed included supervised programs of moderate to vigorous physical activity (MVPA) for 30- to 45-minutes in duration, three to five days per week. Evidence-based data were strong for the beneficial effects of physical activity on muscular health, cardiovascular health, adiposity in overweight youth and blood pressure in mildly hypertensive adolescents. The panelists' recommendation was consistent with that of the CDC[1], school-age youth should participate in 60-minutes or more of MVPA on every day of the week. Activities should be enjoyable and developmentally appropriate. The panelists regard increasing the level of habitual MVPA in youth as a health promotion and disease prevention strategy.

Unfortunately, increasing overweight and physical inactivity trends do not reflect these recommendations and provide a grim outlook on the developing health of Americans. The problem is that many youth are physically inactive and are increasingly sedentary. Evidence supported by the CDC and the U.S. Department of Health and Human Services: *Healthy People* 2010 indicate that nearly 35% of youth in the U.S. do not meet the minimum physical activity guidelines and an additional 14% are inactive. Evidence suggest that young people would like to be active but are often constrained by external factors such as school policy or curricula, parental rules in relation to safety and convenience, and physical environmental factors (Dollman, Norton & Norton, 2005). Racial/ethnic disparities in youth physical inactivity trends mimic those regarding weight

[1] Children and adolescents should engage in 60 minutes or more of physical activity each day. Moderate-intensity aerobic activity should make up most of the 60 minutes each day. Vigorous-intensity aerobic activity, and muscle strengthening and bone strengthening activity should occur at least 3 days per week.

status. The 2005 Youth Risk Behavioral Surveillance System (YRBS) indicates that 38% of black and 31% of Hispanic adolescents report insufficient physical activity levels compared to 30% of their white counterparts (CDC, 2005). Continuing trends will likely cost the country billions in health care costs and will continue to decrease the quality of life for most Americans across the lifespan afflicting all racial/ethnic populations (Brownson et al., 2005). There is a great need to modify health behaviors including diet and physical activity practices in low SES, high minority youth populations. Familial characteristics might help explain subgroup differences starting at an early age but are demonstrated as less influential with maturation (Delva, Johnston & O'Malley, 2007). Further investigation is needed to understand the interaction among genetic, social, cultural and environmental factors (Crespo et.al, 2003).

Examining People and Places

In addition to SES and racial/ethnic partiality in overweight and physically inactive youth, evidence suggests there are seasonal (Ma, Li, Hafner,Chiriboga, Hebert, Campbell, Sarnie & Ockene, 2006; Uitenbroek, 1993) and regional variations, as well as differences between community settings; urban versus suburban versus rural (Jones-Matre, Welk, Calabro, Russel, Nicklay & Hensley, 2008). Seasonal variations have been observed in physical activity patterns across all ages; in general, individuals report being more active during the summer and spring than they do during the winter months (Ma et.al, 2006). Seasons are also experienced differently within the U.S. and may be one of the influential factors contributing to variations in physical activity patterns between regions within the country.

Martin, Kirkner, Mayo, Matthews, Durstine and Hebert (2005) examined the prevalence of physical inactivity and the association between physical inactivity and physical activity to degree of urbanization in the four main regions of the U.S. (Northeast, Midwest, South and West). BRFSS data from 2000 were analyzed from 49 states (excluding Alaska). Respondents (N = 126,824) were asked to describe their leisure-time physical activity, its frequency, average duration and intensity. Urbanization was defined using the U.S. Department of Agriculture Rural-Urban Continuum Codes. The prevalence of physical inactivity was highest in the most rural category (33.1%). The odds of being physically inactive were 43% higher in the most rural compared with the most urban categories (OR=1.43; 95% CI: 1.23-1.66). The prevalence of meeting either vigorous or moderate physical activity recommendations was lowest in the rural categories (23.8% to 27.7%) and highest in the most urban categories (30.1%; OR=0.73; 95% CI: 0.62-0.85 for rural compared with most urban). Investigators conclude that the association between physical activity and urbanization is evident and robust in the South but not in all regions of the U.S. These data support evidence from studies which report the prevalence of leisure-time physical inactivity and obesity as higher in rural areas compared with urban and suburban areas (CDC, 1996; Kirkner, Levin, Durstine, Hebert & Mayo, 2001; Parks, Housemann, & Brownson, 2003; NCHS, 2001; Patterson, Moore, Probst & Shinogle, 2004). Observed regional differences in physical activity likely contribute to the southern portion of the U.S. identified as the leader in poor health, namely leading the nation in obesity and diabetes (Liao, Greenlund, Croft, Keenan & Giles, 2009).

One potential explanation for this phenomenon is that people in rural as opposed to suburban or urban areas perceive their environment to be a barrier to engaging in health-related behaviors. Boehmer, Lovegreen, Haire-Joshu and Brownson (2006) sought to identify perceived indicators of the physical environment associated with obesity specifically in rural southern communities. Adults (N = 2,510) from 13-communities in rural Missouri, Tennessee and Arkansas completed a cross-sectional telephone survey to measure perceptions of the neighborhood environment (recreational facilities, land-use, transportation safety, aesthetics and food environment) and health-related behaviors. The primary outcome measure was obese versus normal weight as determined by BMI. Logistic regression was used to control for age, gender and education. Several indicators of the perceived neighborhood environment were associated with being obese (adjusted OR, 95% CI) including the following: furthest distance to the nearest recreational facility (1.8; 1.3-2.4); unpleasant community for physical activity (1.8; 1.3-2.6); feeling unsafe from crime (2.1; 1.5-2.9) or traffic (1.7; 1.2-2.3); and few non-residential destinations (1.4; 1.0-1.9). In the multivariate model distance to recreational facilities and crime safety remained significant in addition to dietary-fat intake, sedentary behavior and MVPA. This investigation adds to the evidence base of environmental correlates of obesity and makes a unique contribution regarding rural communities in particular.

Access to Facilities: A Barrier for Underprivileged Youth

Children's participation in physical activity is positively associated with publicly provided recreational facilities and schools (Krahnstover Davison et.al., 2006). In urban environments the relationship between physical activity and access to safe places to be active varies by SES, race/ethnicity and neighborhood characteristics (Babey, Hastert, Yu & Brown, 2008). Reduced access to facilities among low SES high minority block groups is associated with decreased physical activity and increased overweight (Gordon-Larsen, Nelson, Page & Popkin, 2006). Providing affordable access to facilities and programs that provide opportunity for regular physical activity in safe environments is complicated in underserved communities (Floyd et al., 2008). Inequality in relation to the availability of physical activity facilities may contribute to SES and ethnic disparities in physical activity behavior and overweight patterns among adolescents (Gordon-Larsen et al., 2006). Recreational facilities and the resources they offer are not equitably distributed and there is evidence that improving parks in poor minority areas can increase physical activity in low SES, high minority populations (Moore, Diez Roux, Evenson, McGinn & Brines, 2008).

Powell, Chaloupka, Slater, Johnston and O'Malley (2007) used a combined economical and ecological model to examine the importance of external factors associated with physical activity behaviors in youth. Specifically, investigators sought to determine the relationship between availability of commercial physical activity-related facilities and self-reported physical activity behavior in adolescents (8^{th}, 10^{th} and 12^{th} grades) using data from MTF surveys. Physical activity outlet density measures were matched to individual-level data at the school level for the years 1997 through 2003. Frequency of physical activity (sports, athletics or exercise) participation was significantly associated to the availability of physical activity-related facilities ($p < 0.01$). There were significant associations among older students; increasing availability from a low (1 facility) to a high (8 facilities) number of facilities was associated with an increase in frequent activity among 12th grade girls (6.6%), and an increase in frequent vigorous exercise among 12th grade girls (9.0%) and boys (6.4%). These results suggest that improving the availability of commercial facilities for physical activity in underserved communities may help to increase physical activity levels in older adolescents, particularly among girls.

Similarly, Gordon-Larsen, Nelson, Page and Popkin (2006) assessed the geographic and social distribution of physical activity facilities in U.S. adolescents (N = 20,745) grades 7-12 to determine how access disparity might underlie population-level physical activity and overweight patterns. Data from the National Longitudinal Study of Adolescent Health were geocoded and an 8.05-km (approximately 5 miles) buffer around each residence was drawn. Physical activity facilities were measured by national databases and satellite data, and were then linked with GIS technology to each respondent. The relationship between physical activity facilities and block-group SES, and subsequent association of facilities with overweight and physical activity were assessed using logistic regression (control for population density). Outcome measures were overweight and achievement of greater than or equal to five bouts of MVPA per week. Results revealed that higher SES block groups had significantly greater relative odds of having 1 or more facilities than low SES high minority block groups. Relative to no facilities per block group, an increasing number of facilities was associated with decreased overweight and increased relative odds of achieving $\geq$ 5 bouts of MVPA per week. Reduced access to facilities among low SES high minority block groups was associated with decreased physical activity and increased overweight. These results suggest inequality of availability of physical activity facilities may contribute to SES and ethnic disparities in physical activity behavior and overweight patterns in adolescents.

One approach to overcome SES barriers to physical activity concerning access to commercial facilities is to provide access to physical activity amenities on school grounds during after school hours and on weekends. Farley, Meriwether, Baker, Watkins, Johnson and Webber (2007) evaluated the effect of providing a safe place for play on the physical activity level of high minority children (99% and 90% African America) in two low-income New Orleans cities. Prior to this investigation the schoolyards at the public elementary schools in each neighborhood were locked when the school was not open. In one of the two schoolyards investigators provided adult attendants and opened the schoolyard to children during otherwise closed school hours. Over the next 2-years direct observations of the number of children and their physical activity levels in the schoolyard were made, as well as in surrounding intervention and comparison neighborhoods. After the schoolyard was opened an average of 71.4 children used the playground on weekdays and 25.8 children used it on weekends during the school year. When observed 66% of these children were physically active. In the intervention neighborhood 84% more children were physically active than in the comparison neighborhood. Among children in the intervention group survey results showed a decline in watching television, watching movies or DVD’s, and playing video games on weekends. When low SES high minority children are provided access to safe places to recreate there is a relative increase in their physical activity.

Scott, Cohen, Evenson, Elder, Catellier, Ashwood and Overton (2006) used the Trail in Adolescent Girls (TAAG) to determine the availability of active amenities on school grounds and school accessibility on Saturdays. TAAG is a multi-center randomized trial designed to test an intervention to reduce the decline in MVPA in middle-school girls. The intervention centers are located at the Universities of Arizona, Maryland, Minnesota and South Carolina, San Diego State University and Tulane University, a Coordinating Center at the University of North Carolina, Chapel Hill, and a Project Office at the National Heart Lung and Blood Institute. Sixth grade adolescent girls (N = 1556) were used in this analysis. Descriptive results revealed that schools represented 44% of potential neighborhood sites for physical activity; however, one-third of them were inaccessible on the Saturday that the investigators visited. Neighborhoods with locked schoolyards were found in primarily non-white, older, more densely populated and of lower SES settings. Girls with the potential to encounter a locked school yard had higher BMI scores compared to their counterparts with no schools within a half-mile radius of their homes and those with access to schools that provided active amenities within a half-mile radius of their home. However, there was no significant relationship between school accessibility and weekend MVPA. These findings suggest that young adolescent girls may not identify schools as recreational resources. Regardless, the relationship between BMI and locked school yards supports changing policies to allow school yards to be accessible on weekends to provide opportunity for physical activity. Schools can provide many opportunities for children to be physically active and can play an important role in motivating youth to stay active (Burgeson, Wechsler, Brener, Young & Spain, 2001). It appears crucial that national-level strategies include attention to school physical education and community recreation programs, particularly for segments of the U.S. population without access to resources and opportunities that allow participation in physical activity.

Social-Ecological Models

Physical activity occurs in specific places, hence theoretically based ecological models provide a supportive framework for physical activity research and practice which examine places and policies that facilitate or hinder physical activity (Giles-Corti, 2006; Sallis et al., 2006). Historically, physical activity interventions routinely use educational and small group programming to target individual behaviors (Dehghan, Akhtar-Danesh & Merchant, 2005). While these interventions focus on important individual and interpersonal factors several have yielded positive short-term outcomes and long-term success has yet to be observed (Matson-Koffman, Brownstein, Neiner & Greaney, 2005). Given the importance of the physical and social contexts of individual behavior and the limited success of individually-based interventions in obesity prevention, more research combining social and ecological perspectives is needed (Papas, Alberg, Ewing, Helzlsouer, Gary & Klassen, 2007). Social-ecological models provide a collaborative approach and focus attention on multiple levels of behavioral influence. Factors addressed in social-ecological models include individual and interpersonal factors, social influences, organizational, community and public policy and political determinants, the physical environment, and the interactions among them (Giles-Corti, 2006; Matson-Koffman et al., 2005; Pellma, Brandt & Macaran, 2002). Physical activity interventions based on social-ecological models are successful when they ensure safe, attractive and convenient places for physical activity, implement motivational and educational programs to encourage use of those places, and use mass media and community organization to change social norms and culture (Sallis et al., 2006).

Multi-faceted interventions should be based on community and organizational partnerships working collaboratively to set short- and long-term goals and to develop strategies aimed at bringing about cultural shifts favoring physical activity. Integrated communitywide physical activity campaigns affect the perceptions of policy makers (Leyden, Reger-Nash, Bauman & Bias, 2008). Efforts should include the development of supportive physical environments and policies that foster physical activity behaviors and emphasize overall improved health. For instance, providing youth with daily physical activity opportunities in safe physical environments may serve as a foundation for increasing physical activity. Certain environmental features, i.e., access to safe activity friendly environments such as school playgrounds, may set the stage for social interactions and influence social norms regarding physical activity specifically among youth (Cohen, Inagami & Finch, 2008). Policy interventions are likely to influence school-based physical education with adequately trained physical education instructors and increase the length of time students are physically active (Matson-Koffman et al., 2005).

A Framework for Policy Research

Advancing the science of policy change is a high priority to create transformation among obesogenic environments with an emphasis on understanding the policy change process (Sallis & Glanz, 2006). The translation of heath conditions into political problems occurs when individuals recognize their personal needs and desires are shared with others. Then, through public opinion, emergence of social movements, interest group mobilization and voting the demand is made that public officials pay attention to their concerns (Oliver, 2006). The way in which the government responds and how it is chosen to respond depends heavily on the process of identifying and defining the problem. Overweight among youth is a national epidemic. Schmid, Pratt and Witmer (2006) summarized the findings of three workshops hosted by the CDC to generate guidelines for researchers to investigate how policy influences physical activity to encourage work in the area. The workshops and discussions included experts from urban planning, architecture, transportation, parks, recreation and public lands, health care, public health and physical activity, and representatives from the Robert Wood Johnson Foundation (RWJF) and the NIH. The first workshop focused on transportation, planning and community design; the second on economics, school, insurance, safety and social capital; and the third to develop an initial research agenda, to prioritize important policy studies and to establish criteria for ranking policy studies. A definition and conceptualization of policy and policy research has been established by professionals as the following:

> Policy provides an organized structure and guidance for collective and individual behavior. It may be defined as legislative or regulatory action taken by federal, state, city or local governments, government agencies, or nongovernmental organizations such as schools or corporations. Policy includes formal and informal rules and design standards that may be explicit or implicit. (Sallis et al., 1998, p. 380).

The importance of policy research is to study how policies come to be formed, what determines if they are applied or enforced and their effects once they are in place. The relationships among policy, the environment, behavior and health are the foundation for the conceptual framework developed to better visualize, categorize and understand physical activity policy research (Figure 2).

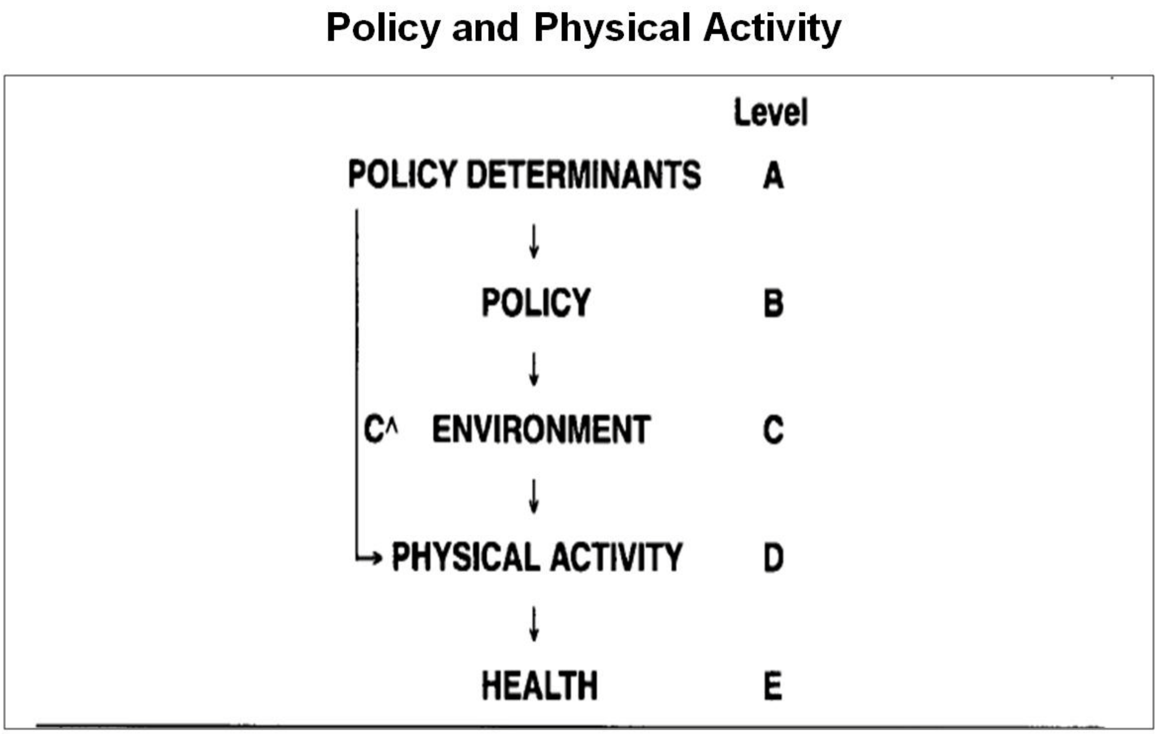

Figure 2. Presumptive model of how policy moves from formulation to implementation and thereby influencing physical activity directly or through the environment. (Schmid et al., 2006)

The components of policy and the settings in which policies are applied are defined by the sector (health, transportation, parks or public spaces, worksite and school; Figure 3). Hence, the top ten categories of physical activity policy research are identified as: 1) workplace; 2) economics; 3) school; 4) recreation, parks and trails; 5) land use and community design; 6) crime and safety; 7) active commute to school; 8) public spaces; 9) active commute to work; and 10) neighborhood walkability. These ten priorities are the sustenance for two high priority topics identified by the CDC for research. The two high priority topics are: 1) to develop better tools to assess the effects of policies, to guide policy development and to prioritize policy choices; and 2) to determine the effects of policies relating to schools and physical activity by cataloging and synthesizing model policies and relating them to evidence-based effective intervention strategies.

Physical Activity Policy Framework

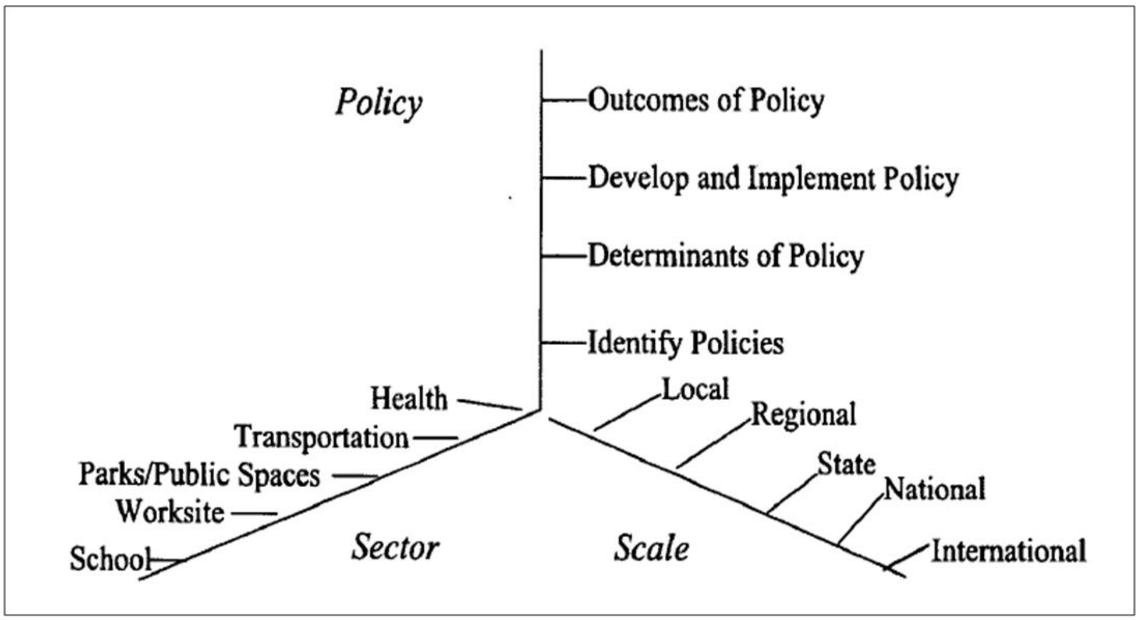

Figure 3. A conceptual framework for public policy relevant to physical activity. (Schmid et al., 2006)

A lead organization with these research initiatives is RWJF, which funds three national research programs to identify environmental and policy strategies to reverse the childhood obesity epidemic by 2015. In 2004 RWJF announced more attention must be brought to research gaps related to active living among populations at greatest risk for inactivity and obesity (Floyd et al., 2008). These programs include Bridging the Gap

(BTG), Healthy Eating Research (HER) and Active Living Research (ALR). The collaborative efforts of these programs is to provide information that can be used by policy makers and practitioners to improve dietary and physical activity behaviors in youth with an emphasis on low-income and high minority communities at highest risk for childhood obesity (Sallis, Story & Orleans, 2007). The common goal is to build evidence base of environmental and policy influences and strategies that have the greatest potential to increase physical activity and improve dietary habits among youth, and to communicate these findings to inform policy debates, public health action and advocacy (Sallis et al., 2007).

Collaborative communication efforts are exemplified by Chaloupka and Johnston (2007) and their effort to determine influences that contribute to the childhood obesity epidemic through the use of data from the MTF study. Data included the following: 1) surveys from administrators in the MTF schools; 2) collection of contextual information from the communities in which the MTF schools are located; 3) tracking the relevant state policies; and 4) gathering of a wide variety of data from archival and commercial databases. The extensive research done within BTG demonstrates the importance of school, community, state and environmental factors in adolescent diet, physical activity and obesity patterns, as well as observed racial/ethnic and socioeconomic-related disparities. A variety of policies, programs and other interventions have been identified that stimulate healthy eating and physical activity in recognition of the growing obesity epidemic among all age groups. The impact of these interventions remains to be observed at the public health level and further research is needed to build upon the evidence base and determine the significance of the outcomes.

Communicating research findings to politicians plays a pivotal role in policy formation and enactment. Politics plays a central role in determining how citizens and policy makers recognize and define health problems with existing social conditions and policies, in facilitating certain kinds of public health interventions, and in generating a variety of challenges in policy implementation (Oliver, 2006). Boehmer, Luke, Haire-Joshu, Bates & Brownsom (2008) used a policy research framework to identify factors that predict successful enactment of childhood obesity legislation in the U.S. A review of the bills introduced during 2003-2005 in all 50 states identified 717 bills related to childhood obesity prevention. Bill-level (procedure, composition and content) and state-level (sociodemographic, political, economic and industrial) factors associated with bill enactment were identified using multiple logistic regressions. Of the 717 bills identified 17% were enacted (n = 123) in 38 states. The following factors were associated with increased likelihood of enactment: having more than one sponsor; bipartisan sponsorship; introduction in the state senate; budget proposals; and content areas related to safe routes to school, walking/biking trails, model school policies, statewide initiatives, and task forces and studies. Nutrition/vending standards, curriculum/course credit for health, nutrition and physical education were less likely to be enacted. State-level political factors that increased enactment likelihood included a 2-year legislative session and Democratic control of both chambers. In conclusion, it appears that bill-level factors are more influential than state-level factors on bill enactment. These findings are important for policymakers, practitioners and advocacy groups attempting to change and enact childhood obesity policy.

School Policy and Physical Activity

Schools can provide many opportunities for children to be physically active and can play an important role in motivating youth to stay active (Burgeson, Wechsler, Brener, Young & Spain, 2001). National-level strategies must include attention to school physical education and community recreation programs, particularly for segments of the U.S. population without access to resources and opportunities that allow participation in physical activity (Gordon-Larsen, McMurray & Popkin, 2000). According to the *2006 Shape of the Nation Report: Status of Physical Education in the USA* [National Association for Sport and Physical Education (NASPE) & American Heart Association (AHA), 2006], the national recommendation for physical education among school-age youth is 60-minutes or more of MVPA daily. Activities should be developmentally appropriate, enjoyable and involve a variety of activities. Specifically for all elementary school students, the recommendation is at least 150-minutes of physical education per week for the entire school year. For all middle and high school students at least 225-minutes of physical education per week are recommended throughout the entire school year. The NASPE and AHA (2006) suggest the following five critical elements of a quality physical education program: 1) Physical education be delivered by certified/licensed physical education teachers; 2) Adequate time is provided for physical education at every grade, K-12; 3) All states develop standards for student learning in physical education that reflect the National Standards for Physical Education; 4) All states set minimum standards for student achievement in physical education; and 5) Successfully meeting minimum standards in physical education is a requirement for high school education.

Burgeson and colleagues (2001) described the findings from the School Health Policies and Programs Study (SHPPS, 2000) regarding state- and district-level requirements and policies, standards and guidelines, student assessment, evaluation, physical education for students with disabilities, collaboration, staffing and professional preparation, elementary school recess, and interscholastic sport coaches. Authors addressed school-level requirements and policies, standards and guidelines, student assessment, physical education for students with disabilities, collaboration, staffing and professional preparation, elementary school recess, intramural activities and physical activity clubs, interscholastic sports and facilities. Finally, authors sought to describe physical education curriculum and instruction, student assessment, physical education for students with disabilities, and professional preparation at the classroom level. All 51 (100%) state education agencies completed the state-level physical education questionnaire, at the district-level 491 (66%) completed the questionnaire, at the school level 921 (69%) completed the physical education interview, and at the classroom-level 1,562 (90%) of teachers completed interviews.

Most states require elementary schools (78.4%), middle/junior high school (85.7%) and senior high schools (82.4%) to teach physical education. Most districts require elementary schools (82.6%), middle/junior high schools (84.6%) and senior high schools (88.8%) to teach physical education. Many states (60.8%) require districts to follow national or state physical education standards or guidelines, and 23.5% of states encourage districts or schools to do so. At the district-level, 67.9% of districts require schools to follow national or state physical education standards or guidelines and another 6.9% encourage schools to do so. Among these states and districts, 70.7% of states and 68.2% of districts require or recommend standards or guidelines based on the National Standards for Physical Education. At the school level, 96.4% require students to take some physical education. Most schools (81.4%) follow national, state, or district physical education standards or guidelines; 81.8% of these schools follow standards based on the National Standards for Physical Education. Most schools (81.4%) provide their physical education teachers with goals, objectives and expected outcomes for physical education; 77.4% provide a physical education curriculum; 58.9% provide a chart describing the scope and sequence of instruction for physical education; 58.8% provide plans for how to assess or evaluate students in physical education, and 52.6% provide lesson plans or learning activities for physical education. Unfortunately, only 8% of elementary, 6% of middle/junior high, and 6% of senior high schools provide daily physical education or its equivalent for the entire school year for all grades in the school.

The authors of a review (Burgeson et al., 2001) suggest that to strengthen school physical education programs, public health and education officials need to work together to increase the number of schools that provide the recommended amount of physical education for all students; teachers who require students to develop individualized physical activity plans; states and districts that require testing of student knowledge and performance; states, districts and schools that provide staff development; and states that require teachers to earn continuing education credits on physical education topics to maintain state certification, licensure, or endorsement. In addition, to strengthen the overall school physical activity program and opportunities that students have for physical activity outside of physical education classes, public health and education officials need to increase the number of states and districts that require recess for elementary school students; schools that offer intramural activities or physical activity clubs; and schools in which community members can use school physical activity facilities.

Cawley, Meyerhoefer and Newhouse (2007) examined the extent to which state requirements increase the time that students spend being active in physical education. The authors attempt to estimate the effect of physical education on overall physical activity and weight in high school adolescents. Data from the Youth Risk Behavior Surveillance System (YRBSS) for 1999, 2001 and 2003 were merged with data on state minimum physical education requirements from the 2001 Shape of the Nation Report. The results show that high school students with a compulsory physical education requirement reported an average of additional 31-minutes per week being physically active during physical education. The results also indicate that additional physical education time raises the number of days per week that girls report having exercised vigorously or having engaged in strength building activity. Enforcing increased physical education time at the state level may influence levels of physically activity in adolescents but does not appear to effect weight status.

Masse, Chriqui, Igoe, Atienza, Kruger, Kohl, Frosh and Yaroch (2007) assessed state physical education and recess-related policies in schools, and examined variability in state policies using a December 31, 2003 baseline. Since physical education and recess time policies may be formulated through legislative and executive branches of government searches were conducted including all 50 states and the District of Columbia. Physical education-related policies at the state level are expected to have an

Physical Education and Recess Conceptual Framework

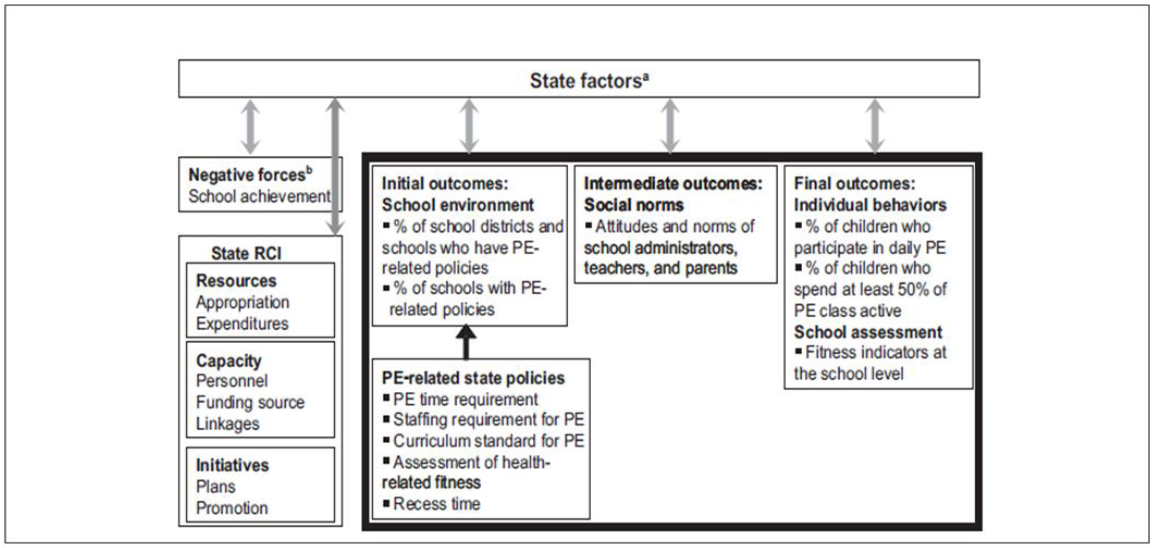

Figure 4. Physical education (PE) and recess time conceptual framework. [a]Age, education, population size, poverty status, race/ethnicity, urban/rural, baseline policies, sociopolitical factors. [b] This may be a force that can detract from allocating resources to PE.

RCI, resources, capacity, and infrastructure. (Masse et al., 2007).

impact on the school environment and social norms that may affect children’s behavior. A conceptual framework developed by the National Cancer Institute based on a socio-ecological model, the Physical Education and Recess State Policy Classification System (PERSPCS; Figure 4) was used to address the following: physical education time requirements, staffing requirements for physical education, curriculum standards for physical education, assessment of health-related fitness, and recess time (elementary schools only). Overall, state policies met minimum requirements across areas and grade levels as of December 2003. Staffing requirements had more restrictive policies, followed by time requirements, curriculum standards, assessment and recess time. The authors suggest that PERSPCS should be examined in conjunction with school district- level policies to determine the overall effects of policies on school environmental and behavioral outcomes.

Policies and practices that put physical activity back into daily routines of youth through physical education are vital to increase physical activity and decrease time spend in sedentary behavior in youth (Brownson et al., 2005). Despite national efforts and the development of the National Standards for Physical Education to increase the opportunity for children and adolescents to be physically active while at school there is no federal law that requires physical education to be provided within the American education system, and there are no incentives for offering physical education programs (NASPE & AHA, 2006). At the state level, policy makers may set general or minimum requirements for physical education however, individual school districts often provide specific guidelines (NASPE & AHA, 2006). Researchers predict the ability of wellness policies to impact children will depend on efforts at the school and district levels to implement and enforce policies (Probart, McDonnell, Weirich, Schilling & Fekete, 2008).

Results of the 2000 SHPPS revealed 8% of elementary schools, 6.4% of middle school and/or junior high schools, and 5.8% of senior high schools provide daily physical education or its equivalent for the entire school year (Burgeson et.al, 2001). Having adequate instruction time and modifying the curriculum to increase physical education time results in a significant increase in fitness among school-aged children (CDC, 2001). Johnston, Delva and O'Malley (2007) sought to determine levels of physical education and sports participation among American secondary school students (8^{th}, 10^{th} and 12^{th} grades), and to establish the extent to which they vary by grade level, racial/ethnic background and SES of the student. Data were collected from over 500 schools and 54,000 students as part of the Youth, Education, and Society study and the MTF study. School administrators completed questionnaires on physical activity of students in their schools and students in the same schools completed self-administered questionnaires providing gender, racial/ethnic identification and parents' education level. The results show a significant drop between 8th and 12th grades in the requirement that students take physical education. In 8th grade 87% of students that attend school were required to participate in physical education; this rate fell to 47% in 10th grade ($p < 0.05$) and to 20% in 12th grade ($p < 0.05$). The mean percentage of students in each grade who took physical education also decreased significantly with grade ($p < 0.05$), from 91% in 8th grade to 62% in 10th grade and 34% in 12th grade. No significant difference was found between grade levels and interscholastic sports participation, with similar participation levels between boys and girls (37% and 33% respectively). Participation in activity correlates negatively with SES and was lower among black and Hispanic students than white. For all groups physical education is lacking in American high schools. Students of low SES high minority groups are getting less exercise and are at a greater risk for adolescent overweight. The authors suggest disparities in resources available to minorities and low SES youth may explain some of these differences. There are many barriers to developing and implementing policy to increase physical activity among children while at school.

Young, Felton, Grieser, Elder, Johnson, Lee and Kubik (2007) identified barriers to physical activity at the school level that prevents schools from promoting physical activity. The primary aim was to determine if a physical activity intervention linking communities and schools reduces age-related decline in MVPA in middle school girls. Thirty-six middle schools across six states (Arizona, California, Louisiana, Maryland, Minnesota, and South Carolina), which are a part of TAAG, participated in this investigation. Schools were randomly assigned to treatment conditions for a total of 18 intervention and 18 control schools. In this report investigators describe the school climate regarding physical activity education and practice. Policies, programs and opportunities available in middle schools were assessed and compared to published recommendations by the NIH and the CDC. Investigators conducted interviews with school principals, physical education and health education department heads, and school-based physical activity program leaders to document instructional practices and policies that enhance and/or limit physical activity opportunities. The results indicated the average exposure to physical education per year was approximately 110 hours in each grade. Two schools reported up to 25% of physical education classes shortened or cancelled while 83% offered interscholastic sports and 69% offered intramural sports. Twenty of the 36 department heads identified primary obstacles to implementing quality physical education as: 1) physical education not a school priority; 2) not a priority for students; 3) inappropriate class sizes; 4) lack of funding and indoor facilities; and 5) insufficient physical education staff development. Environmentally, on average schools scored less than 7 points (6.7) out of 10 when evaluated on having a school environment that supports physical activity. Based on these and other results the authors conclude that schools have policies and practices that support physical activity however, unfavorable practices exist.

In addition to these barriers, the No Child Left Behind signed into public law by President Bush in 2002 has increased academic demands and may result in a decrease in time available for daily physical activity by school officials. Recently, Governor Haley Barbour of Mississippi signed into law Senate Bill 2369, “Mississippi Healthy Students

Act." This law was in effect beginning at the start of the 2008-2009 school year and requires public schools to provide at least 150 minutes of physical activity-based instruction and 45 minutes of health education instruction per week for children in kindergarten through 8th grade, and students in grades 9 through 12 to complete a half Carnegie unit of physical education before qualifying for graduation. The outcomes of the new law will need to be closely monitored and evaluated to determine its impacts as recommended by professionals from the International Conference on Physical Activity and Obesity in Children (Katzmarzyk, Baur, Blair, Lambert, Oppert & Riddoch, 2008).

Factors Related to In-School Physical Activity

While it is difficult to precisely quantify owing to the lack of long-term data, it is likely that a combination of changes to the built environment and increases in the proportion of the population engaging in sedentary behavior put a majority of the American population at risk for physical inactivity (Brownson, Boehmer & Luke, 2005). Changes to the built environment are likely a promising strategy in fighting youth physical inactivity, especially among low SES high minority populations (Heinrich et al., 2007; Katzmarzyk et al., 2008). In particular, neighborhood, household and individual demographics, land-use variables, transportation network attributes and characteristics of the weekend day have been shown to influence physical activity among children ages 5- through 17-years (Copperman & Bhat, 2007). By identifying features of the built environment combined with how children experience their physical surroundings interventionists can begin to make environmental, policy and legislative changes which can influence physical activity patterns among children (Nelson and Woods, 2007).

More specifically, from an ecological perspective there is evidence that certain features of the built environment positively influence children's physical activity preferences while at school.

Sallis and colleagues (2001) assessed the association of school environmental characteristics with student physical activity at 24 middle schools (grades 6-8) in San Diego County, California. Potential physical activity areas were assessed by observation and included the following variables: 1) area type: court space, open fields and indoor space; 2) area size in square meters; and 3) permanent improvements. The System for Observing Play and Leisure Activity in Youth (SOPLAY) was used to assess the number of participants and their activity levels. The proportion of physically active boys ranged from 1% to 11% with a mean of 5.5% (SD=2.7%) and for girls ranged from 0% to 5% with a mean of 1.6% (SD=1.2%) across schools. The final model for boys explained 59% of the variance and for girls explained 42% of the variance in observed physical activity. Boys were most likely to be active on courts with high supervision when equipment was available. The interaction "area type x equipment" explained 16% of the variance. The interaction "area type x supervision" explained 11% of the variance in girls physical activity and revealed that supervision was most important in indoor areas. These results suggest that making improvements to school environments could increase physical activity of students during the school day. In addition, high levels of both physical improvements and adult supervision increased the percentage of physical activity among boys 4-fold and among girls 5-fold. Enhanced physical environments and social resources are two ways to intervene and may attract students to activity areas and stimulate physical activity.

Ridgers, Stratton, Fairclough & Twisk (2007) investigated the impact of a playground redesign intervention across time on children's (N = 470) recess physical activity levels and to evaluate the potential influence of covariates on the intervention effect. Fifteen schools located in areas of high deprivation in one large city in England each received funding to resign the playground environment based on a multicolored zonal design. This involved dividing the playground into three specific color-coded areas: 1) a red sports area; 2) a blue multi-activity area; and 3) a yellow quiet play zone. Physical structures included soccer goal posts, basketball hoops, fencing around the red sports area and seating in the yellow quiet area. School teachers supervised morning and afternoon recess while lunchtime assistants supervised during lunch times. Eleven schools served as matched socioeconomic controls and did not receive any playground markings. Physical activity during recess was quantified using heart rate telemetry and accelerometry at baseline, 6 weeks and 6 months following playground redesign intervention. Significant intervention effects were found across time for MVPA and vigorous physical activity assessed using both heart rate and accelerometry ($p < 0.05$). Children in the intervention schools engaged in 4% and 2.4% more MVPA and VPA respectively during recess than controls (adjusted model for gender, baseline BMI, age and available recess time). A positive interaction was found between the intervention and recess time ($p < 0.05$). These results suggest that a playground redesign that utilizes multicolor playground markings and physical structures is a suitable stimulus for increasing children's school recess physical activity levels. In addition, despite previous research longer recess times may allow children to engage in more physical activity during recess.

Chow, McKenzie and Louie (2008) examined physical activity levels and how physical activity is influenced by environmental and instructor-related characteristics during 368-lessons taught by 105-physical education specialists in 42-randomly selected schools in Hong Kong. One class from fourth-, fifth- and sixth-grade were randomly selected for observation during three randomly selected days at each school over an 8-month period. To account for seasonal and curricular diversity observation days were arranged in three cycles, autumn, winter and spring. The SOFIT instrument was used to simultaneously record student activity levels, lesson context and teacher behavior. To determine environmental influence the following were recorded: class size, lesson location, weather, air temperature and size of the activity area. Descriptive analyses were calculated for each SOFIT subcategory. Inferential statistical analyses involving MVPA% in one-way ANOVA and independent *t* tests for environmental and instruction-related variables were conducted using all observed lessons. Stepwise multiple linear regression was used to determine predictors of MVPA%. Overall, students spent the greatest proportion of their lesson time standing (38%), followed by walking (36%). On average, children accrued 4.6-minutes of VPA (15% of lesson time) and 15.8-minutes of MVPA (50.7% of lesson time). Relative to lesson context, teachers allocated the largest proportion of time to skill practice (32%), fitness activities (20%), general knowledge (17%), and management (17%). Teachers spent 59% of their time providing general instruction, followed by class management (18%) and demonstrating fitness (10%). Four factors predicted a total of 29% of the variability in MVPA%, and these include lesson context (16% of explained variance), teacher behavior (5%), lesson content (4%) and temperature (4%). In conclusion, subject matter selected by teachers, the way they deliver it and how they themselves behave during the lesson were significantly related to the intensity of children's activity during lesson time. Most of these factors are modifiable and changes could improve the quantity and intensity of children's physical activity.

Barr-Anderson, Young, Sallis, Neumark-Sztainer, Gittelsohn, Webber, Saunders, Cohen and Jobe (2007) used data collected in the TAGG study to identify the types of physical activity in which 6th grade girls (N = 2,791) participate and to examine psychosocial correlates of physical activity. Data were collected from six geographical locations in the U.S. using surveys to assess participation in sports team activities and activity classes in and out of school, self-efficacy for physical activity, physical activity enjoyment, physical education enjoyment and perceived school climate for girls' physical activity. Investigators also explored participation in structured physical activity and sociodemographic determinants. Of those surveyed, 89.5% of girls participated in structured physical activity; 39% at school and 86% outside of school. The most reported activities were basketball (44%), cheerleading or dance (41%), and swimming (39%) across race/ethnicity. Controlling for SES, geographic location and race/ethnicity, girls with higher self-efficacy (OR = 3.44, CI = 1.72-6.92) and higher enjoyment of physical education class (OR = 1.97, CI = 1.25-3.120) were more likely to participate in structured physical activity. Perceived school environment and physical activity enjoyment were not associated with participation in structured physical activity. The investigators conclude that interventions that focus on increasing self-efficacy and making physical education classes more enjoyable could result in greater participation in structured physical activity and increased overall physical activity levels in adolescent girls.

Mota, Gomes, Almeida, Ribeiro and Santos (2007) described the relationships between sex, age, physical activity behavior and choice of structured versus unstructured physical activity in boys and girls (N = 594). Participants were recruited from eleven urban public secondary schools (grades 7-12) in Aveiro District, Portugal. Students were given a questionnaire asking about leisure activities and based on their responses were assigned to one of two groups: 1) those who reported both organized and nonorganized activities or one or the other were classified as *actives* during their leisure time (ALTPA); and 2) those who reported neither organized or nonorganized PA were classified as *nonactives* during leisure time (NLTPA). The data show that significantly more girls than boys ($p \leq 0.001$) belonged to the sedentary group (80.7% girls) and low activity group (64.5% girls). A significantly greater proportion of NLTPA girls, as opposed to ALTPA girls, agreed that "the crime rate in my neighborhood makes it unsafe or unpleasant to walk in my neighborhood" ($p \leq 0.05$). A greater proportion of ALTPA girls, as opposed to NLTPA girls, agreed that aesthetics and access to recreational facilities were important factors ($p \leq 0.05$). Both ALTPA boys and girls agreed that the social environment was important ($p \leq 0.05$). Older participants chose more structured activities while younger participants chose unstructured activities, these results were more significant for girls than for boys. Active girls chose more structured physical activities than sedentary counterparts (83.3% and 18.8%, respectively), while boys preferred unstructured physical activity regardless of physical activity group (83.7% and 58.5%, respectively; $p \leq 0.05$). The authors conclude that LTPA for girls, but not for boys, seems to be influenced by certain modifiable built environment factors, such as aesthetics and safety. Additionally, it can be concluded that as age increased, organized sport activities became a relatively more important component of total weekly activity for both male and female participants.

This investigation and other recent investigations examining the influence of the built environment on physical activity and overweight specific to youth reveal certain characteristics of the built environment and policy influence decision-making and physical activity among children and adolescents in urban environments. In particular, youth residing in low SES high minority communities are at a strong disadvantage regarding access to physical activity facilities where they feel safe (Popkin, Duffey & Gordon-Larsen, 2005). However, strategies used to intervene in urban settings may not be as effective when applied in rural settings. Special attention in future studies should focus on environmental and policy characteristics in rural settings, where little is understood about the influence of policy and the built environment on physical activity in children while at school.

Despite evidence linking multiple factors of the built environment to physical activity, causal evidence of health related outcomes arising from changes to the physical environment have not been established (Nelson et al., 2007). BMI is widely known to vary by individual characteristics, but little is known about whether BMI varies by school characteristics. O'Malley, Johnston, Delva, Bachman and Schulenberg (2007) described the extent to which student overweight and at risk for overweight cluster by school and by particular characteristics of the school, providing indications of the potential importance of contextual factors in the school and community. Data from the

Michigan MTF project (1991-2004) were used in this investigation. Students were characterized by their BMI, racial/ethnic group, and parental education. The following school characteristics were used in this investigation: school type; school size; race/ethnicity of the students; average parental education; region, determined by the geographic region of the country where the school is located; and population density. The results show a small proportion of variance in BMI lies between schools; intraclass correlations on the order of 3%. This is sufficient variation to provide very different environments for students attending schools that are low versus high in average BMI. There is modest variation by school type, school size, region of the country and population density ($p < 0.05$). There is more variation as a function of school SES status and racial/ethnic composition of the school ($p < 0.001$). School SES in particular was negatively associated BMI levels, even after controlling individual-level SES and racial/ethnic status. The authors conclude that the differences in BMI by school suggest that some characteristic of the school and/or community environment facilitate obesity in schools with a high concentration of low SES students beyond individual factors. It is suggested that cultural factors, peer role modeling and differences in school food, beverage and physical education policies might account for some of the differences. Intervention at the structural, policy and legislative levels are likely to make active choices easy choices (Nelson et al., 2007).

Outcome Measures

In general, investigations examining the influence of policy and the built environment on children's physical activity while at school reveal that there is a relationship among these variables and physical activity participation. As a result, policy and environmental interventions are being developed and implemented to increase physical activity opportunities for children at school; however the outcome effects on health and weight status have yet to be determined. In Mississippi, where school's will be required to provide physical activity reflecting the National Recommendation beginning in the 2008-2009 school year, it is important to monitor and evaluate the impact of this policy change and to determine if there is a change in the health and weight status of children.

Li, Ford, Mokdad and Cook (2006) examined trends in mean waist circumference (WC), waist-height ratio (WHtR) and the prevalence of abdominal obesity among children and adolescents ages 2- through 19-years in the U.S. Data from four NHANES time periods (1988 to 1994, 1999 to 2000, 2001 to 2002 and 2003 to 2004) were used in the analysis. To ensure comparability of measures over time body measurements were taken using the CDC standardized methods and equipment. Subjects with abdominal obesity were identified as the 90^{th} percentile values of WC for gender and age generated by NHANES III and a WHtR cutoff of 0.5 was used to define abdominal obesity for boys and girls ages 6- through 19-years. Linear regression and logistic regression models were used to determine the prevalence of abdominal obesity across the four time periods by gender and four age categories. A steady increase in mean WC occurred across the four time periods for boys and girls ($p < 0.0001$) and among all of the gender and age-specific groups ($p < 0.05$). Increasing age was associated with larger increases in absolute differences and relative changes for both boys and girls. The largest increase in mean WC occurred among 18 to 19 year-old boys (5.3 cm or 2.1

in increases) and 18 to 19 year-old girls (6.2 cm or 2.4 in increases). The overall increase in the prevalence of abdominal obesity was 65.4% (p < 0.0001) for boys and 69.4% (p < 0.0001) for girls. The largest increase in the prevalence of abdominal obesity between NHANES 1988 to 1994 and NHANES 1999 to 2004 occurred among 2 to 5 year-old boys (84.0%; p < 0.0001) and 18 to 19 year-old girls (126.2%; p = 0.0001). The agreement between defining abdominal obesity by cutoff values of WC for 90th percentile versus WHtR cutoff value of 0.5 was good for 6 to 11 year-olds (κ = 0.66), 12 to 17 year-olds (κ = 0.61) and 18 to 19 year-olds (κ = 0.56); correlation coefficients and the κ statistics were similar across gender and over time. Investigators report particular concern regarding these results because abdominal adiposity, measured by WC and WHtR, increases the risk for obesity related morbidity and mortality in children and adults.

The trends reported suggest high priority be placed on intervention efforts to reduce obesity, particularly abdominal obesity among adolescents. Researchers recommend that WHtR might be a better predictor of risk for cardiovascular disease than BMI or WC. Evidence to support this recommendation is threefold: 1) WHtR is more highly correlated with visceral fat mass and clustering of cardiovascular risk factors in children and adults; 2) WHtR may be a more accurate tracking indicator of fat distribution and accumulation by age, because it accounts or growth in both WC and height over age; and 3) the value of WHtR is free of measurement units and is in close agreement between males and females at each age group. In conclusion, authors strongly recommend that pediatricians routinely measure WC and efforts are needed to promote measurement of this anthropometric parameter as a “vital sign.”

Instrument Validation

Physical Activity Resource Assessment (PARA)

Lee, Booth, Reese-Smith, Regan and Howard (2005) conducted an investigation to develop and test a brief instrument to systematically document and describe the type, features, amenities, quality and incivilities of a variety of physical activity resources. The PARA is a one-page instrument developed to assess all publically available physical activity resources. For this particular investigation the instrument was developed to assess resources in 13 urban lower income, high ethnic minority concentration neighborhoods that surround public housing developments and 4 higher income, low ethnic minority concentration comparison neighborhoods. A total of 97-physical activity resources in 17-neighborhoods were assessed. A three step strategy was used to reach a census of physical activity resources available to the general public. First, internet and telephone book searches were performed to generate an initial list of all physical activity resources in each neighborhood. Nest, trained assessors conducted “windshield” surveys to confirm locations of resources and identify any resources that had not been identified by existing databases. Then, trained field coders rated each resource on location, type, cost, features, amenities, quality and incivilities using the PARA. Data collectors counted and coded 25 unique possible elements of each physical activity resource that included 13 features (e.g., basketball courts, soccer fields, playgrounds) and 12-amenities (e.g., benches, lighting, sidewalks). Each feature and amenity was rated for quality by a three category quantitative system. Each resource was also rated on overall incivilities including 9-elements that would reduce pleasure associated with using that particular physical activity resource. The PARA was developed over a 9-

month period, was pilot tested and revised to achieve the final form. Reliability test of a 10% overlap showed good reliability (*R* > 0.77).

The results show housing development neighborhoods had a range of zero to 8 physical activity resources (mean = 4.85, SD = 2.82), including fitness clubs, parks, sport facilities, community centers, churches, and schools, with considerable variability in the types of resources available for each neighborhood. One-third of the resources in housing development neighborhoods were parks (n = 22, 35%). One out of 4 of the resources were public school yards (n = 16, 25%), illustrating an important and under recognized role that public schools play in communities. Comparison neighborhoods had a range of 2 to 9 physical activity resources (mean = 6, SD = 3.56), including fitness clubs, parks, sport facilities, trails, community centers, churches and schools. Nine of the resources in the comparison neighborhood were churches (38%), but only one neighborhood (25%) had access to a community center. Most resources were evenly distributed throughout the neighborhoods and were freely accessible at no cost (82%). Housing development neighborhoods had slightly more physical activity features within each resource (mean = 2.71, SD = 1.65) than did resources in comparison neighborhoods (mean = 2.17, SD = 1.63). Housing development neighborhoods, fitness clubs, and community centers had the most physical activity features available, on average (mean = 4, SD = 1.91), in comparison neighborhoods parks had the most features available (mean = 4.67, SD = 1.53). Regarding amenities, housing development neighborhoods had more amenities per resource, on average (mean = 3.79, SD = 2.16) than did comparison neighborhoods (mean = 2.96, SD = 2.42). Quality ratings ranged from 1 to 3 (mean = 2.40, SD = 0.68) in housing development neighborhoods and from 2 to 3 (mean = 2.32, SD = 0.97) in comparison neighborhoods. In the housing development neighborhood 80% of the resources had incivilities (mean = 1.81, SD = 1.72), and in the comparison neighborhoods only 11% had incivilities (mean = 0.29, SD = 0.75). This relationship was significant ($t = 12.60$, $p < 0.001$).

The authors conclude that both lower income, higher ethnic concentration, housing development neighborhoods and higher income, lower ethnic concentration comparison neighborhoods varied widely in the number and type of resources that were available for physical activity. The neighborhoods were selected to be similar in age and urban design; thus the neighborhoods might have similar amounts of parks, schoolyards, and other public structures resulting from similar urban planning strategies. Despite the net number of resources being similar between neighborhood types, the overall environment of the physical activity resources was different. This suggests that evaluating merely the presence or absence of physical activity resources may be an over simplistic way to investigate access to resources. In this investigation, incivilities were consistently present and offensive at resources in lower income, high ethnic concentration neighborhoods. Hence, building a park in a deprived area may be insufficient for insuring its intended use and maintenance. Ongoing support for maintenance and civic improvements are also necessary, and policy makers and political leaders need to work with communities to improve the quality of public resources. This investigation also provides evidence for the inclusion of quality and incivility ratings assessed by the PARA instrument.

Systematic Observation of Play and Leisure Activity in Youth (SOPLAY)

McKenzie, Marshall, Sallis and Conway (2000) measured leisure-time physical activity of adolescents throughout the school day (during recess) and assessed the SOPLAY as an instrument to directly observe group physical activity. The study sample included 24 middle schools (grades 6-8) and a total of 151 target areas were identified for observation, ranging from 2 to 8 per school (mean = 6.3). SOPLAY was designed to obtain observational data on the number of participants and their physical activity levels during play and leisure opportunities. Scans of SOPLAY target areas were made during three measurement periods (before school, after school and during lunch). Simultaneous entries were made for the time of the observation and contextual characteristics of each area such as its accessibility, usability, and whether supervision, organized activities and equipment were provided. Using a list of 14 activities, the predominant type of activity in each area was recorded for boys and girls. The counts were transformed into estimates of energy expenditure rate (kcal/kg/min). Systematic observations were made periodically in each area during three randomly scheduled days at each school over 20 weeks (total = 72 days).

For analyses involving contextual characteristics of activity areas, the unit of analysis was one scan of one area. Gender- and period-specific daily for each school was the unit of analyses for all other variables, with the exception of summary school-level variables where school was the unit of analysis. Percentages of occurrence measures were used as dependent variables when comparing area contexts across the school day. Counts of boys and girls were divided by the gender-specific daily attendance to derive the percentage of school attendance present in activity areas at any particular time for activity variables. The proportion of school attendance engaged in MVPA and estimates of energy expenditure rate were included as dependent variables. Independent variables were gender (two levels) and observation period (five levels; before school, lunch time, and three after school). Analyses of frequency data were analyzed using Chi-square. To analyze gender and period differences in activity variables, a series of 2 X 5 (gender by period) mixed-model ANCOVA's were computed. For each mixed model, gender and period were included as fixed effects, with school included as a random effect to account for the effects of clustering by school. Tukey post hoc comparisons were computed for significant period effects. All means and standard errors were adjusted for covariate and clustering effects, unless stated otherwise. Pearson correlations were used to examine the association between school characteristics and school-level activity variables.

The results indicated that the areas were nearly always usable, but were accessible to students only about 66% of the time. Areas were more accessible after school than during other time periods [χ^2 (2, N = 2,544) = 141.09, $P < 0.001$]. They were supervised [χ^2 (2, N = 1,710) = 455.43, $P < 0.001$] and had equipment provided [χ^2 (2, N = 1,710) = 403.87, $P < 0.001$] more during lunch time than before and after school. Organized activities rarely happened before school and occurred infrequently (mean = 8% of the observations). Significantly more boys than girls visited activity areas at lunch time (30.6 vs 8.3% of daily attendance, $P < 0.001$), but not before (6.7 vs 1.6%) or after school (1.9 vs 2.2%). Both boys and girls were more likely to visit activity areas at lunch time than before ($P < 0.001$) and after school ($P < 0.001$). A significant gender by period interaction ($P < 0.001$) indicated that lunch time had a more powerful influence on attracting boys to activity areas than girls. Overall boys in areas engaged in more MVPA than girls (adjusted grand means = 62.4 vs 48.3% in MVPA) and had a higher average energy expenditure rate (0.083 vs 0.070 kcal/kg/min, $P < 0.001$). The most prominent activity that both girls and boys engaged in was “no identifiable sport, game, or exercise.” Activities with more structure occurred mostly at lunch time.

The main findings of this investigation were that although physical settings are available for physical activity school officials made limited efforts to provide equipment, supervision, or structured activities to support or encourage student physical activity. In addition, relatively few students sought out opportunities for physical activity during leisure periods. Secondly, the feasibility of the SOPLAY was established through 72 days of measurement at 24 diverse schools. Interobserver reliabilities for counts of boys and girls in targeted activity areas, their physical activity levels and all coded contextual variables were very high. The number of students in each activity area was significantly correlated with the number of students who self-reported that they typically used school activity areas. The activity codes were supported by heart rate monitoring which permitted energy expenditure rates to be estimated. Hence, the instrument is useful for researchers and practitioners interested in assessing the numbers of participants and their physical activity levels in leisure settings. It also has the potential to assess the effects of environmental and policy interventions that may be implemented to influence the physical activity of entire populations.

Systematic Observation of Fitness and Instruction Time (SOFIT)

McKenzie, Sallis and Nader (1991) describe and report on the reliability, validity, and feasibility of using SOFIT, a momentary time sampling and interval recording system that involves direct observation to assess variables associated with students' activity levels. SOFIT uses a three-phase decision system that examines how active students are, how much time is allocated to various tasks and goals, and how teachers spend their time during class. Phase one involves making decisions on the activity level of individual learners. This is made by observing (one at a time) preselected students (n =4) and determining their level of physical activity (or active engagement level) periodically (every 20-seconds) throughout the class time. The engagement level provides an estimate of the intensity of a student's physical activity through the use of activity codes (1=lying, 2=sitting, 3=standing, 4=light, 5=moderate or 6=vigorous). Coding is based on the observed activity of the target student at the moment the observation interval ends.

Phase two of the decision sequence involves coding the curricular lesson context of the class being observed. At the end of each observation interval a decision is made whether class time is being allocated for general context (such as management) or for actual subject matter (physical education) content. If substantive physical education content is occurring, an additional decision is necessary to decide whether the class focus is on knowledge content (coded as either general knowledge or physical fitness knowledge) or on motor content (physical activity). If motor content is occurring, a further decision is necessary to code whether the context is one of fitness, skill practice, or game play. The lesson context will be simultaneously coded every 20-seconds into one of seven categories: 1=management, 2=general knowledge, 3=fitness knowledge, 4=fitness, 5=skill practice, 6=game play or 7=free play.

Phase three of the decision sequence involves coding the teacher's involvement during class. Teacher behavior is classified into one of six categories. The first behavior category, promotes fitness, directly relates to student involvement in fitness activities and is coded when the teacher prompts or reinforces learners for physical fitness engagement. The second category, demonstrates fitness, identifies when the teacher models fitness engagement. The remaining four categories, instructs generally, manages, observes and off-task are only indirectly related to students fitness opportunities but provide important information on how teachers spend their time during class. Teacher behavior will be simultaneously coded every 20-seconds into one of six categories: 1=fitness promotion, 2=fitness demonstration, 3=general instruction, 4=management, 5=observation, and 6=off-task.

Investigators were particularly interested in studying elementary school physical education. Third, fourth, and fifth grade (N = 88) physical education lessons taught by trained specialist and classroom teachers were observed. The class size ranged from 23 to 34 students, averaged 24.5 minutes in length, and were all held outdoors during the spring semester. Observer training consisted of approximately 2 hours studying definitions and coding conventions, 2 hours practicing coding vignettes form videotapes of physical education classes, and 4 hours practicing coding with a trainer in the live setting. Two observers independently coded 31 or 88 classes (2,063 intervals) simultaneously. Interobserver reliabilities using interval-by-interval comparisons indicated agreements of 88.3%, 91.8%, and 89.8%, respectively, for student activity level, lesson context, and teacher behavior. Several associations among the observed variables strongly support the construct validity of the SOFIT instrument. Time spent in management correlated positively with the amount of time students spent standing (r = 0.448, p < 0.001) and negatively with the amount of time they spent walking (r = -0.411, p < 0.001), being very active (r = -0.324, p < 0.01), and engaging in MVPA (r = -0.556, p < 0.001). Class time dedicated to fitness correlated positively with the amount of time students spent walking (r = 0.448, p < 0.001), being very active (r = 0.360, p < 0.001), and engaging in MVPA(r = 0.685, p < 0.001).Time devoted to skill development correlated negatively with MVPA (r = -0.291, p < 0.01).

To further assess the validity of the SOFIT, investigators sought to determine if the instrument discriminated between classes reported by teachers to have fitness as their primary focus and those that did not. Forty-nine of the observed lessons were categorized as fitness lessons and 39 as nonfitness lessons. Students in fitness classes compared to nonfitness classes spent more significantly more time walking (35.8% vs 27.2%), being very active (21.8% vs 16.6%), and engaging in MVPA (51.3% vs 37.2%). In addition, students in nonfitness classes spent significantly more time standing (51.3% vs 37.2%). SOFIT also detected differences between fitness and nonfitness classes in lesson context and teacher behavior. Fitness classes tended to be shorter (23.4 vs 25.8 minutes), but they had four times the amount of time allocated for fitness activities (64.2% vs 15.6%). Little time was devoted for fitness knowledge in either type class.

The SOFIT instrument requires a substantial amount of time from trained observers however; data on student activity level, lesson context, and teacher behavior cannot be done by other means than direct observation. Self-report data on these events are not reliable. The construct validity in this sample suggests that SOFIT is suitable for investigating physical activity and fitness development opportunities for students. The instrument can be used to assess classes either live or from video tape, and can be used in descriptive or experimental studies. Moreover, the five-category activity coding system makes it possible to assess the amount of time students of any age spend in vigorous activity levels. It is possible to estimate the amount of energy expended during observed periods, a substantial advantage in epidemiological studies.

Pope, Coleman, Gonzalez, Barron and Heath (2002) conducted an investigation to test the validity of the original SOFIT (SOFIT5) instrument in a field setting and a modified SOFIT (SOFIT6), which distinguishes between moderate and light physical activity. Validity was established using TriTrac accelerometers. Participants were 56 third-, fourth-, and fifth-grade students form a predominantly Hispanic school (98%). Two observers collected data for this study. One observer used the SOFIT5 and the other used the SOFIT6. Data collection procedures using SOFIT5 were the same as explained above (McKenzie et al., 1991). The SOFIT6 is also a momentary time sampling and interval system with procedures identical to that of SOFIT5. However, the moderate category for SOFIT5 was divided into two distinct intensity categories: light activities (code 4) and moderate activities (code 5). For three nonconsecutive weeks observers visited the elementary school twice a week. A total of 18-lessons were observed. Third-grade physical education classes were approximately 30-minutes long, while the fourth- and fifth-grade lessons were approximately 45-minutes.

Intraclass correlation coefficients for inter-rater reliability were r = 0.98 for both SOFIT scales. Pearson product-moment correlation coefficients were generated for each child between the SOFIT5 and TriTrac vector magnitude activity counts ($r = 0.98$; CI = 0.43-0.73), and the SOFIT6 and TriTrac vector magnitude counts (r = 0.68; CI = 0.52-0.80). A MANOVA with dependent measures of correlation was used to assess the differences between correlations. There were no significant differences between correlations using MANOVA ($F (1,45) = 0.06$; $p = 0.80$). Percentage of MVPA and VPA were calculated for both SOFIT scales. The amount of MVPA recorded with the SOFIT6 was less (20.2% of class time) than that recorded with the SOFIT5 (52.4% of class time). The amount of VPA recorded with the SOFIT6 (12.8% of class time) was also less than that recorded with the SOFIT5 (18.2% of class time). For SOFIT5, MVPA reflected a range in vector magnitude of 185-6069 activity counts and a mean ± standard deviation of 2055 ± 1189 activity counts. VPA corresponded to a range in vector magnitude of 185-6069 activity counts and a mean ± standard deviation of 2438 ± 1451 activity counts. For SOFIT6, MVPA reflected a range in vector magnitude of 185-6069 and a mean ± standard deviation of 2190 ± 1319 activity counts. VPA corresponded to a range in vector magnitude of 302-6069 activity counts and a mean ± standard deviation of 2560 ± 1416 activity counts. Based on these findings, the authors suggest the SOFIT6 be used for baseline levels of physical activity in school-based interventions and that codes 4-6 be combined to compare MVPA with national data that used the SOFIT5. Further research should include comparing the SOFIT5 and SOFIT6 in controlled and field settings with oxygen consumption and activity monitors. Additionally, training for SOFIT6 should include multiple observers, videotaped training sessions with isolated, difficult activities, and multiple field trials on a variety of settings and different types of activities.

Heath, Coleman, Lensegrav and Fallon (2006) conducted an investigation to validate the estimates of time spent in various physical activity intensities obtained with the paper and pencil versions of the five- and six-category SOFIT scales during actual physical education classes, using a computerized system of recording and timekeeping. The SOFIT6 is a modification of the original SOFIT (McKenzie et al., 1991). In this investigation, 5-students were randomly selected from each third-, fourth-, and fifth-grade physical education classes and were observed every 20-secdonds for 4-minute intervals on a rotational basis. Each third-grade class was approximately 30-minutes and fourth- and fifth-grade lessons were approximately 45-minutes long. Activity was recorded in one of the six following categories: lying down, sitting, standing, light, moderate, and vigorous. Lesson context was the same as in the original SOFIT (McKenzie et al., 1991). Simultaneously and with the same children as the paper and pencil SOFIT6, the Behavioral Evaluation Strategies and Taxonomies (BEST) was used to record children's physical activity level. The BEST software was developed to observe and record behaviors continuously in real time. Four observers were trained and collected data for this investigation. For both paper and pencil SOFIT6 and BEST SOFIT6 instruments reliability between the observer and trainer was determined by using intraclass correlation coefficients. When the intraclass correlation coefficient was $\geq$ 0.90, all observers were considered "reliably trained." During each lesson, observers positioned themselves inconspicuously with one person using the paper and pencil SOFIT6 and the other using the BEST. They observed the same children and made observations at the same 20-second intervals. The observer using the paper and pencil

SOFIT6 also recorded temperature, weather, size of class, the instructor's name, characteristics of each child, and types of activities the class was engaged in.

Data were arranged so that both the SOFIT5 and SOFIT6 scale could be evaluated using BEST. Intraclass correlation coefficients between the BEST and paper and pencil SOFIT methods were calculated for each activity category. Intraclass correlation coefficients ranged from $r = 0.54$ for SOFIT6 moderate intensity to 0.985 for the five-point SOFIT MVPA. Two *t* test ($df = 36$) comparisons between paper and pencil and BEST data were significant: SOFIT6 moderate intensity activity ($p = 0.02$) and SOFIT6 MVPA ($p = 0.025$). Effect sizes for the differences between the paper and pencil SOFIT methods and BEST were small ranging from 0.0 for SOFIT6 light activity to 0.14 for the SOFIT6 moderate intensity. These results strongly support the use of the original SOFIT for estimating physical activity intensity and total time spent in various activity intensities. Findings showed no significant differences in time spent in various intensities of activity between the paper and pencil versions of both SOFIT instruments and BEST, except for SOFIT6 moderate intensity activity ($r = 0.54$). This demonstrates high criterion validity for all SOFIT6 activity categories. Lower agreement for SOFIT6 moderate intensity activity most likely reflects ambiguity in the definition of moderate intensity activity as anything similar to brisk walking. Further development of the SOFIT6 brisk walking moderate intensity activity coding scheme is warranted. Authors conclude that health surveillance can be more accurately and easily with computerized observation systems such as BEST, using the SOFIT5 observation system.

Conclusion

Provided causation can be established, environmental interventions that target obesogenic features may reduce the prevalence of obesity at a population level. One thing remains clear, policy and organizational changes are needed to address the factors that determine energy balance in children, specifically in southern rural underprivileged communities serving high minority populations in the U.S. (Anderson et.al, 2006; Maziak, Ward & Stockton, 2007). Determining the behavioral factors and social-ecological determinants leading to childhood obesity is paramount to reversing these trends in youth. Socially and politically disadvantaged populations with respect to the larger social structure are disadvantaged in many respects. Issues surrounding food availability, food advertising, school policies, recreational facilities and opportunities for safe, affordable physical activity combined with racial/ethnic and economic stratification contribute to the disparity individuals in these communities face (Yancey et al., 2007). Efforts aimed at increasing physical activity on multiple levels and in various behavior settings serving low SES, high minority populations may be the most effective approach to reduce the increasing prevalence of overweight and obesity (Delva et al., 2007; Merchant, Dehghan, Behnke-Cook & Anand, 2007). Among children of low SES, high minority populations living in rural communities intervening at the school level may prove to be the most economical and effective strategy for increasing physical activity and decreasing overweight in youth at high risk for overweight and subsequent adverse health outcomes. The use of previously validated instrumentation to observe physical activity among children while at play during physical education and recess should be used to determine the amount and level of physical activity children are actually engaging in while at school. These data can be compared to children's weight and health status.

Chapter III

Methodology

The purpose of this investigation was to examine the social-ecological determinants of physical activity among youth. The primary objective of this investigation was to describe state, district and school level policy regarding physical activity, to describe the school built environment and to examine in-school physical activity of children ages 6 through 11 years.

The purpose of this chapter is to describe the methodology used in this investigation. The target population is defined and rationale for the selection of the target population is discussed. The equipment used to collect anthropometric, physical activity and the built environment data, and the equipment used to conduct key personnel interviews is described. The procedures for data collection using these instruments and equipment are individually outlined to provide understanding of how the data were collected. The timeline for data collection and procedures, and a description of how the project was managed by the Principle Investigator is included. Finally, the experimental design of the study is explained followed by a description of the data processing and statistical techniques used for qualitative and quantitative data analysis are explained.

Target Population:

The prevalence of overweight in youth is highest among children ages 6 through 11 years (1st through 5th grades). NHANES 1976-1980 and 2003-2004 show the prevalence of overweight among this age group quadrupled from 6.5% to 18.8% respectively. According to a report released by Trust's for America (2007) in Mississippi 17.8% of youth ages 10 through 17 years are overweight. It has also been shown that the higher prevalence's of youth overweight and physical inactivity are found among low SES high minority populations in underserved communities. Research has been conducted in urban environments to guide interventions and increase physical activity among adults and more recently among youth; however, little is known about the determinants of physical activity among youth in rural environments.

Based on this information, the rural Mississippi Delta was selected because the communities within the Delta counties are predominantly characterized by low SES, high minority populations in comparison to state and national levels (Appendix A; Table 1). The Mississippi Delta is the distinct northwest section of the state of Mississippi that lies between the Mississippi and Yazoo Rivers. The Delta is a region that struggles to accelerate the rate of social and economic improvements that provide the "average" Delta resident a standard of living at least equal to that of the "average" Mississippian (Doolittle, 2002). County A and County B are located in the Mississippi Delta and have been identified by the Office on Rural Health Policy as rural. These two Mississippi Delta counties were selected for this investigation because they provide a demographically diverse sample of the Delta in terms of race and socioeconomic status (Appendix A; Table 2, Table 3 and Table 4a-4c). Prior to submission of the grant proposal the Principal Investigator (PI) contacted Holmes County School District, North Panola School District, and South Panola School District superintendents in Mississippi to gain support for the proposed investigation. Contact was made to inform district superintendents of the proposal and to solicit their support to conduct research within their school district (Appendix B).

Equipment:

Physical Activity Resource Assessment (PARA)

The PARA is an empirically established urban/suburban environmental audit tool that has been previously revised for use in a rural setting using an expert panel review process (Appendix C). The instrument was used to assess the actual built environment for its physical activity-friendliness within the school communities proposed in this study. The PARA is a brief, one-page, check-box instrument used to assess the setting type, and quantity and quality of features, amenities, and incivilities of various physical activity resources (e.g., schools, parks, churches, recreational facilities, fitness centers, community centers, and trails). Discrete operational definitions, using pictorial aids, are used to rate features, amenities and incivilities and rating scales range from not present (0), poor (1), mediocre (2) or good (3).

System for Observing Fitness Instruction Time (SOFIT)

SOFIT is a momentary time sampling and an interval recording system designed specifically to quantify factors believed to promote health-related physical activity (Appendix C). SOFIT uses a three-phase decision system that examines how active students are during physical education, how class time is allocated to various tasks and goals, and how teachers spend their time during class. Phase one involves making decisions on the activity level of individual learners. Phase two of the decision sequence involves coding the curricular lesson context of the class being observed. Phase three of the decision sequence involves coding the teacher's involvement during class.

SOFIT Methodology

Data Collection: Pre-recorded CD's or audiotapes keep observers on pace throughout the lesson via standard observe/record prompts every 10 seconds. During each record interval the observer enters a code for each of the three phases of decision sequence.

Observation Technique: Student Activity and Lesson Context are coded for events occurring at the "record" prompt at end the observation interval. The Interaction code is based on teacher promotion of physical activity or fitness during the 10-second observation interval.

Interval Length: Alternately "observe" and "record" during 10-second intervals. This yields 3 observations per minute or 90 observations per 30 minutes. Note: Observe for student level of activity, lesson context, and instructor interaction during the "observe" interval and record the results during the "record" interval (i.e., one line on the data record form).

Selection of Students: Select five target students as directed for each observed lesson. Rotate focus among the first four target students after observing each one for four consecutive minutes. The fifth student is selected as back-up. Begin observation period when the teacher and 51% of the class has reached the instructional station and continue until half the class has departed the area. A 32 minute lesson would yield 96 observation intervals (24 samples with 4 different students).

Data Yield: Data may be summarized by time (3 intervals = 1minute), percent of intervals or lesson time, or estimated energy expenditure. Comparisons may be made among different categories, from class to class over time, or to established standards.

System for Observing Play and Leisure Activity in Youth (SOPLAY)

SOPLAY is designed to obtain observational data on the number of students and their physical activity levels during play and leisure opportunities in a specified activity area (Appendix C). The instrument is based on momentary time sampling techniques in which systematic and periodic scans of individuals and contextual factors within pre-determined target areas are made. During a scan the activity of each individual is mechanically coded as “Sedentary” (lying down, sitting, or standing), “Walking”, or “Very Active.” Separate scans are made for males and females, and simultaneous entries are made for time of day, temperature, area accessibility, area usability, presence of supervision, presence and classification of organized activity, and equipment availability. Summary counts describe the number of males and females in any given setting and their activity levels. The instrument permits physical activity level comparisons to be made among different environments or within the same environment over different time periods. Energy expenditure rates (Kcal/kg/min) can also be calculated based on previously validated constants for each level of activity.

Anthropometric Data

Anthropometric data were collected to determine the weight status of children in 1^{st} through 5^{th} grades (approximately 6 through 11 years-old) from selected districts in the Mississippi Delta. A portable weight scale was used to provide a consistent measure of students' weight. Waist circumference data were collected following a protocol described by the CDC in the NHANES Anthropometry Procedures Manual (2004) and was measured using a measuring tape. Abdominal adiposity is a predictor of obesity-related diseases (CDC, 2007); waist circumference has been shown to be a more accurate indicator of visceral fat and may be a better predictor of cardiovascular disease risk than BMI among children (Li et.al, 2008). Waist circumference data were used to calculate WtHR.

Key Informant Interviews

In depth interviews were conducted with state level coordinators, school superintendents and school personnel to document instructional practices and policies that influence opportunities for physical activity during physical education and recess. Individuals representing key disciplines shown to potentially influence decision making regarding physical activity include:

- State Physical Activity Coordinator
- District Physical Education Coordinator
- School Physical Education or Wellness Council Coordinator
- School Physical Education Instructor

All interviews were conducted via the telephone and lasted for 25 to 30 minutes. Each interview was recorded using a digital voice recorder owned by the Center for Health Behavior Research at the University of Mississippi. The interview guide consisted of questions based on findings from physical activity school policy literature, current national standards and physical activity recommendations, and current state guidelines. Topics from school physical activity policy literature that were used in creating the interview guide include: school policies that support or constrain physical activity, structured and unstructured physical activity opportunities, instructional practices and policies that enhance and/or limit opportunities for students' physical activity, barriers and adequacy of equipment and facilities to implement physical activity curriculum (Young et al., 2007). The interview guide was modified for each key informant classification (i.e., state, district and school level coordinators). Telephone calls were audio taped and transcribed verbatim. A grounded theory approach was used for analyses to capture major themes (Strauss et.al, 1990) using N-VIVO software, also owned by the Center for Health Promotion and Health Behavior at the University of Mississippi. All data are stored in locked filing cabinets and password protected computer systems.

Experimental Design:

Given the aims of the proposed investigation, a multifaceted method for data collection was used including qualitative and quantitative procedures to thoroughly provide an understanding of how current policy and the built environment influences in-school physical activity and weight status of children in the Mississippi Delta. Physical activity data were collected at each school at three different times spread across the 2010 spring semester using the SOFIT (physical education) and the SOPLAY (recess) instruments. Analysis of the built environment was measured by objective observation using the PARA. In depth interviews were conducted with state, district and school personnel to provide a description of physical activity policy, implementation and barriers.

Anthropometric data were collected and include height, weight and waist circumference measures. Demographic data were collected and include age, grade, race and sex. Combined anthropometric and demographic data were used to calculate BMI and WtHR. These data were used to describe weight status and health risk among children ages 6 through 11 years in the Mississippi Delta. Given the aims of the proposed investigation, this mixed-methods design was suitable.

Data Collection Protocols:

<u>SOPLAY Protocol</u>

1.1 Procedures for Describing Target Areas:

1. Obtain a detailed map from school officials.
2. Walk throughout the entire school campus.
3. Indicate precisely (draw) on the map each area that is available for physical activity anytime (before school, during lunch, and after school). Include areas that are used for physical education classes.
4. Be sure to include Target Areas, including: (a) basketball, volleyball, tennis, handball, and wall ball courts; (b) tracks, baseball, hockey, soccer, and other

playing fields; (c) gymnasiums, weight training and multipurpose rooms; (d) grass, dirt, cement, matted, tiled or carpeted areas specifically available for users to be physically active.

5. Number the Target Areas sequentially, in the specific order they will be observed during each rotation. Establish a logical route (e.g., the first Target Area is the one closest to the main cafeteria door).
6. Store the finalized map of the Target Areas in a specific "records" office (located in the Turner Center, Department of Health, Exercise Science and Recreation Management).
7. Occasionally it may be necessary to add or delete a Target Area (e.g., campus or park construction). Designate only one person to add or delete Target Areas (e.g., the leader of the field observation team). This person makes the changes on the master map and provides revised copies to field observation team members.

1.2 Protocol for Environmental Assessments:

Prior to mapping Target Areas the following materials are required: data collection forms, 2 pencils with erasers, and a school map. Make certain to record/number the proper Target Area sequence on the data collection form. Enter school ID number, date, observer ID number, and whether or not the form is a reliability assessment. Complete the following variables for each Target Area:

1. Fixed Setting: identify either indoors or outdoors.

2. Location: Record whether Target Area is part of the school campus or adjacent to it.
3. Area Type: Select only one code. If none are appropriate, enter 9 and describe it.
4. Area Improvements: Count the number of improvements and record in the appropriate box(s). For example, walk around the entire Target Area #1, count the number of basketball half courts, and record this number in the space under the column for Target Area 1 and across the row for basketball courts (half courts). Count and record the quantity for each Improvement type in each different Target Area.
5. Improvement Overlap: Code 1=Yes if any of the improvements overlap each other or are dual-use improvements in the same Target Area (i.e., Target Area has both basketball court markings and tennis court poles and markings, but the two games cannot be played simultaneously). If different games can be played at the same time they are not considered overlapping, therefore code 0=No.
6. Area Surface: (codes listed near the bottom of the data collection form) Primary=most dominant ground surface within each Target Area (i.e., 51% or greater). Secondary=second most prominent surface area (if there is one; e.g., dirt track surrounds a grassy field). Record “0” if there is no secondary surface.
7. Area Size: Use a standard measuring wheel. Enter the square footage/meters for each Target Area.

1.3 Mapping Training and Reliability

1. Explanation of variables and the coding conventions (rules).
2. Demonstration of how to complete Mapping Variables on the data collection forms (use pictures of actual school Target Areas).
3. Presentation of pictures of different variables on the data collection form. Observers will record responses to the pictures on Mapping Variable data collection forms. Inter-observer agreements will be tallied and percentage agreement recorded. Observers will train until 90% agreement is achieved.
4. Discuss discrepancies, refinement of definitions, and protocol recommendations. Note discrepancies (inter-observer disagreement), tally, and discuss until 100% agreement is reached.
5. Trained mappers should go to schools in teams of two (a Primary and a Reliability assessor). Each observer should individually assess and record for Fixed Setting, Location, Area Type, Area Improvements, Area Overlap, and Surface Area for each Target Area. They should then resolve any differences before leaving the location.

1.4 Recording (Scanning) Protocol

1. On the observation form, enter the school ID, the date, observer ID, if it is a reliability assessment, the temperature, and period of assessment. Enter the start time for each Area scan.
2. Record contextual variables for each area.

3. Scan each entire Target Area for girls, using the mechanical counter to record the number of Sedentary, Walking and Very Active observations. Classify the predominant type of Activity occurring using the codes at the bottom of the SOPLAY Observation Form. Transfer these data to the SOPLAY Observation Form and reset the counter. Repeat for boys. Record empty Target Areas by entering zero (0) into the SAV columns.
4. Always scan from left to right. Observe each student in the area once. If an observed student reappears in the scan area, do not record a second time. Do not back-track to count new children entering the scan area.

Before School Observations: The objective is to obtain an accurate measure of the number of students engaged in physical activity before school starts. The last scan should begin 15-minutes before school starts. Begin at School Start minus 40-minutes (with 6 Target Areas), minus 30 minutes (with 4 Target Areas), or minus 25-minutes (with 3 Target Areas).

Lunchtime Observations: The objective is to obtain an accurate measure of the number of students engaged in physical activity at lunchtime (outside of required physical education). There are two complete rotations of scans during lunchtime. The first rotation begins at Lunch Start plus 15-minutes. Always begin at Area 1 at start time. If a physical education class is occurring in a target area, record the area "accessible=no." The second rotation of scans begins at Lunch Start plus 25-minutes.

After School Observations: The objective is to obtain an accurate measure of the number of students engaged in physical activity beginning at School End plus 15, 45, and 75 minutes. Start at Area 1 at specified start time; then walk directly to subsequent Areas in designated rotation.

Sample Schedule (9:00am School Start; 4 Target Areas; 3 Lunch Periods)

8:00-8:20am	check Target Areas, prepare data forms
8:25am	initiate SCAN in Target Area 1 (following established sequence)
8:30am	initiate SCAN in Target Area 2 (continue established sequence)
8:55am	first school warning bell rings
9:00am	School Starts
11:30am	Lunch One (initiate SCAN 1 in Target Area 1 at 11:45am) (initiate SCAN 2 in Target Area 1 at 11:55am)
12:00	Lunch Two (Initiate SCAN in Target Area 1 at 12:15) (initiate SCAN 2 in Target Area 1 at 12:25)
12:30	Lunch Three (initiate SCAN in Target Area 1 at 12:45) (initiate SCAN 2 in Target Area 1 at 12:55)
15:00	School Ends
15:15	initiate SCAN in Target Area 1, continue
15:45	initiate SCAN in Target Area 1, continue
16:15	initiate SCAN in Target Area 1, continue

SOFIT Protocol

2.1 Directions for SOFIT Observers

1. Warm-up: Arrive at the instructional site and be prepared to collect data at least 10 minutes before the announced start time of the class. Warm-up by mentally rehearsing or actively practicing the coding conventions.
2. Equipment: The following supplies are needed for SOFIT observation
   - Pencils, clipboard, ample SOFIT observation sheets
   - Portable audio player, ear jack, fresh batteries
   - Pre-recorded SOFIT pacing audio to pace observations
   - Hip pack to hold the audio player.
3. Record Environmental Measures: Record class size (number of students), lesson location (covered concrete playground, outdoor concrete court, combined), weather (sunny, cloudy, rainy), air temperature, and size of activity area.
4. Select Target Students: Select five students who are representative of the class as possible targets for observation. Do not select five students who are sitting out. As students arrive at the instruction station, select students 4, 8, 12, 16 and 20 from classes with fewer than 25 students, and select numbers 5, 10, 15, 20 and 25 from classes with more than 25 students. Note some identifying characteristics of each student on the SOFIT Lesson Observation Form to enable you to locate him/her later.

2.2 Observation Procedures

1. The target student is the major focus of the observation; however, the observer will place themselves in a position so that they can also hear the teacher and

observe what the class as a whole is doing. Be as inconspicuous as possible and do not interfere with class activities. Be prepared to relocate frequently.

2. Observation should not begin until the teacher is present.
3. Start the audio player and begin observing when 51% of the students reach the instructional station (gymnasium or designated outdoor space) and the teacher is present. Write the start time on the first cover page.
4. Data should be representative of the entire class period. Even in emergency situations (e.g., can’t find the class), do not begin observations if the class has been underway for over five minutes.
5. Observe the student activity, lesson context, and interaction/involvement throughout the 10-second “observe” interval. Enter codes by filling in the appropriate symbols during the 10-second “record” interval.
6. Code Student One for four consecutive minutes (12 observations). Then code Students Two, Three and Four in sequence. Continue in this manner, rotating the focus on a different target student every four minutes until the lesson ends.
7. End observing when 51% of the students have departed the instructional area. Record end time on the cover page.

2.3 Summarize Data

1. Calculate and record the lesson length on page one of the SOFIT observation booklet.
2. Tabulate (sum vertically) and record the total for each of the 14 coding categories at the bottom of each page in the booklet.

3. Copy the summary scores from each page to the SOFIT Summary Form.
4. Calculate the total (across all pages) and record under TOTAL.
5. Complete the header information of all SOFIT Summary Forms.
6. Attach forms in the following order: 1) SOFIT Summary Form; 2) SOFIT Lesson Observation Booklet; and 3) any reliability materials.

2.4 Reliability Checks

1. Approximately 12% of all SOFIT lessons could be coded simultaneously by two independent observers. All observers should complete reliability checks. Reliabilities should be conducted at several different schools.
2. To the extent possible, reliabilities should take place at least once per school.
3. When doing reliability checks, use a single audio player/tape recorder to pace both observers. Insert a y-adapter into the audio-out and attach the two ear jacks to it.
4. One person is designated the Lead Observer and his/her data will be used for analysis. The other person will be the Reliability Observer and will indicate this on the cover page of the SOFIT Booklet.
5. It is very important that the Lead Observer and the Reliability Observer begin observing at the same time and that they record the same information on the front page of the SOFIT form for all entries except REL OBS. The Lead Observer will check “NO” for REL OBS and the Reliability Observer will check “YES.”

6. It is acceptable for reliability and lead observers to talk to each other when they are changing students (i.e., at the end of each 4 minute interval) to ensure that they are selecting the same student to observe.

<u>PARA Protocol</u>

1. Date: Date of Data Collection.
2. Data Collector: person collecting the data for that form.
3. HD/PA Resource ID: NA
4. Time: record the starting and ending time of data collection
5. Phone Call: NA
6. Type of PA Resource: circle “school”
7. Approximate Size: sm=Small, med=Medium, lg=Large
8. Capacity: for an indoor facility look for number which should be posted
9. Cost: circle “Free, no charge”
10. Hours of Operation: enter hour that resource opens and closed in Military Time
11. Signage: Hours of Operation, place a check in the appropriate box
12. Signage: Rules of Use, place a check in the appropriate box
13. Features: for items 13-25 rate each item by circling a number 0=not present, 1=Poor, 2=Mediocre, 3=Good
14. Amenity: for items 26-37 rate each item by circling a number 0=Not Present, 1=Poor, 2=Mediocre, 3=Good
15. Incivilities: for items 38-49 rate each item by circling a number 0=Not Present, 1=Poor, 2=Average, 3=Good.

Anthropometric Data Protocol

During physical education class anthropometric data were collected.

1. Students whose parent(s)/guardian(s) signed and returned a reverse consent form were not asked to participate.
2. Students who agreed to participate and signed an informed assent form were eligible to participate.
3. Students' age, grade, race/ethnicity and sex were recorded.
4. Next, students' height and weight was measured and recorded.
5. Finally, students' waist circumference was measured and recorded.
6. All data and measurements are unidentifiable and results were not shared with students', teachers or parent(s)/guardian(s).

Key Personnel Interview Protocol

1. Key informant personnel were identified and contacted via email with a request to participate.
2. Interviews were scheduled and the PI contacted each interviewee via telephone.
3. A verbal informed consent was read to each participant. Following consent, the interview was audio recorded.
4. Interviews were transcribed, coded and entered into NVIVO software.

Management of the Project:

The program was managed by the Principle Investigator. Execution of the project began in November 2009 and data collection was completed in May 2010 (Appendix A; Table 5).

- Interviews with Key Informants: Interviews were conducted by the PI via telephone from January through May 2010.
- Interview Transcription: Voice recorded interviews were sent for transcription in March through May 2010.
- Anthropometric Data Collection: Height, weight and waist circumference measures were collected by the PI from November 2009 through January 2010. Data were collected at each school sight.
- Built Environment Assessment: The built environment was assessed using the PARA by the PI and staff beginning in February through April 2010.
- SOPLAY Preparation: Each school that offers recess to students was visited prior to physical activity data collection using the SOPLAY for the initial mapping of Target Areas. Initial mapping of the Target Areas were conducted in March and April 2010.
- SOPLAY Data Collection: Physical activity in children while at recess were collected by the PI and staff at each school that offered recess to students at three different times spread across the 2010 spring semester from March through May.
- SOFIT Data Collection: To obtain a representative sample of physical activity during physical education schedules for all physical education teachers were

collected prior to SOFIT data collection. The PI was in continuous contact with each school physical education coordinator from November through May 2010.

- SOFIT Data Collection: Physical activity of children during physical education was collected by the PI and staff at each school that offered physical education to students at three different times spread across the 2010 spring semester from January through May.
- Data Management: Due to the complexity and in-depth nature of this investigation, data management began in November 2009 and is ongoing. Specifically, anthropometric, PARA, SOPLAY and SOFIT data were entered into computer excel spread sheets immediately following data collection. Transcribed interviews were entered into N-Vivo software, allowing for hierarchical coding and organization of data. The PI and Project Support Staff independently coded the transcribed interviews, and comparison and consensus of coding occurred between the two staff in June through August 2010.
- Analyses and Syntheses of Findings: Final data analyses and syntheses were conducted in June through September 2010.
- Dissemination of Findings: The results of this investigation will be disseminated through peer-reviewed journals and annual meetings of Active Living Research, American Public Health Association, Obesity Society, and American College of Sports Medicine. The PI will also report the findings to participants of the in-depth interviews, the school principle, the district superintendent, and the Mississippi State Physical Education Coordinator.

Data Processing and Statistical Analysis:

Qualitative Analysis Plan:

Transcripts of the in-depth interviews were prepared verbatim. The text was then entered in NVIVO 7, a software program that facilitates qualitative data analysis by allowing for the hierarchical coding and organization of data across themes and groups. The coding guide was organized according to the conceptual model in order to capture policy influences on physical activity through state, district and school levels. After in-depth discussion of the codes between the principle investigator and consultants, practice coding occurred and modifications were made where necessary. The principle investigator and one staff independently coded all transcripts, and then made comparisons and came to consensus of coding. A total of 11 in-depth interviews took take place, providing sufficient data for rich analyses.

Quantitative Analysis Plan:

Quantitative data were used for descriptive purposes to report weight status (BMI, percentile, weight category) and “at risk” for obesity-related diseases (waist circumference, WtHR risk category, BMI category). Weight status and health risk were compared between districts. Recruitment of participants to determine weight status was determined by the number of independent variables (IV=3), number of groups (n=3), $\alpha=0.05$ a priori, and power at 0.80 ($1-\beta=0.80$). Individual school level analyses were conducted to determine the relationship between school wide proportion of physically active students (SOPLAY) and weight status and “at risk” for obesity-related diseases;

and the relationship between the percent of time spent in MVPA during physical education (SOFIT) and weight status and "at risk" for obesity-related diseases.

Multiple regression analysis was conducted to determine the association of physical education context and teacher instructional practices with the amount of time students spent in MVPA during physical education (SOFIT) while at school. A total of eleven schools were visited across two counties ($n = 11$). During each school visit 4 physical education classes (minimum of 16-minutes; 3 observations per minute) were observed (where schedules permitted) and averaged across 3 different time periods; a total of 12 lessons per school per measurement period ($N = 132$). During each class a total of 4 students (2 male and 2 female) were randomly selected and identified for observation. Recruitment of schools to participate was determined by the number of independent variables (IV=8), number of groups ($n=11$), $\alpha=0.05$ a priori, and power at 0.80 ($1-\beta=0.80$).

Multiple regression analysis was conducted to determine the association of school environmental characteristics with student physical activity during recess while at school (SOPLAY). A total of five schools were visited within one county ($n = 5$). Each Target Area was observed at 3 different periods averaged across 3 different days. Based on previous literature, there is anticipated to be an average of 6 Target Areas per school ($N = 60$). Recruitment was determined based on pervious research by the number of significant independent variables and interactions (IV = 6), the number of schools ($n = 11$), $\alpha=0.05$ a priori, and power at 0.80 ($1-\beta=0.80$). Quantitative analyses were conducted using SPSS 17.0.

Chapter IV

Results

The purpose of this investigation was to examine the social-ecological determinants of physical activity among youth. The primary objective of this investigation was to describe state, district and school level policy regarding physical activity, to describe the school built environment and to examine in-school physical activity of children ages 6 through 11 years.

The purpose of this chapter is to report the results of statistical analysis. This chapter is broken into five sections and the results are discussed in the following order: 1) anthropometric data analysis; 2) physical activity data analysis; 3) the built environment data analysis, 4) qualitative analysis of state, district and school level physical activity policy; and 5) test of the hypotheses. The anthropometric data analyses are provided in the following order: 1) violations of statistical assumptions and outliers, 2) participant demographics and descriptive data, and 3) analysis of dependent variables using ANOVA. The physical activity data analyses are provided in the following order: 1) violations of statistical assumptions and outliers, 2) participant demographics and descriptive data, and 3) analysis of dependent variables using ANOVA. The built environment data are provided in the following order: 1) violations of statistical assumptions and outliers, 2) school demographic and descriptive data, and 3) analysis of dependent variables using ANOVA. Salient themes from the in-depth interviews regarding school physical activity policy are provided in the following order: 1) state level, 2) district level, and 3) school level.

Anthropometric Data Analyses

Violations of Statistical Assumptions and Outliers

An exploratory analysis was initially conducted to evaluate the univariate and bivariate distributions of the data, to identify violations in statistical assumptions for the planned analysis, to identify univariate and multivariate outliers, and to evaluate the amount and pattern of missing data.

Violations of Statistical Assumptions

The assumption of normality was violated. There are two dimensions to consider when assessing the severity of violating the assumption of normality. First, there are impacts due to the shape of the distribution (skewness and kurtosis). The samples used to measure the anthropometric dependant variables (height, weight, BMI, waist circumference and waist-to-height ratio) are leptokurtic, meaning the distribution is taller and more peaked than normal and are skewed to the left with the acceptation of height, which is skewed to the right (Appendix A; Table 6). Second, larger sample sizes ($N \geq 200$; $N = 1,136$) have been reported to reduce the effects of non-normality. In addition, when group comparisons are made with differing sample sizes between groups, as is the case in this investigation, the detrimental effects of non-normality can become null. Therefore, in these instances the investigator can be less concerned about nonnormally distributed variables. (Hair, Black, Babin, Anderson & Tatham, 2006)

The assumption of homogeneity of variance was also violated. Levene's test for homogeneity of variance indicated that for each variable the variances for the reported scores differ significantly (Appendix A; Table 6). Homoscedasticity is related to the assumption of normality and the failure of homoscedasticity can be attributed to the violation of the assumption of normality (Tabachnick & Fidell, 2007). One option to remedy this violation and to avoid a Type I error is to use untransformed variables with a more stringent alpha level; in this instance the investigator will set the significance level a posteriori at an alpha level of $p < 0.01$.

Outliers

Box plots revealed that outliers exist on height, weight, BMI, waist circumference and waist-to-height ratio. There were fifteen (N = 15) outliers on height (13 above the hinge and two below the hinge). There were 7 (46.7%) outliers on height from District 1, four (26.7%) from District 2 and four (26.7%) from District 3. The school most represented among this group of outliers was School 3 (26.7%; District 1). All of these individuals were black (100.0%) and more than half were female (53.3%), in 4th or 5th grade (86.7%), and were between the ages of 9- and 11-years old (66.7%). The mean height of these individuals was 57.4 in. $\pm$4.3 (95% CI: 56.6 – 58.1). The mean weight of these individuals was 137.6 lbs. $\pm$35.3 (95% CI: 131.5 – 143.8), the mean BMI was 29.8 $\pm$4.0 (95% CI: 29.0 – 30.6) and 26.7% had a BMI at or above the 95th percentile for age and sex, and thus are categorized as obese. The mean waist circumference was 37.7 in. $\pm$4.3 (95% CI: 36.9 – 38.5), the mean waist-to-height ratio was 65.3 $\pm$7.0 (95% CI:

64.1 – 66.6) and 46.7% of these individuals were classified as "at-risk" for weight related health complications according to waist-to-height ratio (Appendix A; Table 7).

There were ninety-nine (N = 99) outliers on total body weight (above the hinge). There were 54 (54.5%) outliers on total body weight from District 1, there were 24 (24.2%) from District 2 and there were 21 (21.2%) from District 3. The school most represented among this group of outliers was School 1 (23.2%; District 1). The majority of these individuals were black (91.9%) and male (52.5%), in 4^{th} or 5^{th} grade (81.8%) and were between the ages of 9- and 11-years (82.9%). The mean height of these individuals was 61.7 in. ±3.2 (95% CI: 61.0 – 62.3). The mean weight of these individuals was 160.5 lbs. ±21.3 (95% CI: 156.3 – 164.8), the mean BMI was 29.8 ±4.0 (95% CI: 29.0 – 30.6) and 96.0% had a BMI at or above the 95^{th} percentile for age and sex, and thus were categorized as obese. The mean waist circumference was 38.9 in. ±3.8 (95% CI: 38.1 – 39.7), the mean waist-to-height ratio was 63.3 ±7.4 (95% CI: 61.8 – 64.8) and 98% of these individuals were classified as "at-risk" for weight related health complications according to waist-to-height ratio (Appendix A; Table 7).

There were one hundred twenty-two (N = 122) outliers on BMI (above the hinge). There were 57 (46.7%) outliers on BMI from District 1, there were 34 (27.9%) from District 2 and there were 31 (25.4%) from District 3. The school most represented among this group of outliers was School 1 (19.7%; District 1). The majority of these individuals were black (90.2%) and female (51.6%), in 4^{th} or 5^{th} grade (63.9%) and were between the ages of 9- and 11-years (70.5%). The mean height of these individuals was 58.8 in. ±4.2 (95% CI: 58.1 – 59.6). The mean weight of these individuals was 149.2 lbs. ±28.4 (95% CI: 144.2 – 154.4), the mean BMI was 30.1 ±3.1 (95% CI: 29.6 – 30.7) and all (100%) had a BMI at or above the 95th percentile for age and sex, thus categorized as obese. The mean waist circumference was 38.1 in. ±4.2 (95% CI: 37.3 – 38.8), the mean waist-to-height ratio was 64.7 ±5.8 (95% CI: 63.7 – 65.7) and 98.4% of these individuals were classified as "at-risk" for weight related health complications according to waist-to-height ratio (Appendix A; Table 7).

There were one-hundred six (N=106) outliers on waist circumference (above the hinge). There were 54 (50.9%) outliers on waist circumference from District 1, there were 31 (29.2%) from District 2 and there were 21 (19.8%) from District 3. The school most represented among this group of outliers was School 1 (23.6%).The majority of these individuals were black (89.6%) and female (51.9%), in 4th or 5th grade (71.7%) and were between the ages of 9- and 11-years old (80.1%). The mean height of these individuals was 60.2 in. ±3.4 (95% CI: 59.5 – 60.8). The mean weight of these individuals was 153.6 lbs. ±27.2 95% (CI: 148.4 – 158.9), the mean BMI was 29.8 ±3.9 (95% CI: 29.0 – 30.6) and 98.1% had a BMI at or above the 95th percentile for age and sex, thus were categorized as obese. The mean waist circumference was 39.4 in. ±3.1 (95% CI: 38.8 – 39.9), the mean waist-to-height ratio was 65.5 ±5.3 (95% CI: 64.5 – 66.6) and 99.1% of these individuals were classified as "at-risk" for weight related health complications according to waist-to-height ratio (Appendix A; Table 7).

There were one-hundred twenty-eight (N=128) outliers on waist-to-height ratio (126 above the hinge and 2 below the hinge). There were 60 (46.9%) outliers on waist-to-height ratio from District 1, there were 35 (27.3%) from District 2 and there were 33 (25.8%) from District 3. The school most represented among this group of outliers was School 1 (19.5%).The majority of these individuals were black (84.4%) and female

(52.3%), in 4th or 5th grade (53.1%) and were between the ages of 9- and 11-years old (64.9%). The mean height of these individuals was 57.4 in. $\pm$4.3 (95% CI: 56.6 – 58.1). The mean weight of these individuals was 137.6 lbs. $\pm$35.3 (95% CI: 131.5 – 143.8), the mean BMI was 28.9 $\pm$4.2 (95% CI: 28.2 – 29.7) and 96.1% had a BMI at or above the 95th percentile for age and sex, thus were categorized as obese. The mean waist circumference was 37.7 in. $\pm$4.2 (95% CI: 36.9 – 38.5), the mean waist-to-height ratio was 65.3 $\pm$7.0 (95% CI: 64.1 – 66.6) and 97.7% of these individuals were classified as "at-risk" for weight related health complications according to waist-to-height ratio (Appendix A; Table 7).

The investigator carefully and extensively considered the outliers and their impact on analysis and decided to include the outliers for height, weight, BMI, waist circumference and waist-to-height ratio. There are several reasons for this decision. First, although these observations are particularly high or in a few cases low on the variables, the investigator believes that the observations with extreme values represent a viable segment of the population that fall within the possible range of values on each of these variables. These observations have the potential to score high or low because these variables are a measure of growth, something we have little or no control over. For this reason, the investigator believes these observations are unique in their contribution of values across the variables, and make a significant contribution to the accurate description the population. In instances such as this, statisticians recommend that the investigator retain the observations unless specific evidence is available that discounts the outliers as a valid member of that population (Hair et al., 2006); which in this case there is not. Second, prior to the removal of the outliers, the sample distributions violated the assumption of normality. Following the removal of the outliers, some skewness and kurtosis remained, and thus the assumption of normality was still violated. Further, in cases where the sample size is greater than 200, the violation of normality is expected. In this investigation, the sample size was greater than 200 (N = 1,136). Third, removing the outliers and running individual analysis of variance tests increases the risk of committing a Type I error, rejecting a true null hypothesis. The outliers are believed to make up a segment of the population that has recently developed and will likely continue to grow. In the context of this investigation, it is imperative that these observations be described, included in analyses, further discussed and considered in the implications and recommendations made based on these findings.

Missing Data

There are no missing data for any of the anthropometric observations on any of the anthropometric variables included in this investigation.

Participant Demographics and Descriptive Data

Anthropometric data were collected on 1,136 students in first through fifth grades across two counties, three school districts and 11 schools in the Mississippi Delta. With all three School Districts combined, 21.0% of the participants were in first grade, 21.0% were in second grade, 10.0% were in third grade, 20.9% were in fourth grade and 18.1% were in fifth grade. The mean age was 8.7 years $\pm$1.6 (range 7.0; 95% CI = 8.5 – 8.7), 58.1% of the participants were male and 48.2% were female. The majority of the participants were black (82.2%), 15.9% were white and 1.8% other (Appendix A; Table 8a). The mean height of the sample was 54.8 in. ±4.7 (range 33.8; 95% CI = 54.4 – 55.0), the mean weight was 85.9 lbs. ±31.7 (range 183.5; 95% CI = 84.1 – 87.8) and the mean BMI was 19.7 ±4.8 (range 30.4; 95% CI = 19.4 – 19.9). According to BMI 0.7% of the population was underweight, 52.2% was normal weight and 47.1% were overweight or obese; 18.3% were overweight and 28.8% were obese. The mean waist circumference was 27.7 in. ±5.1 (range 29.5; 95% CI = 27.4 – 28.0) and the mean waist-to-height ratio was 50.5 ±7.4 (range 63.2; 95% CI = 50.1 – 50.9). Based on waist circumference percentiles for age, sex and ethnicity 59.9% participants were at risk for obesity-related disease. According to waist-to-height ratio 42.0% of the participants were “at risk” for developing and suffering from weight related chronic diseases (Appendix A; Table 8b).

There were 426 participants from District 1. Among District 1 participants, 18.8% were in first grade, 18.8% were in second grade, 21.8% were in third grade, 19.7% were in fourth grade and 20.9% were in fifth grade. The mean age was 8.7 years ±1.6 (range 7.0; 95% CI= 8.6 -8.9), 53.5% were male and 46.5% female. The majority of the participants were black (97.7%), 0.9% were white and 1.4% other (Appendix A; Table 8a). The mean height for the participants from District 1 was 55.5 in. ±4.9 (range 26.8; 95% CI = 55.1 - 55.9), the mean weight was 91.3 lbs. ±34.8 (range 170.9; 95% CI = 87.9 – 94.6) and the mean BMI was 20.3 ±5.3 (range 30.4; 95% CI = 19.8 – 20.8). According to BMI 0.5% of the participants from District 1 were underweight, 49.1% were normal weight and 50.4% were overweight or obese; 18.5% were overweight and 31.9% were obese. The mean waist circumference was 28.9 in. ±5.6 (range 29.3; 95%

CI = 28.3 – 29.4) and the mean waist-to-height ratio was 51.7 ±8.1 (range 63.2; 95% CI = 50.9 – 52.5). Based on waist circumference percentiles for age, sex and ethnicity, 71.4% of participants in District 1 were at risk for obesity-related disease. According to waist-to-height ratio, 46.5% of the participants from District 1 were “at risk” for developing and suffering from weight related chronic diseases (Appendix A; Table 8b).

There were 303 participants from District 2. Among District 2 participants, 24.4% were in first grade, 23.8% were in second grade, 18.8% were in third grade, 19.8% were in fourth grade and 13.2% were in fifth grade. The mean age for the population in District 1 was 8.6 years ±1.7 (range 7.0; 95% CI= 8.4 -8.8), 50.8% were male and 49.2% female. The majority of the participants were black (95.4%), 3.3% were white and 1.3% other (Appendix A; Table 8a). The mean height of the participants from District 2 was 54.8 in. ±4.8 (range 33.8; 95% CI = 54.2 - 55.3), the mean weight was 85.9 lbs. ±31.7 (range 176.2; 95% CI = 82.4 – 89.5) and the mean BMI was 19.6 ±4.7 (range 22.7; 95% CI = 19.1 – 20.2). According to BMI, 0.7% of the participants from District 2 were underweight, 52.5% were normal weight and 46.8% are overweight or obese (17.8% overweight and 29.0% obese). The mean waist circumference was 27.9 in. ±4.9 (range 24.3; 95% CI = 27.4 – 28.5) and the mean waist-to-height ratio was 50.9 ±6.9 (range 32.4; 95% CI = 50.1 – 51.7). Based on waist circumference percentiles for age, sex and ethnicity, 62.7% of participants in District 2 were at risk for obesity-related disease. According to waist-to-height ratio, 46.5% of the participants from District 2 were “at risk” for developing and suffering from weight related chronic diseases (Appendix A; Table 8b).

There were 407 participants from District 3. Among District 3 participants, 20.6% were in first grade, 21.4% were in second grade, 16.2% were in third grade, 22.9% were in fourth grade and 18.9% were in fifth grade. The mean age for the population in District 3 was 8.5 years $\pm$1.6 (range 7.0; 95% CI= 8.4 - 8.7), 50.6% were male and 49.4% female. Most of the participants were black (50.6%), 49.4% were white and 2.7% other (Appendix A; Table 8a). The mean height for the participants from District 3 was 53.9 in. $\pm$4.4 (range 28.2; 95% CI = 53.5 – 54.3), the mean weight was 80.2 lbs. $\pm$27.1 (range 169.9; 95% CI = 77.6 – 82.9) and the mean BMI was 19.0 $\pm$4.1 (range 22.1; 95% CI = 18.6 – 19.4). According to BMI, 1.0% of the participants from District 3 were underweight, 55.3% were normal weight and 43.7% were overweight or obese (18.4% overweight and 25.3% obese). The mean waist circumference was 26.4 in. $\pm$4.5 (range 23.8; 95% CI = 25.9 – 26.8) and the mean waist-to-height ratio was 48.8 $\pm$6.7 (range 37.6; 95% CI = 48.2 – 49.5). Based on waist circumference percentiles for age, sex and ethnicity, 45.7% of participants in District 3 were at risk for obesity-related disease. According to waist-to-height ratio, 33.9% of the participants from District 3 were “at risk” for developing and suffering from weight related chronic diseases (Appendix A; Table 8b).

There were 149 participants from School 1 (District 1). In School 1, 18.1% of the participants were in first grade, 19.5% were in second grade, 21.5% were in third grade, 21.5% were in fourth grade and 19.5% were in fifth grade. The mean age for the participants in School 1 was 8.7 years $\pm$1.6 (range 7.0; 95% CI= 8.5 – 9.0), 49.0% were male and 51.0% female. The majority of the participants were black (98.7%) and 1.3% were white (Appendix A; Table 9a). The mean height for the participants from School 1 was 55.6 in. ±4.8 (range 22.3; 95% CI = 54.9 – 56.4), the mean weight was 94.5 lbs. ±38.7 (range 170.9; 95% CI = 88.3 – 100.8) and the mean BMI was 20.9 ±5.9 (range 29.4; 95% CI = 19.9 – 21.9). According to BMI, 48.3% of the participants in School 1 were normal weight and 51.7% are overweight or obese (16.1% overweight and 35.6% obese). The mean waist circumference was 29.6 in. ±6.1 (range 27.0; 95% CI = 28.6 – 30.5) and the mean waist-to-height ratio was 52.9 ±8.6 (range 41.0; 95% CI = 51.6 – 54.3). Based on waist circumference percentiles for age, sex and ethnicity, 73.2% participants were at risk for obesity-related disease. According to waist-to-height ratio, 53.7% of the participants from School 1 were “at risk” for developing and suffering from weight related chronic diseases (Appendix A; Table 9b).

There were 94 participants from School 2 (District 1). In School 2, 17.0% of the participants were in first grade, 20.2% were in second grade, 22.3% were in third grade, 20.2% were in fourth grade and 20.2% were in fifth grade. The mean age for the population in School 2 was 8.6 years ±1.6 (range 6.0; 95% CI= 8.3 – 8.9), 57.4% were male and 42.6% female. The majority of the participants were black (96.8%) and 3.2% were white (Appendix A; Table 9a). The mean height was 55.4 in. ±4.9 (range 24.8; 95% CI = 54.4 – 56.4), the mean weight was 85.4 lbs. ±28.9 (range 135.4; 95% CI = 79.5 – 91.3) and the mean BMI was 19.2 ±4.3 (range 17.6; 95% CI = 18.3 – 20.1). According to BMI, 1.1% of the participants from School 2 were underweight, 53.2% were normal weight and 45.7% were overweight or obese (23.4% overweight and 22.3% obese). The mean waist circumference was 27.7 in. ±4.5 (range 20.3; 95% CI = 26.7 – 28.6) and the mean waist-to-height ratio was 49.7 ±7.0 (range 47.9; 95% CI = 48.3 – 51.2). Based on waist circumference percentiles for age, sex and ethnicity, 69.1% of participants from School 2 were at risk for obesity-related disease. According to waist-to-height ratio, 35.1% of the participants from School 2 were “at risk” for developing and suffering from weight related chronic diseases (Appendix A; Table 9b).

There were 98 participants from School 3 (District 1). In School 3, 16.3% of the participants were in first grade, 20.4% were in second grade, 23.5% were in third grade, 15.3% were in fourth grade and 24.5% were in fifth grade. The mean age for the population in School 3 was 8.7 years ±1.4 (range 5.0; 95% CI= 8.4 – 8.9), 53.1% were male and 46.9% female. The majority of the participants were black (96.9%), 1.0% were white and 2.0% other (Appendix A; Table 9a). The mean height was 55.6 in. ±4.9 (range 23.0; 95% CI = 54.6 – 56.6), the mean weight was 89.5 lbs. ±34.5 (range 153.6; 95% CI = 82.6 – 96.4) and the mean BMI was 19.8 ±5.3 (range 24.6; 95% CI = 18.8 – 20.9). According to BMI, 1.0% of the participants from School 3 were underweight, 56.1% were normal weight and 42.9% were overweight or obese (13.3% overweight and 29.6% obese). The mean waist circumference was 28.5 in. ±5.7 (range 25.8; 95% CI = 27.4 – 29.7) and the mean waist-to-height ratio was 51.2 ±7.9 (range 39.0; 95% CI = 49.6 – 52.8). Based on waist circumference percentiles for age, sex and ethnicity, 66.3% of participants from School 3 were at risk for obesity-related disease. According to waist-to-height ratio, 41.8% of the participants from School 3 were “at risk” for developing and suffering from weight related chronic diseases (Appendix A; Table 9b).

There were 85 participants from School 4 (District 1). In School 4, 24.7% of the participants were in first grade, 14.1% were in second grade, 20.0% were in third grade, 21.2% were in fourth grade and 20.0% were in fifth grade. The mean age for the population from School 4 was 8.8 years ±1.8 (range 6.0; 95% CI= 8.4 – 9.2), 57.6%

were male and 42.4% female. The majority of the participants were black (97.6%), 1.2% were white and 1.2% other (Appendix A; Table 9a). The mean height was 55.5 in. ±4.9 (range 23.0; 95% CI = 54.4 – 56.5), the mean weight was 94.2 lbs. ±33.4 (range 132.5; 95% CI = 87.0 – 101.4) and the mean BMI was 20.9 ±4.8 (range 19.6; 95% CI = 19.9 – 22.0). According to BMI, 37.6% of the participants in School 4 were normal weight and 62.3% were overweight or obese (23.5% overweight and 38.8% obese). The mean waist circumference was 29.4 in. ±5.4 (range 22.0; 95% CI = 28.2 – 29.7) and the mean waist-to-height ratio was 52.5 ±8.2 (range 56.2; 95% CI = 50.7 – 54.2). Based on waist circumference percentiles for age, sex and ethnicity, 76.5% of participants from School 4 were at risk for obesity-related disease. According to waist-to-height ratio, 51.8% of the participants from School 4 were “at risk” for developing and suffering from weight related chronic diseases (Appendix A; Table 9b).

There were 83 participants from School 5 (District 2). In School 5, 20.5% of the participants were in first grade, 21.7% were in second grade, 22.9% were in third grade, 24.1% were in fourth grade and 10.8% were in fifth grade. The mean age for the population in School 5 was 8.7 years ±1.6 (range 6.0; 95% CI= 8.3 – 9.0), 48.2% were male and 51.8% female. The majority of the participants were black (88.0%), 7.2% were white and 4.8% other (Appendix A; Table 10a). The mean height was 54.7 in. ±4.4 (range 21.0; 95% CI = 53.7 – 55.7), the mean weight was 84.6 lbs. ±30.9 (range 145.3; 95% CI = 77.9 – 91.4) and the mean BMI was 19.4 ±4.5 (range 21.8; 95% CI = 18.5 – 20.4). According to BMI, 55.4% of the participants from School 5 were normal weight and 44.6% were overweight or obese (18.1% overweight and 26.5% obese). The mean waist circumference was 28.2 in. ±4.8 (range 22.0; 95% CI = 27.2 – 29.3) and the mean waist-to-height ratio was 51.5 ±6.5 (range 30.9; 95% CI = 50.1 – 52.8). Based on waist circumference percentiles for age, sex and ethnicity, 66.3% of participants from School 5 were at risk for obesity-related disease. According to waist-to-height ratio, 50.6% of the participants from School 5 were "at risk" for developing and suffering from weight related chronic diseases (Appendix A; Table 10b).

There were 129 participants from School 6 (District 2). In School 5, 29.5% of the participants were in first grade, 24.0% were in second grade, 17.1% were in third grade, 16.3% were in fourth grade and 13.2% were in fifth grade. The mean age for the population from School 6 was 8.4 years ±1.7 (range 6.0; 95% CI= 8.1 – 8.7), 48.1% were male and 51.9% female. The majority of the participants were black (97.7%) and 2.3% were white (Appendix A; Table 10a). The mean height was 54.1 in. ±4.6 (range 26.0; 95% CI = 53.4 – 54.9), the mean weight was 81.7 lbs. ±30.3 (range 162.0; 95% CI = 76.4 – 86.9) and the mean BMI was 19.1 ±4.5 (range 20.6; 95% CI = 18.3 – 19.9). According to BMI, 1.6% of the participants from School 6 were underweight, 52.7% were normal weight and 45.7% were overweight or obese (20.9% overweight and 24.8% obese). The mean waist circumference was 27.4 in. ±4.8 (range 23.8; 95% CI = 26.6 – 28.3) and the mean waist-to-height ratio was 50.6 ±6.7 (range 29.1; 95% CI = 49.4 – 51.8). Based on waist circumference percentiles for age, sex and ethnicity, 61.2% of participants from School 6 were at risk for obesity-related disease. According to waist-to-height ratio, 45.0% of the participants from School 6 were "at risk" for developing and suffering from weight related chronic diseases (Appendix A; Table 10b).

There were 91 participants From School 7 (District 2). In School 5, 20.9% of the participants were in first grade, 25.3% were in second grade, 17.6% were in third grade, 20.9% were in fourth grade and 15.4% were in fifth grade. The mean age for the population in School 7 was 8.8 years ±1.8 (range 7.0; 95% CI= 8.4 – 9.1), 57.1% were male and 42.9% female. The majority of the participants were black (98.9%) and 1.1% were white (Appendix A; Table 10a). The mean height was 55.8 in. ±5.2 (range 27.5; 95% CI = 54.7 – 56.8), the mean weight was 93.1 lbs. ±33.5 (range 161.4; 95% CI = 86.2 – 100.1) and the mean BMI was 20.6 ±4.9 (range 19.9; 95% CI = 19.5 – 21.6). According to BMI, 49.5% of the participants from School 7 were normal weight and 50.6% were overweight or obese (13.2% overweight and 37.4% obese). The mean waist circumference was 28.4 in. ±5.2 (range 19.5; 95% CI = 27.3 – 29.5) and the mean waist-to-height ratio was 50.8 (±7.6; range 29.3; 95% CI = 49.3 – 52.4). Based on waist circumference percentiles for age, sex and ethnicity, 61.5% of participants from School 7 were at risk for obesity-related disease. According to waist-to-height ratio, 44.0% of the participants from School 7 were "at risk" for developing and suffering from weight related chronic diseases (Appendix A; Table 10b).

There were 118 participants from School 8 (District 3). In School 8, 13.6% of the participants were in first grade, 15.3% were in second grade, 22.9% were in third grade, 26.3% were in fourth grade and 22.0% were in fifth grade. The mean age for the population in School 8 was 8.8 years ±1.6 (range 6.0; 95% CI= 8.5 – 9.1), 53.4% were male and 46.6% female. The majority of the participants were white (70.3%), 28.0% were black and 1.7% other (Appendix A; Table 11a). The mean height was 54.5 in. ±4.3 (range 19.5; 95% CI = 53.8 – 55.3), the mean weight was 81.2 lbs. ±25.6 (range 136.5; 95% CI = 76.5 – 85.8) and the mean BMI was 18.8 ±3.7 (range 18.6; 95% CI = 18.2 – 19.5). According to BMI, 1.7% of the participants from School 8 were underweight, 57.6% were normal weight and 40.6% were overweight or obese (16.9% overweight and 23.7% obese). The mean waist circumference was 26.9 in. ±4.9 (range 20.7; 95% CI = 26.1 – 27.9) and the mean waist-to-height ratio was 49.3 ±6.9 (range 31.4; 95% CI = 48.1 – 50.6). Based on waist circumference percentiles for age, sex and ethnicity, 50.0% of participants from School 8 were at risk for obesity-related disease. According to waist-to-height ratio, 33.9% of the participants from School 8 were "at risk" for developing and suffering from weight related chronic diseases (Appendix A; Table 11b).

There were 68 participants in School 9 (District 3). In School 9, 100.0% of the participants were in first grade. The mean age was 6.6 years ±0.6 (range 2.0; 95% CI= 6.4 – 6.7), 42.6% were male and 57.4% female. The majority of the participants were black (61.8%), 35.3% were white and 2.9% other (Appendix A; Table 11a). The mean height was 49.4 in. ±2.6 (range 15.7; 95% CI = 48.7 – 49.9), the mean weight was 61.5 lbs. ±13.1 (range 72.1; 95% CI = 58.3 – 64.6) and the mean BMI was 17.7 ±3.1 (range 16.4; 95% CI = 16.9 – 18.4). According to BMI, 52.9% of the participants from School 9 were normal weight and 47.1% were overweight or obese (25.0% overweight and 22.1% obese). The mean waist circumference was 24.5 in. ±3.1 (range 14.5; 95% CI = 23.8 – 25.3) and the mean waist-to-height ratio was 49.7 ±5.6 (range 25.7; 95% CI = 48.4 – 51.1). Based on waist circumference percentiles for age, sex and ethnicity, 54.4% of participants from School 9 were at risk for obesity-related disease. According to waist-to-height ratio, 41.2% of the participants from School 9 were "at risk" for developing and suffering from weight related chronic diseases (Appendix A; Table 11b).

There were 108 participants in School 10 (District 3). In School 10, 63.9% of the participants were in second grade and 36.1% were in third grade. The mean age was

7.9 years +0.8 (range 3.0; 95% CI= 7.7 – 8.0), 50.9% were male and 49.1% female. The majority of the participants were black (69.4%), 25.9% were white and 4.6% other (Appendix A; Table 11a). The mean height was 52.5 in. +3.0 (range 16.5; 95% CI = 51.9 – 53.1), the mean weight was 72.3 lbs. +18.5 (range 78.0; 95% CI = 68.8 – 75.9) and the mean BMI was 18.3 +3.7 (range 17.2; 95% CI = 17.6 – 19.0). According to BMI, 1.9% of the participants from School 10 were underweight, 56.5% were normal weight and 41.6% were overweight or obese (18.5% overweight and 23.1% obese). The mean waist circumference was 25.3 in. +3.7 (range 19.0; 95% CI = 24.6 – 26.0) and the mean waist-to-height ratio was 48.0 +6.4 (range 33.7; 95% CI = 46.9 – 49.3). Based on waist circumference percentiles for age, sex and ethnicity, 37.0% of participants from School 10 were at risk for obesity-related disease. According to waist-to-height ratio, 25.9% of the participants from School 10 were "at risk" for developing and suffering from weight related chronic diseases (Appendix A; Table 11b).

There were 113 participants from School 11 (District 3). In School 11, 54.9% of the participants were in fourth grade and 45.1% were in fifth grade. The mean age was 10.0 years +0.9 (range 4.0; 95% CI= 9.8 – 10.2), 52.2% were male and 47.8% female. The majority of the participants were black (69.9%), 28.3% were white and 1.8% other (Appendix A; Table 11a). The mean height was 57.4 in. +3.4 (range 19.5; 95% CI = 56.7 – 57.9), the mean weight was 98.1 lbs. +30.9 (range 154.8; 95% CI = 92.3 – 103.8) and the mean BMI was 20.7 +5.0 (range 21.5; 95% CI = 19.8 – 21.6). According to BMI, 53.1% of the participants from School 10 were normal weight and 46.9% were overweight or obese (15.9% overweight and 31.0% obese). The mean waist circumference was 27.9 in. +4.9 (range 22.3; 95% CI = 27.0 – 28.9) and the mean waist-to-height ratio was 48.6 ±7.6 (range 35.3; 95% CI = 47.2 – 50.0). Based on waist circumference percentiles for age, sex and ethnicity, 44.2% of participants from School 11 were at risk for obesity-related disease. According to waist-to-height ratio, 37.2% of the participants from School 11 are "at risk" for developing and suffering from weight related chronic diseases (Appendix A; Table 11b).

Analysis of Anthropometric Dependent Variables

One-way ANOVA was used to determine differences between District 1, District 2 and District 3 on the following anthropometric variables: height, weight, BMI, waist circumference and waist-to-height ratio. A priori the significance level was set at an alpha level of $p < 0.05$. Following the violation of homogeneity of variance the investigator set the significance level a posteriori at an alpha level of $p < 0.01$.

Height

There was a significant difference between District 1 and District 3 ($F_{(2, 1133)} = 12.499$, $p = 0.00$) on height. There was no significant difference between District 1 and District 2 ($F_{(2, 1133)} = 12.499$, $p = 0.082$), and District 2 and District 3 ($F_{(2, 1133)} = 12.499$, $p = 0.039$). The mean height for District 1 was 55.5 ±4.9 in. (95% CI = 55.1 – 55.9), the mean for District 2 was 54.8 ±4.8 in. (95% CI = 54.2 – 55.3) and for District 3 was 53.9 ±4.4 in. (95% CI = 53.5 – 54.3; Appendix B; Figure B-1).

Weight

There was a significant difference between District 1 and District 3 ($F_{(2, 1133)}$ = 12.966, p = 0.000) on total body weight. There was no significant difference between District 1 and District 2 ($F_{(2, 1133)}$ = 12.966, p = 0.060), and District 2 and District 3 ($F_{(2, 1133)}$ = 12.966, p = 0.044). The mean weight for District 1 was 91.3 $\pm$34.8 lbs. (95% CI = 87.9 – 94.60), the mean for District 2 was 85.9 $\pm$31.7 lbs. (95% CI = 82.4 – 89.5) and for District 3 was 80.2 $\pm$27.1 lbs. (95% CI = 77.6 – 82.9; Appendix B; Figure B-2).

BMI

There was a significant difference between District 1 and District 3 ($F_{(2, 1133)}$ = 7.450, p = 0.000) on BMI. There was no significant difference between District 1 and District 2 ($F_{(2, 1133)}$ = 7.450, p = 0.155) or District 2 and District 3 ($F_{(2, 1133)}$ = 7.450, p = 0.207). The mean BMI for District 1 was 20.3 $\pm$5.3 (95% CI = 19.8 – 20.8), the mean for District 2 was 19.6 $\pm$4.7 (95% CI = 19.1 – 20.2) and for District 3 was 19.0 $\pm$4.1 (95% CI = 18.6 – 19.4; Appendix B; Figure B-3).

Waist Circumference

There was a significant difference between District 1 and District 3 ($F_{(2, 1133)}$ = 25.300, p = 0.000), and District 2 and District 3 ($F_{(2, 1133)}$ = 25.300, p = 0.000) on waist circumference. There was no significant difference between District 1 and District 2 ($F_{(2, 1133)}$ = 25.300, p = 0.038). The mean waist circumference for District 1 was 29.9 $\pm$5.6 in. (95% CI = 28.3 – 29.4), the mean for District 2 was 27.9 $\pm$4.9 in. (95% CI = 27.4 – 28.5) and for District 3 was 26.4 $\pm$4.5 in. (95% CI = 25.9 – 26.8; Appendix B; Figure B-4).

Waist-to-Height Ratio

There was a significant difference between District 1 and District 3 ($F_{(2, 1133)}$ = 16.509, *p* = 0.000), and District 2 and District 3 ($F_{(2, 1133)}$ = 16.509, *p* = 0.001) on waist-to-height ratio. There was no significant difference between District 1 and District 2 ($F_{(2, 1133)}$ = 16.509, *p* = 0.288). The mean waist-to-height ratio for District 1 was 51.7 ±8.1 (95% CI = 50.9 – 52.5), the mean for District 2 was 50.9 ±6.9 (95% CI = 50.1 – 51.7) and for District 3 was 48.9 ±6.8 (95% CI = 48.2 – 49.5; Appendix B; Figure B-5).

Physical Activity Data Analyses

<u>Violations of Statistical Assumptions and Outliers: SOFIT</u>

An exploratory analysis was initially conducted to evaluate the univariate and bivariate distributions of the data to identify violations in statistical assumptions for the planned analysis, to identify univariate and multivariate outliers, and to evaluate the amount and pattern of missing data.

Violations of Statistical Assumptions

The assumption of normality was not violated. Based on Levene's statistic the assumption of homogeneity of variance was not violated (*p* = 0.872). The assumption of independence was violated because there typically was one physical education instructor at each of the schools used in this investigation (Appendix A; Table 6).

Outliers

There was one class identified as an outlier on the percent of time spent in MVPA. The class was observed in District 3, School 11 and 92.0% of class time was spent in MVPA. The lesson was outside and the students spent 96.0% of class time in fitness. This observation was not excluded from analyses. The potential exists for variability between physical education classes within schools that are taught by the same physical education instructor. The investigator believes that this observation is important to distinguishing factors that influence MVPA during physical education and to identifying best practices for increasing the amount of class time children spend in MVPA.

Missing Data

There was missing data for five out of the 10 schools where physical education classes were observed. The SOFIT protocol suggests 12 physical education classes be observed per school at three separate times (4 classes per visit X 3 visits = 12 observations). There were 10 observations made at School 1, there were 12 observations made at School 2, nine observations made at School 3, eight observations made at School 4, there were 10 observations made at School 5, there were 12 observations made at School 6, there were 13 observations made at School 7, there were 12 observations made at School 8, there were no observations made at School 9 (the school does not provide physical education to students), 11 observations made at School 10 and 12 observations made at School 11. The missing data is a result of inconsistent and infrequent physical education classes and schedules at several schools in addition to class cancellations.

Participant Demographics and Descriptive Data: SOFIT

Physical Activity

Physical activity observations made using the SOFIT during physical education classes were made at 10 elementary schools across three districts within two counties in the Mississippi Delta. School 9 from District 3 was not observed because physical education was not provided to students at this school. A total of 109 physical education lessons were observed. The mean physical education class time was 39.21 $\pm$8.13 minutes (range 38.33; 95% CI = 37.66 – 40.75). The mean percent of physical education class time spent in MVPA was 36.43% $\pm$15.0 (range 0.90; 95% CI = 0.33 - 0.39), a mean of 13.99 $\pm$5.78 minutes (range 27.0; 95% CI = 12.89 – 15.08). Eighty-four of the 109 classes observed did not meet the standard recommendation that children spend fifty percent of physical education class time in MVPA. Twenty-five of the 109 classes did meet this standard. The SOFIT allowed investigators to code for lesson context while simultaneously recording student activity levels. The majority of physical education class time was spent in management[2]. The mean percent of time spent in management was 28.75% $\pm$19.1 (range 0.97; 95% CI = 25.1 – 32.3), a mean of 13.88 $\pm$13.33 minutes (range 63.33; 95% CI = 11.35 – 16.41). The mean percent of time spent

[2] This refers to general content; lesson time when students are not intended to be involved in physical education content. This includes transition, management and break times. Transition includes time allocated to moving from one space to another, changing stations, teacher explanation of organizational arrangement and changing activities within a lesson. Management refers to time devoted to class business that is unrelated to instructional activity. Break refers to time devoted to rest and or discussion of non-subject matter related to issues such as getting water, etc.

in other[3] was 18.7% ±35.3 (range 1.0; 95% CI = 0.11 – 0.25), a mean of 6.6 ±12.73 minutes (range 46.33; 95% CI = 4.18 – 9.02). The mean percent of time spent in fitness[4] was 18.32% ±22.1 (range 0.96; 95% CI = 0.1411 – 0.2253), a mean of 7.19 ±8.2 minutes (range 30.33; 95% CI = 5.63 – 8.75). The mean percent of time spent in game[5] was 14.59% ±19.0 (range 0.71; 95% CI = 0.11 – 0.18), a mean of 6.16 ±8.29 minutes (range 35.66; 95% CI = 4.58 – 7.73). The mean percent of time spent in skill[6] was 9.93% ±19.7 (range 0.97; 95% CI = 0.0617 - 0.1369), a mean of 3.7 minutes ±7.41 (range 32.33; 95% CI = 2.382 – 5.198). The mean percent of time spent in knowledge[7] was 9.61% ±10.9 (range 0.68; 95% CI = .0752 - 0.1170), a mean of 3.77 minutes ±4.26 (range 26.33; 95% CI = 2.963 – 4.584; Appendix A; Table 12).

The SOFIT also allowed investigators to observe for teacher interactions related to physical activity and fitness promotion while simultaneously recording student activity level and lesson context. Throughout the majority of class time physical education instructors were not providing either in-class or out-of-class promotion. The mean percent of time physical education instructors spent providing neither in-class or out-of-class promotion of physical activity and fitness was 56.1% ±25.8 (range 0.95; 95% CI = 0.5114 – 0.6097), a mean of 21.8 minutes ±11.1 (range 48.0; 95% CI = 19.691 – 23.910). The mean percent of time physical education instructors spent promoting in-

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[3] Other refers to free play time during which physical education instruction is not intended. This time resembles recess during which students may select to participate or not.

[4] Fitness refers to time allocated to activities whose major purpose is to alter the physical state of the individual in terms of cardiovascular endurance, strength or flexibility. This includes aerobic dance, calisthenics, distance running, weight training, agility training, fitness testing, and warm-up and cool-down activities.

[5] Game refers to activity time devoted to the application of skills in a game or competitive setting. Game participants generally perform without major intervention from the instructor.

[6] Skill refers to activity time devoted to practice of skills with the primary goal of skill development.

[7] Knowledge refers to lesson time when the primary focus is on student knowledge acquisition related to physical education, not their activity engagement. Knowledge is typically related to physical activity and fitness, and general knowledge related to technique, strategy, rules or social behavior.

class MVPA[8] was 43.36% ±25.9 (range 0.95; 95% CI = 0.38 – 0.48), a mean of 17.32 minutes ±10.92 (range 44.66; 95% CI = 15.25 – 19.40). The mean percent of time physical education instructors spent promoting out-of-class MVPA[9] was 0.1% ±0.4 (range 0.03; 95% CI = 0.0003 – 0.002), a mean of 0.04 minutes ±0.18 (range 1.33; 95% CI = 0.01 – 0.08; Appendix A; Table 12).

Physical activity observations during physical education class using the SOFIT were made at 4 elementary schools in District 1. A total of 39 physical education classes were observed in District 1. The mean physical education class time was 39.56 minutes ±7.49 (range 29.67; 95% CI = 37.236 – 42.415). The mean percent of physical education class time spent in MVPA was 40.96% ±14.8 (range 0.71; 95% CI = 0.3614 – 0.4578), a mean of 16.02 minutes ±6.02 (range 26.34; 95% CI = 14.069 – 17.074). Twenty-six of the 39 physical education classes observed in District 1 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. Thirteen physical education classes did meet this standard recommendation. The majority of physical education class time was spent in management. The mean percent of time spent in management was 28.71% ±18.4 (range 0.64; 95% CI = 0.2274 – 0.3468), a mean of 11.48 minutes ±7.33 (range 30.0; 95% CI = 9.105 – 13.862). The mean percent of time spent in other was 21.49% ±37.8 (range 1.0; 95% CI = 0.09 – 0.33), a mean of 7.93 minutes ±14.32 (range 46.33; 95% CI = 3.295 – 12.582). The mean percent of time spent in fitness was 17.63% ±23.5 (range 0.90; 95% CI = 0.0999

[8] PE instructor promotes in-class physical activity/fitness or motor skill engagement by promoting or encouraging physical activity or fitness during that interval. For example, attempts to initiate or increase student engagement in a physical or fitness activity; or praises or reinforces physical/fitness activity.

[9] PE instructor promotes out-of-class MVPA beyond the physical education lesson. For example, attempts to initiate or increase student engagement in fitness, physical activity or motor skills outside of physical education class; or praises or reinforces these behaviors for occurring beyond class.

– 0.2527), a mean of 7.16 minutes ±9.55 (range 30.33; 95% CI = 4.064 – 10.256). The mean percent of time spent in skill was 13.3% ±23.1 (range 0.74; 95% CI = 0.0581 – 0.2078), a mean of 5.3 minutes ±9.03 (range 30.33; 95% CI = 2.420 – 8.277). The mean percent of time spent in knowledge was 10.69% ±13.0 (range 0.68; 95% CI = 0.0645 – 0.1494), a mean of 4.39 minutes ±5.44 (range 26.33; 95% CI = 2.625 – 6.155). The mean percent of time spent in game was 8.18% ±10.5 (range 0.33; 95% CI = 0.0475 – 0.1161), a mean of 3.23 minutes ±4.27 (range 15.00; 95% CI = 1.851 – 4.624). The majority of teacher interaction time was spent promoting neither in-class or out-of-class physical activity or fitness. The mean percent of time spent promoting neither in-class or out-of-class physical activity or fitness was 61.3% ±27.0 (range 0.91; 95% CI = 0.5251 – 0.7008), a mean of 24.2 minutes ±11.63 (range 46.67; 95% CI = 20.431 – 27.972). The mean percent of time physical education instructors spent promoting in-class physical activity and fitness was 38.42% ±26.9 (range 0.91; 95% CI = 0.2968 – .4715), a mean of 15.21 minutes ±11.13 (range 44.66; 95% CI = 11.610 – 18.827). The mean percent of time physical education instructors spent promoting out-of-class physical activity and fitness was 0.02% ±0.6 (range 0.03; 95% CI = 0.0007 – 0.005), a mean of 0.12 minutes ±0.29 (range 1.33; 95% CI = 0.0250 – 0.2130; Appendix A; Table 12).

Physical activity observations during physical education class using the SOFIT were made at 3 elementary schools in District 2. A total of 35 physical education classes were observed in District 2. The mean physical education class time in District 2 was 39.82 minutes ±7.53 (range 29.67; 95% CI = 37.23 – 42.41). The mean percent of physical education class time spent in MVPA was 35.00% ±14.0 (range 0.51; 95% CI =

0.3017 – 0.3983), a mean of 13.75 minutes ±5.63 (range 20.33; 95% CI = 11.822 – 15.694). Twenty-eight of the 35 physical education classes observed in District 2 did not meet the standard recommendation of spending fifty percent of total physical education class time in MVPA. Seven physical education classes did meet this standard recommendation. The majority of physical education class time in District 2 was spent in other. The mean percent of time spent in other was 24.89% ±40.2; range 1.0; 95% CI = 0.1106 – 0.3873), a mean of 8.76 minutes ±14.39 (range 42.33; 95% CI = 3.814 – 13.706). The mean percent of time spent in management was 24.1% ±17.0 (range 0.66; 95% CI = 0.1826 – 0.2994), a mean of 15.41 minutes ±17.74 (range 63.33; 95% CI = 9.318 – 21.512). The mean percent of time spent in fitness was 17.64% ±16.6 (range 0.57; 95% CI = 0.1191 – 0.2337), a mean of 7.63 minutes ±7.78 (range 26.33; 95% CI = 4.961 – 10.309). The mean percent of time spent in game was 14.27% ±21.0 (range 0.71; 95% CI = 0.0703 – 0.2152), a mean of 6.26 minutes ±9.11 (range 28.33; 95% CI = 3.132 – 9.397).The mean percent of time spent in skill was 10.28% ±17.4 (range 0.60; 95% CI = 0.0430 – 0. 1626), a mean of 3.94 minutes ±6.55 (range 22.0; 95% CI = 1.689 – 6.194).The mean percent of time spent in knowledge was 8.5% ±8.8 (range 0.38; 95% CI = 0.0546 – 0.1154), a mean of 3.52 minutes ±3.73 (range 14.66; 95% CI = 2.239 – 4.803). The majority of teacher interaction time was spent promoting in-class physical activity or fitness. The mean percent of time spent promoting in-class physical activity or fitness was 57.55% ±25.2 (range 0.89; 95% CI = 0.4886 – 0.6624), a mean of 23.65 minutes ±11.34 (range 37.67; 95% CI = 19.755 – 27.551). The mean percent of time physical education instructors spent promoting neither in-class or out-of-class physical activity and fitness was 42.18% ±25.5 (range 0.89; 95% CI = 0.3340 – .5096), a mean of 16.06 minutes ±8.66 (range 37.0; 95% CI = 13.086 – 19.040). The mean percent of time physical education instructors spent promoting out-of-class physical activity was 0.02% ±0.6 (range 0.03; 95% CI = 0.0007 – 0.0050), a mean of .0094 minutes ±0.05 (range 0.33; 95% CI = -0.0097 – 0.0286; Appendix A; Table 12).

Physical activity observations during physical education class using the SOFIT were made at 3 elementary schools in District 3. School 9 in District 3 was not observed because physical education class is not provided to children in this school. A total of 35 physical education classes were observed in District 3. The mean physical education class time in District 3 was 38.2 minutes ±9.44 (range 38.33; 95% CI = 34.964 – 41.449). The mean percent of physical education class time spent in MVPA was 32.81% ±15.3 (range 0.82; 95% CI = 0.2755 – 0.3807), a mean of 11.95 minutes ±4.98 (range 23.00; 95% CI = 10.245 – 13.670). Thirty of the 35 physical education classes observed in District 3 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. Five physical education classes did meet this standard recommendation. The majority of physical education class time in District 3 was spent in management. The mean percent of time spent in management was 33.43% ±21.4 (range 0.97; 95% CI = 0.2607 – 0.4078), a mean of 15.03 minutes ±13.38 (range 60.0; 95% CI = 10.438 – 19.631). The mean percent of time spent in game was 22.05% ±21.7 (range 0.66; 95% CI = 0.1457 – 0.2954), a mean of 9.31 minutes ±9.75 (range 35.66; 95% CI = 5.960 – 12.662).The mean percent of time spent in fitness was 19.77% ±25.6 (range 0.96; 95% CI = 0.1095 – 0.2860), a mean of 6.78 minutes ±7.14 (range 27.66; 95% CI = 4.332 – 9.242). The mean percent of time spent in knowledge was 9.52% ±10.5 (range 0.40; 95% CI = 0.0589 – 0.1315), a mean of 3.43

minutes ±3.17 (range 11.33; 95% CI = 2.249 – 4.431). The mean percent of time spent in other was 9.39% ±24.7 (range 0.88; 95% CI = 0.0090 – 0.1787), a mean of 2.96 minutes ±7.60 (range 28.00; 95% CI = 0.3490 – 5.573). The mean percent of time spent in skill was 5.83% ±17.7 (range 0.97; 95% CI = -0.0025 – 0.1192), a mean of 1.9 minutes ±5.82 (range 32.33; 95% CI = -0.0985 – 3.9059). The majority of teacher interaction time was spent promoting neither in-class or out-of-class physical activity and fitness. The mean percent of time spent promoting neither in-class or out-of-class physical activity and fitness was 64.08% ±18.9 (range 0.72; 95% CI = 0.5756 – 0.7060), a mean of 24.86 minutes ±10.75 (range 42.33; 95% CI = 21.167 – 28.559). The mean percent of time physical education instructors spent promoting in-class physical activity and fitness was 34.67% ±19.5 (range 0.72; 95% CI = 0.2796 – 0.4138), a mean of 13.34 minutes ±7.01 (range 23.33; 95% CI = 10.939 – 15.758). There was no time spent promoting out-of-class physical activity in District 3 (Appendix A; Table 12).

A total of 10 physical education lessons were observed at School 1 (District 1). The mean physical education class time at School 1 was 38.33 minutes ±9.45 (range 27.67; 95% CI = 31.569 – 45.090). The mean percent of physical education class time spent in MVPA was 36.3% ±8.2 (range 0.29; 95% CI = 0.3038 – 0.4222), a mean of 13.69 minutes ±3.45 (range 11.0; 95% CI = 11.221 – 16.170). Nine of the 10 physical education classes observed at School 1 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. One physical education class did meet this standard recommendation. The majority of physical education class time at School 1 was spent in management. The mean percent of time spent in management was 47.85% ±17.4 (range 0.57; 95% CI = 0.3536 – 0.6034), a mean of

18.76 minutes +7.94 (range 28.34; 95% CI = 13.077 – 24.448). The mean percent of time spent in skill was 19.14% +25.4 (range 0.73; 95% CI = 0.0092 – 0.3735), a mean of 7.06 minutes +8.76 (range 21.33; 95% CI = 0.8618 – 13.266).The mean percent of time spent in game was 18.48% +12.3; (range 0.33; 95% CI = 0.0963 – 0.2733), a mean of 7.13 minutes +5.08 (range 15.00; 95% CI = 3.490 – 10.773). The mean percent of time spent in knowledge was 9.6% +4.4 (range 0.16; 95% CI = 0.0642 – 0.1278), a mean of 3.73 minutes +1.69 (range 5.33; 95% CI = 2.522 – 4.941).The mean percent of time spent in fitness was 3.29% +3.5 (range .10; 95% CI = .0072 – .0586), a mean of 1.23 minutes +1.45 (range 4.66; 95% CI = 0.1887 – 2.271). The mean percent of time spent in other was 1.64% +5.1 (range 0.16; 95% CI = -0.0207 – 0.0536), a mean of 0.40 minutes +1.26 (range 4.00; 95% CI = -0.5049 – 1.304). The majority of teacher interaction time was spent promoting neither in-class or out-of-class physical activity and fitness. The mean percent of time spent the physical education instructor spent promoting neither in-class or out-of-class physical activity and fitness was 74.51% +13.8 (range 0.36; 95% CI = 0.6463 – 0.8438), a mean of 28.59 minutes +8.51 (range 24.00; 95% CI = 22.503 – 34.690). The mean percent of time the physical education instructor spent promoting in-class physical activity and fitness was 25.49% +13.8 (range 0.36; 95% CI = 0.1562 – 0.3537), a mean of 9.72 minutes +5.70 (range 18.33; 95% CI = 5.647 – 13.810). There was no time spent promoting out-of-class physical activity a School 1 (Appendix A; Table 13).

A total of 12 physical education lessons were observed at School 2 (District 1). The mean physical education class time at School 2 was 42.38 minutes +5.24 (range 16.66; 95% CI = 39.054 – 45.715). The mean percent of physical education class time spent in MVPA was 32.79% ±14.1 (range 0.54; 95% CI = 0.2386 – 0.4173), a mean of 14.13 minutes ±6.74 (range 25.34; 95% CI = 9.849 – 18.420). Eleven of the 12 physical education classes observed at School 2 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. One physical education class did meet this standard recommendation. The majority of physical education class time at School 2 was spent in fitness. The mean percent of time spent in fitness was 36.39% ±16.9 (range 0.56; 95% CI = 0.2563 – 0.4714), a mean of 15.33 minutes ±7.06 (range 23.66; 95% CI = 10.8405 – 19.8195).The mean percent of time spent in management was 28.57% ±6.1 (range 0.22; 95% CI = 0.2464 – 0.3250), a mean of 12.05 minutes ±2.92 (range 10.67; 95% CI = 10.194 – 13.908). The mean percent of time spent in knowledge was 19.68% ±19.5 (range 0.63; 95% CI = 0.0725 – 0.3211), a mean of 8.3 minutes ±8.08 (range 24.67; 95% CI = 3.164 – 13.439). The mean percent of time spent in skill was 8.34% ±11.2 (range 0.27; 95% CI = 0.0121 – 0.1546), a mean of 3.74 minutes ±5.01 (range 11.66; 95% CI = 0.5590 – 6.9377). The mean percent of time spent in game was 7.03% ±8.2 (range 0.23; 95% CI = 0.0177 – 0.1229), a mean of 2.94 minutes ±3.65 (range 11.00; 95% CI = 0.6202 – 5.264). School 2 did not spend any physical education class time in other. The majority of teacher interaction time was spent promoting neither in-class or out-of-class physical activity and fitness. The mean percent of time the physical education instructor spent promoting neither in-class or out-of-class physical activity and fitness was 52.56% ±16.3 (range 0.64; 95% CI = 0.4217 – 0.6295), a mean of 28.59 minutes ±8.51 (range 24.00; 95% CI = 22.503 – 34.690). The mean percent of time the physical education instructor spent promoting in-class physical activity and fitness was 46.51% ±15.9 (range 0.62; 95% CI = 0.3636 – 0.5667), a mean of 19.88 minutes ±7.41 (range 29.00; 95% CI = 15.177 – 24.595). The mean percent of time the physical education instructor spent promoting out-of-class physical activity and fitness was 0.93% ±0.9 (range 0.03; 95% CI = 0.0033 – 0.0152), a mean of 0.38 minutes ±0.42 (range 1.33; 95% CI = 0.1188 – 0.6545; Appendix A; Table 13).

A total of 9 physical education lessons were observed at School 3 (District 1). The mean physical education class time at School 3 was 38.47 minutes ±8.6 (range 24.67; 95% CI = 31.860 – 45.095). The mean percent of physical education class time spent in MVPA was 49.9% ±13.4 (range 0.40; 95% CI = 0.3952 – 0.6027), a mean of 18.73 minutes ±5.54 (range 14.67; 95% CI = 14.477 – 22.998). Three of the nine physical education classes observed at School 3 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. Six physical education classes did meet this standard recommendation. The majority of physical education class time at School 3 was spent in other. The mean percent of time spent in other was 38.85% ±46.8 (range 1.0; 95% CI = 0.0284 – 0.7486), a mean of 13.14 minutes ±15.87 (range 34.66; 95% CI = 0.9450 – 25.346). The mean percent of time spent in skill was 23.86% ±35.8 (range 0.74; 95% CI = -0.0366 – 0.5138), a mean of 9.77 minutes ±5.01 (range 11.66; 95% CI = -1.505 – 21.058).The mean percent of time spent in fitness was 16.83% ±34.1 (range 0.90; 95% CI = -0.0942 – 0.4308), a mean of 6.7 minutes ±13.3 (range 30.33; 95% CI = -3.521 – 16.928). The mean percent of time spent in management was 13.0% ±8.4 (range 0.25; 95% CI = 0.0653 – 0.1947), a mean of 5.59 minutes ±3.96 (range 12.0; 95% CI = 2.545 – 8.636). The mean percent of time spent in knowledge was 5.63% ±53.1 (range 0.13; 95% CI = 0.0155 – 0.0972), a mean of 2.4 minutes ±2.31 (range 5.66; 95% CI = 0.6253 – 4.181). The mean percent of time spent in game was 1.81% +4.1 (range 0.12; 95% CI = -0.0135 – 0.0498), a mean of 0.851 minutes +2.0 (range 6.00; 95% CI = -0.6919 – 2.394). The majority of teacher interaction time was spent promoting in-class physical activity and fitness. The mean percent of time the physical education instructor spent promoting in-class physical activity and fitness was 59.88% +15.9 (range 0.62; 95% CI = 0.3454 – 0.8521), a mean of 22.81 minutes +13.88 (range 42.33; 95% CI = 12.134 – 33.487). The mean percent of time the physical education instructor spent promoting neither in-class or out-of-class physical activity and fitness was 40.12% +32.9 (range 0.86; 95% CI = 0.1479 – 0.6546), a mean of 15.66 minutes +14.01 (range 42.67; 95% CI = 4.887 – 26.439). There was no time spent promoting out-of-class physical activity a School 3.

A total of 8 physical education lessons were observed at School 4 (District 1). The mean physical education class time at School 4 was 38.12 minutes +6.51 (range 18.0; 95% CI = 32.679 – 43.567). The mean percent of physical education class time spent in MVPA was 48.98% +16.4 (range 0.47; 95% CI = 0.3522 – 0.6273), a mean of 18.7 minutes +6.58 (range 18.66; 95% CI = 13.196 – 24.213). Three of the eight physical education classes observed at School 4 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. Five physical education classes did meet this standard recommendation. The majority of physical education class time at School 4 was spent in other. The mean percent of time spent in other was 59.00% +43.3 (range 95.0; 95% CI = 0.2273 – 0.9527), a mean of 23.41 minutes +18.05 (range 46.33; 95% CI = 8.320 – 38.507). The mean percent of time spent in management was 22.66% (+0.205; range 0.55; 95% CI = 0.0544 – 0.3988), a mean of 8.16 minutes (+6.79; range 17.34; 95% CI = 2.481 – 13.846). The mean percent of time spent in fitness was 8.31% ±14.7 (range 0.35; 95% CI = -0.0400 – 0.2062), a mean of 2.83 minutes ±5.04 (range 12.66; 95% CI = -1.384 – 7.049). The mean percent of time spent in knowledge was 4.28% ±7.1 (range 0.20; 95% CI = -0.0167 – 0.1022), a mean of 1.58 minutes ±2.73 (range 7.66; 95% CI = -0.7087 – 3.871). The mean percent of time spent in game was 4.19% ±7.7 (range 0.22; 95% CI = -0.0227 – 0.1065), a mean of 1.49 minutes ±2.78 (range 8.00; 95% CI = -0.8279 – 3.825). The mean percent of time spent in skill was 1.55% ±2.8 (range 0.06; 95% CI = -0.0085 – 0.0396), a mean of 0.62 minutes ±1.15 (range 2.66; 95% CI = -0.3446 – 1.592). The majority of teacher interaction time was spent promoting neither in-class or out-of-class physical activity and fitness. The mean percent of time the physical education instructor spent promoting neither in-class or out-of-class physical activity and fitness was 81.71% ±25.4 (range 0.65; 95% CI = 0.6044 – 1.0298), a mean of 31.57 minutes ±12.53 (range 36.34; 95% CI = 21.098 – 42.059). The mean percent of time the physical education instructor spent promoting in-class physical activity and fitness was 18.29% ±25.4 (range 0.65; 95% CI = -0.0298 – 0.3956), a mean of 6.53 minutes ±9.13 (range 23.33; 95% CI = -1.1008 – 14.175). There was no time spent promoting out-of-class physical activity a School 4 (Appendix A; Table 13).

A total of 10 physical education lessons were observed at School 5 (District 2). The mean physical education class time at School 5 was 45.16 minutes ±5.43 (range 18.67; 95% CI = 41.274 – 49.053). The mean percent of physical education class time spent in MVPA was 32.53% ±9.9 (range 0.26; 95% CI = 0.2541 – 0.3964), a mean of 14.86 minutes ±5.3 (range 15.66; 95% CI = 11.069 – 18.656). All 10 of the physical education classes observed at School 5 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. The majority of physical education class time at School 5 was spent in management. The mean percent of time spent in management was 31.87% ±9.3 (range 0.25; 95% CI = 0.2521 – 0.3854), a mean of 27.46 minutes ±22.41 (range 53.00; 95% CI = 11.430 – 43.493). The mean percent of time spent in fitness was 31.74% ±17.6 (range 0. 05; 95% CI = 0.1911 – 0.4438), a mean of 14.83 minutes ±8.7 (range 23.33; 95% CI = -8.603 – 21.059). The mean percent of time spent in game was 14.71% ±21.1 (range 0.60; 95% CI = -0.0040 – 0.2982), a mean of 6.99 minutes ±9.79 (range 26.33; 95% CI = -0.0113 – 14.007). The mean percent of time spent in knowledge was 12.97% ±7.9 (range 0.23; 95% CI = 0.0725 – 0.1868), a mean of 5.69 minutes ±3.5 (range 11.66; 95% CI = 3.188 – 8.205). The mean percent of time spent in skill was 6.34% ±11.3 (range 0.29; 95% CI = -0.0178 – 0.1445), a mean of 2.43 minutes ±4.26 (range 10.66; 95% CI = -0.6199 – 5.483). The mean percent of time spent in other was 2.37% ±3.9 (range 0.09; 95% CI = -0.0049 – 0.0522), a mean of 1.06 minutes ±1.78 (range 4.33; 95% CI = -0.2140 – 2.346). The majority of teacher interaction time was spent promoting in-class physical activity and fitness. The mean percent of time the physical education instructor spent promoting in-class physical activity and fitness was 62.39% ±12.8 (range 0.33; 95% CI = 0.5322 – 0.7157), a mean of 28.49 minutes ±9.13 (range 23.33; 95% CI = 22.868 – 34.123). The mean percent of time the physical education instructor spent promoting neither in-class or out-of-class physical activity and fitness was 37.53% ±12.7 (range 0.33; 95% CI = 0.2838 – 0.4668), a mean of 16.63 minutes ±5.11 (range 15.67; 95% CI = 12.974 – 20.287). The mean percent of time the physical education instructor spent promoting out-of-class physical activity and fitness was 0.08% ±0.2 (range 0.01; 95% CI

= -0.0010 – 0.0025), a mean of 0.03 minutes ±0.10 (range 0.33; 95% CI = -0.0417 – 0.1077; Appendix A; Table 14).

A total of 12 physical education lessons were observed at School 6 (District 2). The mean physical education class time at School 6 was 40.1 minutes ±6.61 (range 20.33; 95% CI = 35.907 – 44.310). The mean percent of physical education class time spent in MVPA was 23.85% ±4.9 (range 0.15; 95% CI = 0.2070 – 0.2699), a mean of 9.66 minutes ±3.06 (range 8.66; 95% CI = 7.714 – 11.612). All 12 of the physical education classes observed at School 6 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. The majority of physical education class time at School 6 was spent in management. The mean percent of time spent in management was 30.06% ±15.8 (range 0.55; 95% CI = 0.1998 – 0.4014), a mean of 14.94 minutes ±11.85 (range 45.33; 95% CI = 7.4055 – 22.474). The mean percent of time spent in skill was 24.53% ±21.7 (range 0.60; 95% CI = 0.1068 – 0.3838), a mean of 9.38 minutes ±8.11 (range 22.00; 95% CI = 4.231 – 14.543). The mean percent of time spent in game was 18.45% ±21.1 (range 0.59; 95% CI = 0.0499 – 0.3190), a mean of 8.24 minutes ±9.81 (range 28.33; 95% CI = 2.015 – 14.481).The mean percent of time spent in fitness was 14.09% ±4.9 (range 0.14; 95% CI = 0.1091 – 0.1727), a mean of 5.74 minutes ±2.23 (range 7.0; 95% CI = 4.326 – 7.166). The mean percent of time spent in knowledge was 12.58% ±9.2 (range 0.38; 95% CI = 0.0668 – 0.1847), a mean of 5.02 minutes ±3.78 (range 14.66; 95% CI = 2.621 – 7.428). There was no time spent in other at School 6. The majority of teacher interaction time was spent promoting in-class physical activity and fitness. The mean percent of time the physical education instructor spent promoting in-class physical activity and fitness was 63.10% ±18.8 (range 0.62; 95% CI = 0.5111 – 0.7509), a mean of 25.24 minutes ±8.88 (range 28.00; 95% CI = 19.601 – 30.892). The mean percent of time the physical education instructor spent promoting neither in-class or out-of-class physical activity and fitness was 36.80% ±18.8 (range 0.62; 95% CI = 0.2483 – 0.4878), a mean of 14.85 minutes ±8.67 (range 33.33; 95% CI = 9.343 – 20.372). There was no time spent promoting out of class physical activity or fitness at School 6 (Appendix A; Table 14).

A total of 13 physical education lessons were observed at School 7 (District 2). The mean physical education class time at School 7 was 35.45 minutes ±7.36 (range 26.67; 95% CI = 31.000 – 39.910). The mean percent of physical education class time spent in MVPA was 47.20% ±13.1 (range 0.41; 95% CI = 0.3927 – 0.5513), a mean of 16.68 minutes ±5.76 (range 19.67; 95% CI = 13.207 – 20.169). Six of the 13 physical education classes observed at School 7 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. Seven physical education classes did meet this standard recommendation. The majority of physical education class time at School 7 was spent in other. The mean percent of time spent in other was 65.2% ±42.1 (range 1.0; 95% CI = 0.3970 – 0.9070), a mean of 22.76 minutes ±15.69 (range 42.33; 95% CI = 13.2818 – 32.2505). The mean percent of time spent in management was 12.63% ±17.1 (range 0.61; 95% CI = 0.0225 – 0.2300), a mean of 6.58 minutes ±13.47 (range 50.33; 95% CI = -1.553 – 14.727). The mean percent of time spent in game was 10.09% ±21.8 (range 0.71; 95% CI = -0.0313 – 0.2330), a mean of 3.87 minutes ±9.81 (range 28.33; 95% CI = -0.9930 – 8.734).The mean percent of time spent in fitness was 10.07% ±17.0 (range 0.51; 95% CI = -0.0024

– 0.2037), a mean of 3.84 minutes ±2.23 (range 7.0; 95% CI = -0.3425 – 8.0317). The mean percent of time spent in knowledge was 1.29% ±2.4 (range 0.08; 95% CI = -0.0017 – 0.0276), a mean of 0.46 minutes ±0.8 (range 3.0; 95% CI = -0.0753 – 0.9969). The mean percent of time spent in skill was 0.16% ±0.5 (range 0.02; 95% CI = -0.0019 – 0.0050), a mean of 0.07 minutes ±0.27 (range 1.00; 95% CI = -0.0907 – 0.2445). The majority of teacher interaction time was spent promoting neither in-class or out-of-class physical activity and fitness. The mean percent of time the physical education instructor spent promoting neither in-class or out-of-class physical activity and fitness was 50.73% ±35.7 (range 0.89; 95% CI = 0.2914 – 0.7232), a mean of 16.74 minutes ±11.04 (range 28.34; 95% CI = 10.067 – 23.412). The mean percent of time the physical education instructor spent promoting in-class physical activity and fitness was 48.69% ±35.0 (range 0.89; 95% CI = 0.2752 – 0.6987), a mean of 18.45 minutes ±13.95 (range 36.00; 95% CI = 10.024 – 26.891). There was no time spent promoting out of class physical activity or fitness at School 7 (Appendix A; Table 14).

A total of 12 physical education lessons were observed at School 8 (District 3). The mean physical education class time at School 8 was 44.94 minutes ±9.56 (range 24.33; 95% CI = 38.421 – 50.573). The mean percent of physical education class time spent in MVPA was 33.36% ±15.1 (range 0.44; 95% CI = 0.2373 – 0.4300), a mean of 14.24 minutes ±6.53 (range 23.0; 95% CI = 10.091 – 18.401). Nine of the 12 physical education classes observed at School 8 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. Three physical education classes did meet this standard recommendation. The majority of physical education class time at School 8 was spent in management. The mean percent of time spent in management was 38.68% ±27.7 (range 0.84; 95% CI = 0.2105 – 0.5631), a mean of 18.41 minutes ±14.82 (range 42.33; 95% CI = 8.990 – 27.832). The mean percent of time spent in fitness was 29.14% ±32.9 (range 0.86; 95% CI = 0.0819 – 0.5009), a mean of 10.52 minutes ±9.8 (range 27.66; 95% CI = 4.295 – 16.752). The mean percent of time spent in game was 27.12% ±25.4 (range 0.66; 95% CI = 0.1095 – 0.4328), a mean of 13.05 minutes ±12.34 (range 35.66; 95% CI = -5.207 – 20.897). The mean percent of time spent in knowledge was 2.6% ±2.8 (range 0.09; 95% CI = 0.0081 – 0.0439), a mean of 1.24 minutes ±1.43 (range 4.33; 95% CI = 0.3338 – 2.1595). The mean percent of time spent in other was 1.86% ±6.4 (range 0.22; 95% CI = -0.0224 – 0.0597), a mean of 0.94 minutes ±15.69 (range 42.33; 95% CI = -1.133 – 3.022). The mean percent of time spent in skill was 0.06% ±2.0 (range 0.07; 95% CI = -0.0072 – 0.0193), a mean of 0.3 minutes ±1.05 (range 3.66; 95% CI = -0.3663 – 0.9763). The majority of teacher interaction time was spent promoting neither in-class or out-of-class physical activity and fitness. The mean percent of time the physical education instructor spent promoting neither in-class or out-of-class physical activity and fitness was 63.89% ±22.6 (range 0.70; 95% CI = 0.4952 – 0.7826), a mean of 29.74 minutes ±14.00 (range 42.33; 95% CI = 20.849 – 38.642). The mean percent of time the physical education instructor spent promoting in-class physical activity and fitness was 36.11% ±22.6 (range 0.70; 95% CI = 0.2174 – 0.5048), a mean of 14.74 minutes ±7.63 (range 21.00; 95% CI = 9.896 – 19.595). There was no time spent promoting out of class physical activity or fitness at School 8 (Appendix A; Table 15).

A total of 11 physical education lessons were observed at School 10 (District 3). The mean physical education class time at School 10 was 31.24 minutes ±2.6 (range

9.0; 95% CI = 29.491 – 32.990). The mean percent of physical education class time spent in MVPA was 31.00% ±9.7 (range 0.33; 95% CI = 0.2446 – 0.3753), a mean of 9.75 minutes ±6.53 (range 23.0; 95% CI = 7.443 – 12.064). Ten of the 11 physical education classes observed at School 10 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. One physical education class did meet this standard recommendation. The majority of physical education class time at School 10 was spent in other. The mean percent of time spent in other was 27.84% ±38.4 (range 0.88; 95% CI = 0.0199 – 0.5369), a mean of 8.39 minutes ±11.7 (range 28.0; 95% CI = 0.5289 – 16.255). The mean percent of time spent in management was 21.69% ±13.8 (range 0.40; 95% CI = 0.1240 – 0.3099), a mean of 6.87 minutes ±4.64 (range 13.66; 95% CI = 3.756 – 9.996). The mean percent of time spent in knowledge was 17.79% ±2.8 (range 0.09; 95% CI = 0.0800 – 0.2758), a mean of 5.42 minutes ±4.26 (range 11.33; 95% CI = 2.556 – 8.287). The mean percent of time spent in skill was 16.08% ±29.5 (range 0.97; 95% CI = -0.0375 – 0.3591), a mean of 5.05 minutes ±9.72 (range 32.22; 95% CI = -1.476 – 11.594). The mean percent of time spent in game was 11.97% ±17.1 (range 0.44; 95% CI = 0.0044 – 0.2350), a mean of 3.96 minutes ±12.34 (range 35.66; 95% CI = 0.093 – 7.843). The mean percent of time spent in fitness was 4.62% ±6.4 (range 0.14; 95% CI = 0.0029 – 0.0896), a mean of 1.51 minutes ±2.10 (range 4.33; 95% CI = 0.0974 – 2.929). The majority of teacher interaction time was spent promoting neither in-class or out-of-class physical activity and fitness. The mean percent of time the physical education instructor spent promoting neither in-class or out-of-class physical activity and fitness was 65.57% ±18.7 (range 0.56; 95% CI = 0.5294 – 0.7820), a mean of 20.36 minutes ±5.63 (range 16.0; 95% CI =

16.571 – 24.148). The mean percent of time the physical education instructor spent promoting in-class physical activity and fitness was 30.39% ±19.9 (range 0.56; 95% CI = 0.1696 – 0.4382), a mean of 10.87 minutes ±6.29 (range 21.33; 95% CI = 6.644 – 15.104). There was no time spent promoting out of class physical activity or fitness at School 10 (Appendix A; Table 15).

A total of 12 physical education lessons were observed at School 11 (District 3). The mean physical education class time at School 10 was 38.3 minutes ±9.28 (range 32.0; 95% CI = 32.405 – 44.199). The mean percent of physical education class time spent in MVPA was 33.92% ±20.1 (range 0.74; 95% CI = 0.2113 – 0.4671), a mean of 11.69 minutes ±3.55 (range 11.0; 95% CI = 9.431 – 13.949). Eleven of the 12 physical education classes observed at School 11 did not meet the standard recommendation of spending fifty percent of physical education class time in MVPA. One physical education class did meet this standard recommendation. The majority of physical education class time at School 10 was spent in management. The mean percent of time spent in management was 38.93% ±16.4 (range 0.57; 95% CI = 0.2846 – 0.4941), a mean of 19.13 minutes ±14.71 (range 60.0; 95% CI = 9.784 – 28.487). The mean percent of time spent in game was 26.23% ±20.1 (range 0.58; 95% CI = 0.1346 – 0.3900), a mean of 10.46 minutes ±8.13 (range 22.00; 95% CI = 5.3001 – 15.6382). The mean percent of time spent in fitness was 24.3% ±23.7 (range 0.96; 95% CI = 0.0918 – 0.3942), a mean of 7.88 minutes ±3.66 (range 16.33; 95% CI = 5.555 – 10.214). The mean percent of time spent in knowledge was 8.86% ±4.8 (range 0.17; 95% CI = 0.0580 – 0.1192), a mean of 3.52 minutes ±1.85 (range 6.66; 95% CI = 2.347 – 4.704). The mean percent of time spent in skill was 1.67% ±4.3 (range 0.15; 95% CI = -0.0109 – 0.0444), a mean of 0.61 minutes ±1.81 (range 6.33; 95% CI = -0.5418 – 1.761). There was no time spent in other at School 11. The majority of teacher interaction time was spent promoting neither in-class or out-of-class physical activity and fitness. The mean percent of time the physical education instructor spent promoting neither in-class or out-of-class physical activity and fitness was 62.9% ±16.6 (range 0.49; 95% CI = 0.5233 – 0.7347), a mean of 24.1 minutes ±9.26 (range 28.67; 95% CI = 18.218 – 29.998). The mean percent of time the physical education instructor spent promoting in-class physical activity and fitness was 37.16% ±16.6 (range 0.49; 95% CI = 0.2659 – 0.4772), a mean of 14.22 minutes ±6.97 (range 20.33; 95% CI = 9.7874 – 18.6526). There was no time spent promoting out of class physical activity or fitness at School 11 (Appendix A; Table 15).

Analysis of Physical Activity Dependent Variable: SOFIT

MVPA: Between Districts

There was a significant difference between District 1 and District 3 ($F_{(2, 106)}$ = 3.052, p = 0.05) on the percent of time students spent in MVPA during physical education. There was no significant difference between District 1 and District 2 ($F_{(2, 106)}$ = 3.052, p = 0.198), or District 2 and District 3 ($F_{(2, 106)}$ = 3.052, p = 0.809). The mean percent of time spent in MVPA for District 1 was 40.96% ±14.8 (95% CI = 0.361 – 0.457), the mean for District 2 was 35.0% ±14.0 (95% CI = 0.301 – 0.398) and for District 3 was 32.8% ±15.3 (95% CI = 0.275 – 0.38; Appendix B; Figure B-6).

MVPA: Between Schools

There was a significant difference between School 6 and the following schools on MVPA during physical education: School 3 ($F_{(9, 99)} = 4.529$, $p = 0.001$), School 4 ($F_{(9, 99)} = 4.529$, $p = 0.003$) and School 7 ($F_{(9, 99)} = 4.529$, $p = 0.001$). There were no significant differences between any of the other schools. The mean percent of time spent in MVPA at School 6 was 23.8% $\pm$4.9 (95% CI = 0.207 – 0.269), School 3 was 49.9% $\pm$13.4 (95% CI = 0.395 – 0.602), School 4 was 48.98% $\pm$16.4 (95% CI = 0.352 – 0.627) and School 7 was 47.20% $\pm$13.1 (95% CI = 0.392 – 0.551; Appendix B; Figure B-7).

Participant Demographics and Descriptive Data: SOPLAY

Missing Data

There is a substantial amount of missing recess data. Of the 11 schools included in this investigation recess data were collected at only four of those schools. Six of the schools did not have a recess policy or regularly scheduled recess. One of the seven schools with missing recess data had recess policy and a recess schedule however, the days that the principle investigator arrived to collect SOPLAY data no students came to the playground at the times they were scheduled to. Among the four schools where SOPLAY data were collected, there is missing data for observations made in particular areas where there were no students present during that particular scan of that particular area. Due to the amount of missing data, the SOPLAY data will only be used for descriptive purposes. Due to a small sample size and insufficient power, there is no subsequent analysis of the SOPLAY data.

Physical Activity: All Participants

All of the schools that had regularly scheduled recess in District 3 were observed using the SOPLAY. There was no recess observed in District 1 or District 2. Considering both males and females a mean of 54.78% $\pm$29.89 (95% CI: 50.73 – 58.82) of children observed in Schools 8-11 engaged in MVPA. A mean of 4.8 $\pm$3.9 (95% CI: 4.34 – 5.41) children were sedentary, a mean of 3.8 $\pm$3.7 (95% CI: 3.35 – 4.38) children were walking, a mean of 2.3 $\pm$2.5 (95% CI: 2.02 – 2.71) children were engaging in vigorous activity, and a mean of 6.2 $\pm$4.9 (95% CI: 5.57 – 6.91) children were in MVPA (walking and vigorous combined). Target areas had supervision a mean of 36.2% of the time[10]. During observation children were engaging in organized play 0.9% of the time and were using equipment 8.2% of the time[11]. The most frequently observed activity was “no specific activity” (39.7%), which included sitting, standing and/or walking. The second most frequently observed activity was “none of the other” (20.6%). This category included games and activities that were not considered: fitness or aerobics; basketball or softball; basketball or volleyball; dance or gymnastics; soccer or football; climbing or sliding; jumping games; manipulative games or racquet activities; sedentary games or activities; or tagging or chasing games. The third most frequently observed activity was climbing or sliding (19.8%), followed by tag or chasing games (7.1%), basketball or volleyball (5.6%), soccer or football (5.1%), sedentary games (1.8%) and racquet activities (0.3%).

A mean of 54.95% $\pm$36.18 (95% CI: 50.05 – 59.85) of the males observed in Schools 8-11 engaged in MVPA. A mean of 2.3 $\pm$2.5 (95% CI: 2.05 – 2.74) males were

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[10] This value includes target areas that were scanned but had no children (missing physical activity data).
[11] This value includes target areas that were scanned but had no children (missing physical activity data).

sedentary, a mean of 2.0 ±2.7 (95% CI: 1.69 – 2.44) males were walking, a mean of 1.3 ±1.6 (95% CI: 1.07 – 1.52) males were engaging in vigorous activity, and a mean of 3.3 ±3.4 (95% CI: 2.90 – 3.82) males were in MVPA. The most frequently observed activity among males was "no specific activity" (34.7%). The second most frequently observed activity was "none of the other" (22.8%). The third most frequently observed activity was climbing or sliding (17.7%), followed by tag or chasing games (9.2%), basketball or volleyball (7.5%), soccer or football (6.5%), sedentary games (1.4%) and racquet activities (0.3%).

A mean of 48.62% ±38.67 (95% CI: 46.92 – 57.30) of the females observed in Schools 8-11 engaged in MVPA. A mean of 2.4 ±2.3 (95% CI: 2.20 – 2.75) females were sedentary, a mean of 1.5 ±2.1 (95% CI: 1.33 – 1.82) females were walking, a mean of 0.9 ±1.5 (95% CI: 0.80 – 1.15) females were engaging in vigorous activity and a mean of 2.5 ±2.9 (95% CI: 2.21 – 2.89) females were in MVPA. The most frequently observed activity among females was "no specific activity" (44.6%). The second most frequently observed activity was "none of the other" (24.4%). The third most frequently observed activity was climbing or sliding (19.2%), followed by tag or chasing games (4.2%), soccer or football (3.8%), sedentary games (2.4%) and basketball or volleyball (1.4%).

School 8:

A mean of 42.53% ±32.95 (95% CI: 35.10 – 49.96) of the children observed at School 8 engaged in MVPA. A mean of 3.9 ±2.9 (95% CI: 3.26 – 4.60) children were sedentary, a mean of 1.4 ±2.0 (95% CI: 0.99 – 1.90) children were walking, a mean of

1.6 ±2.0 (95% CI: 1.22 – 2.15) children were engaging in vigorous activity, and a mean of 3.1 ±3.3 (95% CI: 2.38 – 3.89) children were in MVPA. Children were in areas with supervision a mean of 65.4% of the time. During observation children were engaging in organized play 0.8% of the time and were using equipment 2.3% of the time. The most frequently observed activity at School 8 was “no specific activity” (36.3%). The second most frequently observed activity was climbing or sliding (28.7%). The third most frequently observed activity was “none of the other” (25.0%), followed by sedentary games (5.0%), and tag or chasing games (2.5%) and basketball or volleyball (2.5%) equally. The Area at School 8 where the largest percentage of children engaged in MVPA was Area-7 (69.46%), followed by Area-9 (53.09%), Area-1 (51.79%), Area-2 (50.0%), Area 8 (39.05%), Area-3 (36.81%) and Area-6 (19.38%). Children engaged in “none of the other” activities while in Area-7 and Area-3, climbing or sliding and “none of the other” activities in Area-9 and Area-6, climbing or sliding in Area-1, and no specific activity in Area-2 and Area-8.

There were a total of 10 Target Areas at School 8. Area-1 at School 8 was approximately 1,500 square-feet in size and contained seven exercise stations that were a part of outdoor Project Fit America, There no permanent overlap improvements to this area. The ground surface was primarily woodchips and dirt secondarily. Area-2 was also approximately 1,500 square-feet in size and was a general open area with no permanent overlap improvements. The ground surface was primarily grass and dirt secondarily. Area-3 was approximately 800 square-feet in size and was a play space with nine swings. There were no permanent area overlap improvements. The ground surface was primarily woodchips and dirt secondarily. Area-4 was also approximately

800 square feet in size and was a play space with three climbing apparatus. There were no permanent area overlap improvements. The ground surface was primarily woodchips and grass secondarily. Area-5 was a 1,000 square-foot half-court basketball court with two basketball hoops. There were no permanent area overlap improvements. The court surface was cement. Area-6 was approximately 2,000 square-feet general open space with a bench and two picnic tables. There were permanent area overlap improvements. The ground surface was primarily grass and dirt secondarily. Area-7 was an 800 square foot play space with eight swings. There were no permanent area overlap improvements. The ground surface was primarily woodchips and dirt secondarily. Area-8 was approximately 8,000 square-feet in size and was a general open space. There were no permanent area overlap improvements. The ground surface was primarily grass and dirt secondarily. Area-9 was approximately 1,500 square-feet in size and a play space with one play set. There were no permanent area overlap improvements. The ground surface was primarily woodchips and dirt secondarily. Area-10 was approximately 500 square-feet in size and was an area that contained three benches and one pavilion. There were no permanent area overlap improvements. The ground surface was primarily cement.

A mean of 53.75% $\pm$35.87 (95% CI: 43.45 – 64.05) of the males observed at School 8 engaged in MVPA. A mean of 2.5 $\pm$2.5 (95% CI: 1.84 – 3.33) males were sedentary, a mean of 1.5 $\pm$1.9 (95% CI: 0.98 – 2.07) males were walking, a mean of 1.8 $\pm$2.1 (95% CI: 1.18 – 2.44) males were engaging in vigorous activity, and a mean of 3.3 $\pm$3.3 (95% CI: 2.39 – 4.3) males were in MVPA. The most frequently observed activity among males at School 8 was climbing or sliding (30.6%). The second most frequently observed activity was “no specific activity” (26.5%) and “none of the other” (26.5%) equally; followed by sedentary games (8.2%), and tag or chasing games (4.1%) and basketball or volleyball (4.1%) equally. The area where the largest percentage of males at School 8 engaged in MVPA was Area-1 (76.67%), followed by Area-7 (72.68%), Area-9 (59.06%), Area-3 (58.33%), Area-8 (44.33%) and Area-6 (33.3%). Males engaged in basketball activities while in Area-1; “none of the other” in Area-7; climbing or sliding in Area-9; “none of the other” in Area-3; no specific activity in Area-8; and no specific activity and sedentary games or activities in Area-6.

A mean of 32.8% ±36.48 (95% CI: 23.83 – 41.77) of the females observed at School 8 engaged in MVPA. A mean of 2.7 ±2.1 (95% CI: 2.20 – 3.25) females were sedentary, a mean of 0.5 ±1.1 (95% CI: 0.30 – 0.84) females were walking, a mean of 0.6 ±1.0 (95% CI: 0.39 – 0.91) females were engaging in vigorous activity, and a mean of 1.2 ±1.4 (95% CI: 0.86 – 1.58) females were in MVPA. The most frequently observed activity among females at School 8 was “no specific activity” (40.9%). The second most frequently observed activity was climbing or sliding (27.3%). The third most frequently observed activity was “none of the other” (24.2%) equally, followed by sedentary games (6.1%) and basketball or volleyball (1.5%). The area where the largest percentage of females at School 8 engaged in MVPA was Area-7 (52.5%), followed by Area-2 (50.0%), Area-1 (39.05%), Area-9 (36.27%), Area-3 (33.55%), Area-8 (28.57%), Area-4 (20.56%) and Area-6 (18.24%). Females engages in “none of the other” while in Area-7, Area-2 and Area-3; climbing or sliding in Area-1 and Area-9; no specific activity in Area-8 and Area-6; and no specific activity and climbing or sliding equally in Area-4.

School 9:

A mean of 57.87% ±32.61 (95% CI: 51.90 – 63.84) of the children observed at School 9 engaged in MVPA. A mean of 3.4 ±3.5 (95% CI: 2.81 – 4.11) children were sedentary, a mean of 2.6 ±2.7 (95% CI: 2.16 – 3.15) children were walking, a mean of 1.8 ±2.0 (95% CI: 1.52 – 2.25) children were engaging in vigorous activity, and a mean of 4.5 ±3.5 (95% CI: 3.88– 5.20) children were in MVPA. Children were in areas with supervision a mean of 24.0% of the time. During observation children were engaging in organized play 0.5% of the time and were using equipment 6.4% of the time. The most frequently observed activity at School 9 was “no specific activity” (35.0%). The second most frequently observed activity was “none of the other” (24.6%). The third most frequently observed activity was climbing or sliding (22.35%), followed by tag or chasing games (12.8%), soccer or football (2.5%), basketball or volleyball (2.3%) and racquet activities (0.5%). The area where the largest percentage of children at School 9 engaged in MVPA was Area-7 (93.33%), followed by Area-19 (87.5%), Area-25 (83.4%), Area-23 (83.33%), Area-11 (80.0%), Area-17 (74.56%), Area-4 (74.17%), Area-9 (72.67%), Area-15 (68.89%), Area-10 (68.6%), Area-20 (66.79%), Area-16 (60.74%), Area-6 (60.21%), Area-5 (55.56%), Area-24 (52.74%) and Area-12 (50.0%)[12]. Children at School 9 engaged in tag or chasing games while in Area-7, Area-19 and Area-15; no specific activity in Area-25, Area-11 and Area-4; no specific activity, “none of the other” activities and racquet activities in Area-23; climbing or sliding in Area-17, Area-9, Area-20 and Area-6; “none of the other” activities in Area-10 and Area-24;

[12] Areas where less than 50.0% of children were in MVPA are not reported for School 9.

“none of the other” activities, no specific activity and climbing or sliding in Area-16 and basketball in Area-5 and Area-12.

There were a total of 28 Target Areas at School 9. There were three distinct sections to the outdoor physical activity resources. The first section consisted of Target Areas one through eight. Area-1 at School 9 was approximately 5,000 square-feet in size and was a play space with two pieces of play equipment. There were no permanent over-lap improvements. The ground surface was primarily grass and cement secondarily. Area-2 was also approximately 1,000 square-feet in size and was a general open area with no permanent overlap improvements. There were two picnic tables with four chairs at each table. The ground surface was primarily cement. Area-3 was approximately 800 square-feet in size and was a play space with a tree-fort. There were no permanent area overlap improvements. The ground surface was primarily woodchips and dirt secondarily. Area-4 was approximately 2,000 square feet in size and was a general open area. There were no permanent over-lap improvements. The ground surface was primarily grass and dirt secondarily. Area-5 was a 500 square foot half-court basketball court with one basketball hoop. There were no permanent over-lap improvements. The ground surface was primarily cement. Area-6 was approximately 2,000 square feet in size and was a play space with one climbing apparatus. There were no permanent over-lap improvements. The ground surface was primarily grass and dirt secondarily. Area-7 was approximately 400 square feet in size and was a side-walk. There were no permanent over-lap improvements. The ground surface was primarily cement. Area-8 was approximately 1,500 square-feet in size and was a sidewalk. There was permanent area over-lap improvement. The ground surface was primarily cement and dirt.

The second area consisted of Target Areas nine through 21. Area-9 was approximately 200 square-feet and was a play space with one climbing apparatus. There were no permanent over-lap improvements. The ground surface was primarily grass and dirt secondarily. Area-10 was approximately 450 square feet in size and was a play space with eight swings. There were no permanent over-lap improvements. The ground surface was primarily woodchips and dirt secondarily. Area-11 was approximately 2,000 square feet in size and was a play space with. There were no permanent over-lap improvements. The ground surface was primarily grass and dirt secondarily. Area-12 was approximately 1,500 square feet in size and had one half-court basketball court with ne basketball hoop. There were no permanent over-lap improvements. The ground surface was primarily dirt and grass secondarily. Area-13 was approximately 200 square feet in size and was a play space with two pieces of play equipment. There were no permanent over-lap improvements. The ground surface was primarily woodchips and dirt secondarily. Area-14 was approximately 200 square feet in size and was a general open space with three pieces of play equipment. There were no permanent over-lap improvements. The ground surface was primarily cement. Area-15 was approximately 3,000 square feet in size and was a play space with. There were no permanent over-lap improvements. The ground surface was primarily grass and dirt secondarily. Area-16 was approximately 500 square feet in size and was a play space with two. There were no permanent over-lap improvements. The ground surface was primarily woodchips and dirt secondarily. Area-17 was approximately 500 square feet in size and was a play space with. There were no permanent over-lap improvements. The ground surface was primarily woodchips and dirt secondarily. Area-18 was approximately 500 square feet in size and was a play space with one slide. There were no permanent over-lap improvements. The ground surface was primarily woodchips and dirt secondarily. Area-19 was approximately 5,000 square feet in size and was a play space with one balance beam. There were no permanent over-lap improvements. The ground surface was primarily grass and dirt secondarily. Area-20 was approximately 200 square feet in size and was a play space with two climbing apparatus and two slides. There were no permanent over-lap improvements. The ground surface was primarily grass and dirt secondarily. Area-21 was approximately 2,000 square feet in size and was a play space with eight swings. There were no permanent over-lap improvements. The ground surface was primarily grass and gravel secondarily.

The third section consisted of Target Areas 22 through 28. Area-22 was approximately 1,000 square feet in size and was a play space with two swings, one slide and one wooden bench. There were no permanent over-lap improvements. The ground surface was primarily woodchips and gravel secondarily. Area-23 was approximately 1,000 square feet in size and was a play space with. There were no permanent over-lap improvements. The ground surface was primarily grass and gravel secondarily. Area-24 was approximately 2,500 square feet in size and was a play space with nine swings. There were no permanent over-lap improvements. The ground surface was primarily woodchips and gravel secondarily. Area-25 was approximately 2,550 square feet in size and was a play space with. There were no permanent over-lap improvements. The ground surface was primarily grass and dirt secondarily. Area-

26 was approximately 500 square feet in size and was a sidewalk with two wooden picnic tables. There were no permanent over-lap improvements. The ground surface was primarily cement. Area-27 was approximately 600 square feet in size and was a play space with one merry-go-round and one spring toy. There were no permanent over-lap improvements. The ground surface was primarily woodchips and dirt secondarily. Area-28 was approximately 2,000 square feet in size and was a play space with. There were no permanent over-lap improvements. The ground surface was primarily grass and dirt secondarily.

A mean of 54.3% $\pm$37.67 (95% CI: 47.11 – 61.48) of the males observed at School 9 engaged in MVPA. A mean of 1.8 $\pm$2.1 (95% CI: 1.47 – 2.28) males were sedentary, a mean of 1.4 $\pm$1.8 (95% CI: 1.09 – 1.81) males were walking, a mean of 1.0 $\pm$1.2 (95% CI: 0.83 – 1.32) males were engaging in vigorous activity, and a mean of 2.4 $\pm$2.3 (95% CI: 2.00 – 2.90) males were in MVPA. The most frequently observed activity at among males at School 9 was “no specific activity” (31.5%). The second most frequently observed activity was “none of the other” (25.0%). The third most frequently observed activity was climbing or sliding (19.4%), followed by tag or chasing games (15.7%), basketball or volleyball (4.6%), soccer or football (2.8%) and racquet activities (0.9%). The area where the largest percentage of males at School 9 engaged in MVPA was Area-25 (91.1%), followed by Area-19 (20.29%), Area-23 (88.1%), Area-4 (81.25%), Area-7 and Area-10 (80.0%), Area-17 (77.08%), Area-22 (68.33%), Area-9 and Area-10 (66.67%), Area-15 (66.2%), Area-24 (62.5%), Area-16 (61.1%), Area-6 (56.67%), Area-3 (53.0%) and Area-12 (50.0%)[13]. Males engaged in no specific

[13] Areas where less than 50.0% of children were in MVPA are not reported for School 9.

activities and tag or chasing games while in Area-25; tag or chasing games in Area-19, Area-23, Area-4, Area-10 and Area-15; "none of the other" activities and tag or chasing games in Area-7; climbing or sliding in Area-17, Area-6 and Area-9; "none of the other" activities in Area-22, Area-10, Area-3 and Area-24; "none of the other" activities and climbing or sliding in Area-16; and basketball in Area-12.

A mean of 58.32% ±37.24 (95% CI: 50.56 – 66.08) of the females observed at School 9 engaged in MVPA. A mean of 2.2 ±2.4 (95% CI: 1.71 – 2.72) females were sedentary, a mean of 1.6 ±1.8 (95% CI: 1.30 – 2.08) females were walking, a mean of 1.1 ±1.4 (95% CI: 0.83 – 1.45) females were engaging in vigorous activity, and a mean of 2.8 ±2.3 (95% CI: 2.34 – 3.32) females were in MVPA. The most frequently observed activity at among females at School 9 was "no specific activity" (38.5%). The second most frequently observed activity was climbing or sliding (25.3%). The third most frequently observed activity was "none of the other" (24.2%), followed by tag or chasing games (9.9%) and soccer or football (2.2%). The area where the largest percentage of females at School 9 engaged in MVPA was Area-19 (86.67%), followed by Area-9 (85.71%), Area-22 (84.0%), Area-15 (83.33%), Area-17 (83.27%), Area-20 (73.81%), Area-3 (69.05%), Area-10 (68.13%), Area-25 (67.86%), Area-6 (59.29%), Area-21 (57.36%), Area-24 (56.11%), Area-8 (54.44%) and Area-23 (50.0%)[14]. Females engaged in tag or chasing games in Area-19, Area-15 and Area-3; climbing or sliding in Area-9, Area-17, Area-20 and Area-6; "none of the other" activities in Area-22, Area-10, Area-21 and Area-24; no specific activity in Area-25 and Area-8; and no specific activity and tag or chasing games in Area-23.

[14] Areas where less than 50.0% of children were in MVPA are not reported for School 9.

School 10:

A mean of 60.85% ±31.54 (95% CI: 53.64 – 68.05) of the children observed at School 10 engaged in MVPA. A mean of 3.8 ±3.9 (95% CI: 2.90 – 4.72) children were sedentary, a mean of 3.9 ±4.3 (95% CI: 2.98 – 4.98) children were walking, a mean of 2.4 ±3.1 (95% CI: 1.75 – 3.21) children were engaging in vigorous activity, and a mean of 6.4 ±6.1 (95% CI: 5.06– 7.87) children were in MVPA. Children were in areas with supervision a mean of 35.2% of the time. During observation children were engaging in organized play 0.8% of the time and were using equipment 12.5% of the time. The most frequently observed activity at School 10 was “no specific activity” (41.7%). The second most frequently observed activity was “none of the other” (29.8%). The third most frequently observed activity was climbing or sliding (11.4%), followed by soccer or football (9.2%), basketball or volleyball (4.2%) and tag or chasing games (3.7%). The area where the largest percentage of children at School 10 engaged in MVPA was Area-4 (90.0%), followed by Area-1 (80.0%), Area-6 (76.3%), Area-5 (69.44%), Area-2 (68.12%), Area-3 (61.82%), Area-8 (44.79%), and Area-7 (8.33%). Children engaged in basketball activities while in Area-4; no specific activity and basketball activities in Area-1; no specific activities and soccer and football in Area-6; no specific activities in Area-5, Area-8 and Area-7; “none of the other” activities in Area-2; and no specific activities, “none of the other” activities and climbing or sliding in Area-3.

There were a total of eight Target Areas at School 10. Area-1 was a 500 square-foot half-court basketball court with one basketball hoop. The ground surface was primarily cement. Area-2 was approximately 1,500 square-feet in size and was a play space with eight swings and one balance beam. The ground surface was primarily woodchips and dirt secondarily. Area-3 was approximately 1,500 square-feet in size and was a play space with one climbing apparatus, one slide and eight swings. The ground surface was primarily woodchips and dirt secondarily. Area-4 was a 500 square-foot half-court basketball space with one basketball hoop. The ground surface was primarily dirt. Area-5 was approximately 3,000 square-feet in size and was a walking trail. The ground surface was primarily woodchips and dirt secondarily. Area-6 was approximately 6,000 square-feet in size and was a general open space with. The ground surface was primarily grass and dirt secondarily. Area-7 was approximately 100 square-feet in size and was a general open space with one picnic table. The ground surface was primarily cement. Area-8 was approximately 2,000 square-feet in size and was a general open space with. The ground surface was primarily grass and dirt secondarily. None of the Target Areas at School 10 had permanent area overlap improvements.

A mean of 60.05% $\pm$36.31 (95% CI: 51.46 – 68.65) of the males observed at School 10 engaged in MVPA. A mean of 2.1 $\pm$2.5 (95% CI: 1.60 – 2.79) males were sedentary, a mean of 2.5 $\pm$3.5 (95% CI: 1.71 – 3.38) males were walking, a mean of 1.5 $\pm$2.0 (95% CI: 1.01 – 1.99) males were engaging in vigorous activity, and a mean of 4.0 $\pm$4.4 (95% CI: 2.99 – 5.11) males were in MVPA. The most frequently observed activity at among males at School 10 was “no specific activity” (42.3%). The second most frequently observed activity was “none of the other” (23.9%). The third most frequently observed activity was soccer or football (11.3%), followed by climbing or sliding (8.5%) and basketball or volleyball (8.5%) equally, and tag or chasing games (5.6%). The area where the largest percentage of males at School 10 engaged in MVPA was Area-4 (90.0%), followed by Area-5 (80.0%), Area-6 (76.5%), Area-1 (66.67%), Area-2

(63.15%), Area-3 (59.93%), Area-8 (49.23%), and Area-7 (8.3%). Males engaged in basketball activities while in Area-4; no specific activity in Area-5; soccer or football in Area-6; no specific activity and basketball in Area-1, Area-8 and Area-7; "none of the other" activities in Area-2; and no specific activity, climbing or sliding and "none of the other" activities in Area-3.

A mean of 58.60% ±36.30 (95% CI: 48.88 – 66.08) of the females observed at School 10 engaged in MVPA. A mean of 2.3 ±2.4 (95% CI: 1.71 – 3.03) females were sedentary, a mean of 2.1 ±2.4 (95% CI: 1.53 – 2.82) females were walking, a mean of 1.4 ±1.9 (95% CI: 0.93 – 1.99) females were engaging in vigorous activity, and a mean of 3.6 ±3.6 (95% CI: 2.65 – 4.62) females were in MVPA. The most frequently observed activity at among females at School 10 was "no specific activity" (41.1%). The second most frequently observed activity was "none of the other" (35.7%). The third most frequently observed activity was climbing or sliding (14.3%) followed by soccer or football (7.1%) and tag or chasing games (1.8%). The area where the largest percentage of females at School 10 engaged in MVPA was Area-2 (74.63%), followed by Area-6 (72.86%), Area-5 (66.67%), Area-3 (66.15%) and Area-8 (31.48%). Females engaged in "none of the other" activities while in Area-2; no specific activity in Area-6, Area-5 and Area-8; and climbing or sliding and "none of the other" activities in Area-3.

School 11:

A mean of 50.76% ±37.14 (95% CI: 43.31 – 58.21) of the children observed at School 11 engaged in MVPA. A mean of 3.3 ±3.6 (95% CI: 2.66 – 4.13) children were sedentary, a mean of 3.0 ±3.8 (95% CI: 2.28 – 3.84) children were walking, a mean of

1.1 ±1.6 (95% CI: 0.84 – 1.52) children were engaging in vigorous activity, and a mean of 4.2 ±4.7 (95% CI: 3.29– 5.19) children were in MVPA. Children were in areas with supervision a mean of 43.5% of the time. During observation children were engaging in organized play 1.9% of the time and were using equipment 14.3% of the time. The most frequently observed activity at School 11 was "no specific activity" (48.0%). The second most frequently observed activity was "none of the other" (15.7%). The third most frequently observed activity was climbing or sliding (11.6%), followed by soccer or football (9.4%), basketball or volleyball (8.8%), tag or chasing games (4.4%) and sedentary games or activities (2.0%). The area where the largest percentage of children at School 11 engaged in MVPA was Area-11 (90.59%), followed by Area-10 (74.7%), Area-3 (74.29%), Area-8 (66.67%), Area-7 (45.2%), Area-5 (41.52%), Area-4 (40.48%), Area-2 (31.02%), Area-6 (37.78%), Area-1 (28.45%) and Area-9 (4.9%). Children engaged in basketball while in Area-11; no specific activities and soccer or football in Area-10, Area-5 and Area-4; "none of the other" activities in Area-3; climbing or sliding in Area-8; no specific activities in Area-7; no specific activities and climbing or sliding in Area-2 and Area-6; no specific activities and sedentary games or activities in Area-1; and no specific activities and tag or chasing games in Area-9.

There were 11 Target Areas at School 11. Area-1 was approximately 2500 square-feet in size and was a play space with one climbing apparatus and two exercise stations. The ground surface area was primarily woodchips and dirt secondarily. Area-2 was approximately 450 square-feet in size and was a play space with nine things to climb on or hang from. The ground surface area was primarily woodchips and dirt secondarily. Area-3 was approximately 600 square-feet in size and was a play space with eight swings. The ground surface area was primarily woodchips and dirt secondarily. Area-4 was approximately 150 square-feet in size and was a play space with five climbing apparatus. The ground surface area was primarily woodchips and dirt secondarily. Area-5 was approximately 350 square-feet in size and was a play space with. The ground surface area was primarily woodchips and dirt secondarily. Area-6 was approximately 200 square-feet in size and was a play space with one climbing apparatus. The ground surface area was primarily woodchips and dirt secondarily. Area-7 was approximately 450 square-feet in size and was a play space with one exercise station and eight swings. The ground surface area was primarily woodchips and dirt secondarily. Area-8 was approximately 300 square-feet in size and was a play space with one slide with one pavilion and eight picnic tables. The ground surface area was primarily woodchips and dirt secondarily. Area-9 was approximately 500 square-feet in size and was a general open space. The ground surface area was primarily cement. Area-10 was approximately 7,000 square-feet in size and was a general open space. The ground surface area was primarily grass and dirt secondarily.Area-11 was a 1,000 square-foot basketball court (two half-courts) with two basketball hoops. The ground surface was primarily cement. None of the Target Areas at School 11 had permanent area overlap improvements.

A mean of 58.66% $\pm$37.67 (95% CI: 49.40 – 67.92) of the males observed at School 11 engaged in MVPA. A mean of 2.0 $\pm$2.3 (95% CI: 1.50 – 2.68) males were sedentary, a mean of 2.4 $\pm$3.0 (95% CI: 1.68 – 3.19) males were walking, a mean of 0.9 $\pm$1.2 (95% CI: 0.66 – 1.27) males were engaging in vigorous activity, and a mean of 3.3 $\pm$3.4 (95% CI: 2.52 – 4.22) males were in MVPA. The most frequently observed activity at among males at School 11 was “no specific activity” (37.9%). The second most frequently observed activity was “none of the other” (15.2%) and climbing or sliding (15.2%) equally; followed by basketball or volleyball (13.6%), soccer or football (12.1%) and tag or chasing games (6.1%). The area where the largest percentage of males at School 11 engaged in MVPA was Area-11 (90.1%), followed by Area-10 (75.41%), Area-8 (66.67%), Area-7 (57.92%), Area-6 (56.67%), Area-4 (50.0%), Area-1 (30.41%), Area-2 (30.0%), Area-5 (16.67%) and Area-9 (11.11%). Males engaged in basketball activities while in Area-11; soccer or football in Area-10; climbing or sliding in Area-8, Area-6 and Area-4; no specific activities in Area-7, Area-1, Area-5 and Area-9; and no specific activities and climbing or sliding activities in Area-2.

A mean of 43.25% ±38.99 (95% CI: 34.21 – 52.28) of the females observed at School 11 engaged in MVPA. A mean of 2.6 ±2.5 (95% CI: 2.05 – 3.21) females were sedentary, a mean of 1.8 ±2.5 (95% CI: 1.28 – 2.46) females were walking, a mean of 0.7 ±1.4 (95% CI: 0.36 – 1.03) females were engaging in vigorous activity, and a mean of 2.5 ±3.3 (95% CI: 1.79 – 3.38) females were in MVPA. The most frequently observed activity at among females at School 11 was “no specific activity” (58.1%). The second most frequently observed activity was “none of the other” (16.2%). The third most frequently observed activity was climbing or sliding (8.1%) followed by soccer or football (6.8%), basketball or volleyball (4.1%) and sedentary games or activities (4.1%) equally, and tag or chasing games (2.7%). The area where the largest percentage of females at School 11 engaged in MVPA was Area-3 (73.46%), followed by Area-10 (56.84%), Area-7 (49.96%), Area-4 (40.0%), Area-5 (32.14%), Area-1 (27.91%), Area-2 (27.3%) and Area-9 (4.0%). Females engaged in “none of the other” activities while in Area-3; no specific activities and soccer or football in Area-10; no specific activities in Area-7, Area-4 and Area-9; no specific activities and climbing or sliding in Area-5 and Area-2; and no specific activities and sedentary activities in Area-1.

Built Environment Data Analyses

Violations of Statistical Assumptions and Outliers

An exploratory analysis was initially conducted to evaluate the univariate and bivariate distributions of the data to identify violations in statistical assumptions for the planned analysis, to identify univariate and multivariate outliers, and to evaluate the amount and pattern of missing data.

Violations of Statistical Assumptions

The assumption of normality was not violated. The assumption of homogeneity of variance was not violated for the presence and quality of features of the built environment or for the presence and quality of incivilities of the built environment. However, homogeneity of variance was violated for the presence and quality of amenities of the built environment. This violation combined with the small sample size (n = 10) was of great concern to the investigator One option to remedy this violation and to avoid a Type I error is to use untransformed variables with a more stringent alpha level; in this instance the investigator will set the significance level a posteriori at an alpha level of $p < 0.01$ (Appendix A; Table 6).

Outliers

Box plots of each of the three elements of the school built environment revealed outliers on the presence and quality of the features assessed using the PARA. There were three physical activity resources that received a rating above the hinge on the presence and quality on the features of the school built environment. The outdoor resource at School 3 (District 1) and an outdoor resource each at School 8 and School 10 (District 3) received an extreme score on the presence and quality of features of the school built environment. The investigator decided to retain the outliers because there is no demonstrable proof indicating that they are truly atypical and not representative of the sample.

Missing Data

There are no missing data for any of the school built environment observations on any of the school built environment variables included in the analyses.

<u>The School Built Environment Descriptive Data</u>

The built environment was assessed using a descriptive and quantifiable instrument, the PARA. The PARA was used to assess the quantity and quality of features, amenities and incivilities of various physical activity resources present at each school. The PARA was used to assess both indoor and outdoor recreational facilities and resources. The results of the PARA are reported in the following order: 1) a description of the built environment including the entire sample, by district and by individual school level, and 2) analysis of the dependent variables using ANOVA.

The School Built Environment

Ten of the schools in this investigation had a minimum of one indoor and one outdoor physical activity resource. One school had one outdoor resource, but no indoor resource. Two of the schools each had two indoor facilities and one outdoor resource. All of the physical activity facilities and resources in this instigation were located on public school property and were free to all students during school hours. None of the outdoor facilities were accessible after school hours and only the indoor facilities that had a basketball court were open after school hours for school or town sport league events. The size of each facility varied among small (1/2 square block), medium (greater than ½ square block up to one square block) and large (greater than one square block). There were six indoor facilities that were small, six indoor facilities that were medium and no indoor facilities that were large. There were four small, three medium and four large outdoor resources. Only one outdoor resource had a sign posting the hours of the facility and six resources had signs posted with rules (one outdoor and five indoor; Appendix A; Table 16).

Only one outdoor facility had a baseball field. The baseball field was rated as mediocre; the surface of the field was uneven, slightly unsafe, there was no overhead lighting or benches for dugouts, and/or some fencing existed but were not 100% intact. Eighteen of the facilities had a basketball court. Eleven of the outdoor facilities had a basketball court and seven of the indoor facilities had a basketball court. Six of the outdoor basketball courts were rated as poor; court of hoop was in very bad condition and almost unstable. Five of the outdoor basketball courts were rated as mediocre; the hoop was missing a net, the rim was bent, or the court had cracks or weeds. One of the indoor basketball courts was rated as poor and two were rated as mediocre. Four of the indoor basketball courts were rated as good; the hoop was straight and had a net or chain, and the court was playable. Two facilities had volleyball courts. One of the outdoor facilities had a volleyball court rated as poor; the playing surface had debris or crack or bumps, the net was unusable or missing. One of the indoor facilities had a volleyball court that was also rated as poor. None of the outdoor or indoor facilities had a soccer field or tennis courts (Appendix A; Table 17a).

Eleven the outdoor facilities had play equipment and none of the indoor facilities had play equipment. One of the outdoor facilities had play equipment that was rated as poor; several pieces were in need of major repair and were unstable, there was a lot of trash and/or the ground is overgrown or barren. Four of the outdoor facilities had play equipment that was rated as mediocre; was in need of some minor repair, there was some trash, and/or the ground needed some improvement. Six of the outdoor facilities had play equipment that was rated as good; was in good condition, had a variety of pieces, the ground was in good condition, well-kept and clean. Five of the facilities had exercise stations; two outdoor facilities had exercise stations and three indoor facilities had exercise stations. Both of the outdoor facilities and one of the indoor facilities with exercise stations were rated as good; the stations themselves were in good condition and safe, there were five or more stations with a safe path in between them. Two of the indoor facilities with exercise stations were rated as poor; four or more stations needed repair and were not safe to use, there was no signage or poor signage for several stations, and/or the path between stations was unsafe. Two of the outdoor facilities had a trail that could be used for walking, running and/or biking. One of facilities had a trail that was rated as mediocre; the surface in some places was uneven or in need of minor repair and had few hazards or avoidable debris. One of the facilities had a trail that was rated as good; the surface was smooth and without unmarked hazards or debris and/or had signage for users. Four outdoor facilities had sidewalks in or around the play area. Two of the outdoor facilities had sidewalks that were rated as poor; the sidewalk had major damage, was in need of repair and was almost unusable. Two of the outdoor facilities had sidewalks that were rated as mediocre; the sidewalk had some debris, cracks or uneven surfaces but was otherwise useable. None of the indoor or outdoor facilities had a, pool or wading pool, sandbox, or bike rack (Appendix A; Table 17b).

Twenty-three of the facilities (indoor and outdoor) had access points. Eleven of the outdoor facilities had access points and 12 of the indoor facilities had access points. Three of the outdoor facilities had an access point rated as poor; appears to be potentially unsafe, ill kept and not well marked. Six of the outdoor facilities had access points that were rated as mediocre; not all access points were clearly marked, had trash or overgrown grass. Two of the outdoor facilities had access points rated as good; the access was clearly visible, safe, free of debris or overgrown grass and if gated was functioning properly. Seven of the indoor facilities had access points rated as poor, four were rated as mediocre and one was rated as good. Two of the outdoor facilities had lighting rated as mediocre; the lights were usable but in need of minor repair, were partially clean and adequate for safety. None of the outdoor or indoor facilities had landscaping or a decorative fountain (Appendix A; Table 18a).

Four of the indoor facilities had accessible bathrooms rated as poor; the bathroom was not clean or well-stocked and/or more than 50% of the fixtures were in need of repair. Four of the indoor facilities had showers or locker rooms rated as poor; the areas were unclean, may not have been well lit, had inadequate dressing space and/or plumbing was unusable. Five of the indoor facilities had a drinking fountain. One of the indoor facilities had a drinking fountain rated as poor; either most or the entire fountain was broken. Three of the indoor facilities had drinking fountains rated as mediocre; at least one of the total fountains was not in working condition. One of the indoor facilities had a drinking fountain rated as good; the fountain was in working condition and was clean with a clean surrounding area. Fifteen facilities had trash containers. Six outdoor facilities had trash containers. One outdoor facility had trash containers rated as poor; the container was unclean and/or in poor condition and was overflowing with trash. One outdoor facility had a trash container rated as mediocre; the container was partially clean or was in less than perfect condition and/or was unstable. Four outdoor facilities had trash containers rated as good; the exterior was clean and were scattered throughout with no overflowing trash. None indoor facilities had trash containers. Nine indoor facilities had trash containers. Three indoor facilities had trash containers rated as poor, five were rated as mediocre and one was rated as good (Appendix A; Table 18b).

Three of the outdoor facilities each had one shelter rated as good; the structure was intact and provided protection from weather and contained clean seating and tables. Three of the outdoor facilities had picnic tables. One of the facilities had shaded picnic tables rated as mediocre; tables are usable, need minor repair or are partially clean. Two of the facilities with shaded picnic tables were rated as good; the tables were sturdy and in good, cleanly condition. Two outdoor facilities had picnic tables not shaded that were rated as good. Ten of the facilities had benches. There were a total of 26 benches; there were 21 outdoor benches and seven indoor benches. Three of the outdoor benches were rated as mediocre and 18 were rated as good. Two of the indoor benches were rated as poor, four were rated as mediocre and one was rated as good (Appendix A; Table 18c).

Six facilities had auditory annoyance present. Three outdoor facilities had auditory annoyance where the sound was not irritating and was hardly noticeable. Two indoor facilities had audio annoyance where the sound was noticeable and interfered with enjoyment of the resources. One of the indoor facilities had audio annoyance where the sound was noticeable and unpleasant and the reaction was to leave the area. Eight outdoor facilities had areas of no grass. Four outdoor facilities had small areas of no grass and four outdoor facilities had a moderate potion of the area without grass. Two outdoor facilities had areas of overgrown grass. One outdoor facility had a large, very noticeable area of overgrown grass that was obstructing equipment and one outdoor facility had an area of overgrown grass that was hardly noticeable. None of the facilities had signs of alcohol or substance abuse, or sex paraphernalia (Appendix A; Table 19a).

Eleven facilities had litter present. Seven outdoor facilities had litter present. Two outdoor facilities had between five and ten trash items scattered on the ground. Five outdoor facilities had more than 11 trash items on the ground. Four indoor facilities had trash on the ground. Four of the indoor facilities had litter that consisted of between five and ten trash items on the ground. One outdoor facility had a small amount of graffiti.

One of the outdoor facilities had one unattended dog present. None of the facilities had dog refuse, broken glass, or vandalism (Appendix A; Table 19b).

PARA: District 1

District 1 had nine physical activity resources; four outdoor facilities and five indoor facilities. Two of the outdoor and three of the indoor facilities were small, and two of the outdoor and two of the indoor facilities were medium. None of the facilities had signs posted with hours and two of the indoor facilities had signs posted with rules (Appendix A; Table 16). One outdoor facility in District 1 had a baseball field rated as mediocre; the surface of the field was uneven, slightly unsafe, no overhead lighting and benches for dugouts, some fencing existed but were not 100% intact. Seven of the facilities in District 1 had a basketball court. Four of the outdoor facilities had a basketball court and three of the indoor facilities had a basketball court. Three of the outdoor facilities had basketball courts rated as poor and one rated as mediocre. One of the indoor facilities had a basketball court rated as poor and two rated as mediocre. None of the facilities in District 1 had a soccer field, tennis court, or volleyball court (Appendix A; Table 17a). Four of the outdoor facilities had play equipment; two were rated as mediocre and two were rated as good. Three of the indoor facilities had exercise stations; two rated as poor and one rated as good. None of the facilities in District 1 had a walking/biking trail. Two of the outdoor facilities in District 1 had sidewalks. One outdoor facility had sidewalks rated as poor and one rated as mediocre. None of the facilities in District 1 had a pool or wading pool, sandbox, or bike rack (Appendix A; Table 17b).

Nine facilities in District 1 had access points; four outdoor facilities and five indoor facilities. Two of the outdoor facilities and five of the indoor facilities had access points rated as poor. Two of the outdoor facilities had access points rated as mediocre. Two of the outdoor facilities had lighting rated as mediocre. None of the facilities had in District 1 had landscaping or a decorative fountain (Appendix A; Table 18a). Two indoor facilities had bathrooms rated as poor. Three indoor facilities had a locker-room/shower all rated as poor. One indoor facility had a drinking fountain rated as mediocre. Five facilities had trash containers. One outdoor facility had trash containers rated as mediocre. Four indoor facilities had trash containers; two were rated as poor one rated as poor and two were rated as mediocre (Appendix A; Table 18b). There were a total of four benches in District 1; one outdoor bench rated as good and three indoor benches, one rated as poor and two rated as mediocre. None of the facilities in District 1 had a shelter or picnic tables (Appendix A; Table 18c).

One indoor facility in District 1 had auditory annoyance that was noticeable. Three outdoor facilities had areas of no grass. Two outdoor facilities had a small area of no grass and one outdoor facility had a moderate area of no grass (Appendix A; Table 19a). Five facilities had litter. Two outdoor facilities had litter; one outdoor facility had several trash items on the ground (5-10 items) and one outdoor facility had many trash items on the ground (greater than 11). Three indoor facilities had several trash items on the ground (5-10 items). One outdoor facility had a small amount of graffiti (Appendix A; Table 19b). None of the facilities in District 1 had areas of overgrown grass, evidence of alcohol or substance use, sex paraphernalia, broken glass, unattended dogs or dog refuse, broken glass, or vandalism.

PARA-District 2

District 2 had six physical activity resources; four outdoor facilities and five indoor facilities. Two outdoor facilities and two indoor facilities were small. One outdoor facility and one indoor facility were medium. None of the facilities had signs posted with hours, and one outdoor and one indoor facility had signs posted with rules (Appendix A; Table 16). Four facilities had a basketball court. Three outdoor facilities had a basketball court rated as poor and one indoor facility had a basketball court rated as good. One outdoor and one indoor facility each had a volleyball court rated as poor (Appendix A; Table 17a). Three outdoor facilities had play equipment; one facility had play equipment rated as poor, one mediocre and one good. None of the facilities on District 2 had a baseball field, soccer field, a tennis court, exercise stations, or an outdoor walking/biking trail. One outdoor facility had a sidewalk rated as poor. None of the facilities on District 2 had a pool or wading pool, sandbox or bike rack (Appendix A; Table 17b).

Six of the facilities in District 2 had access points; three outdoor facilities and three indoor facilities had access points. One of the outdoor access points was rated as poor and two of the outdoor access points were rated as mediocre. One indoor facility had an access point rated as poor and two were rated as mediocre. None of the facilities on District 2 had outdoor lighting, landscaping, or a decorative fountain (Appendix A; Table 18a). One indoor facility had a locker-room rated as poor. Two indoor facilities had a drinking fountain; one rated as poor and rated as mediocre. One indoor facility had a drinking fountain rated as poor. Four facilities had trash containers. One outdoor facility had a trash container rated as poor. Three indoor facilities had trash containers; one was rated as poor and two were rated as mediocre (Appendix A; Table

18b). One indoor facility had one bench rated as poor. None of the facilities in District 2 had a bathroom, a shelter, picnic tables (shaded or not shaded), or outdoor benches (Appendix A; Table 18c).

Two facilities in District 2 had auditory annoyances. One of the outdoor facilities had auditory annoyance that was noticeable and interfered with enjoyment of the resources. One indoor facility had auditory annoyance that was noticeable but not irritating. Two outdoor facilities had areas of no grass; one facility had a small area of no grass and one facility had a moderate area of no grass. Two outdoor facilities had areas of overgrown grass; one had a moderate and noticeable amount of overgrown grass and one had a very noticeable amount of overgrown grass that may have been obstructing some equipment. None of the facilities in District 2 had evidence of alcohol or substance abuse or sex paraphernalia (Appendix A; Table 19a). Four facilities had litter. Three outdoor facilities had litter; one facility had several items of trash on the ground (5-10 items) and two facilities had many items of trash on the ground (greater than 11). One indoor facility had several items of trash on the ground (5-10 items). None of the facilities in District 2 had evidence of graffiti, dogs unattended or dog refuse, broken glass, or vandalism (Appendix A; Table 19b).

PARA-District 3

District 3 had eight physical activity resources; four large outdoor facilities and one small and three medium indoor facilities. One of the outdoor facilities had a sign posted with hours and two outdoor facilities had signs posted with rules (Appendix A; Table 16). Seven facilities in had a basketball court. Four outdoor facilities had a basketball court rated as good. Three indoor facilities had a basketball court rated as good. None of the facilities in District 3 had a baseball field, soccer field, tennis court or volleyball court (Appendix A; Table 17a). Four outdoor facilities had play equipment; one outdoor facility had play equipment rated as mediocre and three outdoor facilities had play equipment rated as good. Two outdoor facilities had exercise stations rated as good. None of the facilities in District 3 had indoor exercise stations. Two outdoor facilities had a walking or biking trail. One outdoor trail was rated as mediocre and one was rated as good. One of the outdoor facilities had a sidewalk rated as mediocre. None of the facilities in District 3 had a pool or wading pool, sandbox or bike rack (Appendix A; Table 17b).

Eight of the facilities in District 3 had access points. Four outdoor facilities had access points; two were rated as mediocre and one rated as good. Four indoor facilities had access points; one rated and poor, two rated as mediocre, and one rated as good. None of the facilities in District 3 had outdoor lighting, landscaping or a decorative fountain (Appendix A; Table 18a). Two indoor facilities had bathrooms rated as poor. Two indoor facilities had a drinking fountain; one rated as poor and one rated as mediocre. Six facilities had trash containers; four outdoor facilities had trash containers and two indoor facilities had trash containers. All four of the outdoor trash containers were rated as good and one indoor facilities trash containers were rated as mediocre and one rated as good. None of the facilities in District 3 had a shower/locker room (Appendix A; Table 18b).Three facilities had an outdoor shelter rated as good. Three outdoor facilities had shaded picnic tables; one facility had shaded picnic tables rated as mediocre and two facilities had shaded picnic tables rated as good. Two outdoor facilities had picnic tables that were not shaded rated as good. There were a total of 21 benches in District 3; 20 outdoor benches and three indoor benches. Three of the outdoor benches were rated as mediocre and 17 were rated as good. Two of the indoor benches were rated as mediocre and one was rated as good (Appendix A; Table 18c).

Three facilities in District 3 had auditory annoyance. Two outdoor facilities had auditory annoyance that was not irritating and was hardly noticeable. One indoor facility had auditory annoyance that was noticeable and unpleasant. Three outdoor facilities had areas of no grass; two facilities had a moderate portion of an area with no grass and one facility had a small area with no grass. None of the facilities in District 3 had overgrown grass, evidence of alcohol or substance use, sex paraphernalia (Appendix A; Table 19a). Two outdoor facilities had litter with many items of trash on the ground (more than 11 items). One outdoor facility had one dog that was unattended. None of the facilities in District 3 had indoor litter, graffiti, dog refuse, broken glass, or vandalism (Appendix A; Table 19b).

PARA-School 1

School 1 (District 1) had two physical activity resources; one medium outdoor facility and one medium indoor facility. Neither the outdoor or indoor facilities had signs posting hours or rules (Appendix A; Table 20). School 1 had two basketball courts; one outdoor basketball court rated as poor and one indoor basketball court rated as mediocre. School 1 did not have a baseball field, soccer field, tennis court or a volleyball court (Appendix A; Table 21a). The outdoor facility had play equipment rated as mediocre. There were no exercise stations (outdoor or indoor), or a walking/biking trail.

There were no sidewalks, no pool or wading pool, sandbox, or bike rack (Appendix A; Table 21b). The outdoor and indoor facilities had poor access points. There was no outdoor lighting, landscaping or decorative fountain (Appendix A; Table 22a). There was one indoor trash container rated as mediocre. There were no bathrooms, shower/locker room, drinking fountain or outdoor trash containers (Appendix A; Table 22b). The indoor facility had two benches rated as mediocre. There were no shelters, picnic tables (shaded or not shaded), and no outdoor benches (Appendix A; Table 22c). School 1 had one small area of no grass. There was no auditory annoyance (outdoor or indoor), areas of no grass, evidence of alcohol or substance abuse or sex paraphernalia (Appendix A; Table 23a). The indoor facility had five to ten items of litter. There was no outdoor litter, graffiti, dogs unattended, dog refuse, broken glass or vandalism (Appendix A; Table 22b).

PARA-School 2

School 2 (District 1) had two physical activity resources; one small outdoor facility and one small indoor facility. There was one indoor sign with rules (Appendix A; Table 20). There were two basketball courts; one outdoor court rated as poor and one indoor court rated as good. School 2 did not have a baseball field, soccer field, tennis court or a volleyball court (Appendix A; Table 21a). There was outdoor play equipment rated as mediocre and indoor exercise stations rated as good. There was no outdoor walking/biking trail. School 2 did not have sidewalks (indoor or outdoor), a pool or wading pool, sandbox, bike rack (Appendix A; Table 21b). The outdoor and indoor facilities both had poor access points. There was outdoor lighting rated as mediocre.

There was no landscaping or a decorative fountain (Appendix A; Table 22a). There was one bathroom rated as poor and one shower/locker room rated as poor. The indoor facility had one drinking fountain rated as mediocre and two indoor trash containers rated as mediocre (Appendix A; Table 22b). There were two indoor benches rated as mediocre. School 2 did not have an outdoor shelter, picnic tables (shaded and not shaded) or outdoor benches (Appendix A; Table 22c). The outside facility had one small area of no grass. There was no auditory annoyance (outdoor or indoor), overgrown grass, evidence of alcohol or substance use or sex paraphernalia (Appendix A; Table 23a). There was no litter (outdoor or indoor), graffiti, vandalism, broken glass, unattended dogs or dog refuse (Appendix A; Table 23b).

PARA-School 3

School 3 (District 1) had two physical activity resources; one outdoor facility was rated as mediocre and one indoor facility rated as poor. The outdoor facility had one sign posting the rules (Appendix A; Table 20). School 3 had one baseball field rated as mediocre and one outdoor basketball court rated as mediocre. School 3 did not have an indoor basketball court, soccer field, tennis court or a volleyball court (Appendix A; Table 21a). The outdoor facility had play equipment rated as good and indoor exercise stations rated as poor. There was no outdoor walking/biking trail. The outdoor facility did not have sidewalks, a pool or wading pool, sandbox or a bike rack (Appendix A; Table 21b). The outdoor and indoor facilities each had an access point rated as poor. The outside facility had lighting rated as mediocre. There was no landscaping or decorative fountain (Appendix A; Table 22a). There were three trash containers; two outdoor trash containers rated as mediocre and one indoor trash container rated as poor. There were no bathrooms, shower/locker rooms or drinking fountains (Appendix A; Table 22b). There were two outdoor benches rated as good. There were no indoor benches, shelters or picnic tables (Appendix A; Table 22c). There was no auditory annoyance, areas of no grass or overgrown grass, evidence of alcohol use or substance use or sex paraphernalia (Appendix A; Table 23a). There were many trash items (more than 11 items) on the ground around the outdoor facility and there was a small amount of outdoor graffiti. There were no dogs unattended or dog refuse, broken glass or vandalism (Appendix A; Table 23b).

PARA-School 4

School 4 (District 1) had three physical activity resources; one small outdoor resource and two indoor resources, one small and one medium. There was no outdoor or indoor signage posting hours or rules (Appendix A; Table 20). School 4 had two basketball courts; one outdoor court rated as poor and one indoor court rated as good. There were no baseball fields, soccer fields, tennis courts or volleyball courts (Appendix A; Table 21a). The outdoor facility had play equipment rated as good. One of the indoor facilities had exercise stations rated as poor. There was no outdoor walking/biking trail. There was an outdoor sidewalk leading to the outdoor facility rated as poor. School 4 did not have a pool or wading pool, sandbox or a bike rack (Appendix A; Table 21b). Each facility had an access point; the outdoor access point was rated as mediocre and both of the indoor access points were rated as poor. There was no outdoor lighting, landscaping or a decorative fountain (Appendix A; Table 22a). There was one bathroom and two shower/locker rooms both rated as poor. The indoor facility had three trash containers rated as poor. There were no drinking fountains or outdoor trash containers (Appendix A; Table 22b). There was one indoor bench rated as poor. There were no outdoor shelters, picnic tables (shaded or not shaded) or outdoor benches (Appendix A; Table 22c). One of the indoor facilities had auditory annoyance that was irritating and unpleasant. The outdoor facility had one moderate area of no grass. School 4 did not have any areas of overgrown grass, evidence of alcohol or substance use, sex paraphernalia (Appendix A; Table 23a). The outdoor and indoor facilities each had moderate amount of trash on the ground (5-10 items). There was no outdoor graffiti, dogs unattended or dog refuse, broken glass or vandalism (Appendix A; Table 23b).

PARA-School 5

School 5 (District 2) had two physical activity resources; one small outdoor facility and one small indoor facility. There was one indoor sign posting rules (Appendix A; Table 24). The outdoor facility had a basketball court rated as poor and play equipment rated as good. School 5 did not have a baseball field, soccer field, tennis court, volleyball court, exercise stations, an outdoor walking/biking trail, sidewalks, a pool or wading pool, sandbox or bike rack (Appendix A; Table 25a and Table 25b). The outdoor and indoor facilities each had an access point; the outdoor and indoor facilities had an access point rated as mediocre. There was no outdoor lighting, landscaping or decorative fountain (Appendix A; Table 26a). The indoor facility had two trash containers rated as mediocre. School 5 did not have a bathroom, shower/locker room, drinking fountains or outdoor trash containers (Appendix A; Table 26b). There were no outdoor shelters, picnic tables (shaded or not shaded) or outdoor or indoor benches (Appendix A; Table 26c). The indoor facility had auditory annoyance that was noticeable. The outdoor facility had a small area of no grass, a large area with a lot of overgrown grass. There was no evidence of alcohol or substance use or sex paraphernalia (Appendix A; Table 27a). The outdoor facility also had a moderate amount of trash on the ground (5-10 items). There indoor litter, outdoor graffiti, dogs unattended or dog refuse, broken glass or vandalism (Appendix A; Table 27b).

PARA-School 6

School 6 (District 2) had two physical activity resources; one medium outdoor facility and one small indoor facility. There were no signs posted with hours or rules (Appendix A; Table 24). The outdoor facility had a basketball court rated as poor and a volleyball court rated as poor. School 6 did not have a baseball field, indoor basketball court, soccer field, tennis court, indoor volleyball court (Appendix A; Table 25a). There was outdoor play equipment rated as poor. There were no exercise stations or a walking/biking trail. There was one sidewalk outside rated as poor. There was no pool or wading pool, sandbox or bike rack (Appendix A; Table 25b). There were two access points; one outdoor rated as poor and one indoor rated as mediocre. School 6 did not have any outdoor lighting, landscaping or decorative fountain (Appendix A; Table 26a). The indoor facility had one drinking fountain rated as mediocre and one indoor trash container rated as mediocre. There were no bathrooms, shower/locker rooms or trash containers (Appendix A; Table 26b). There were no outdoor shelters, picnic tables (shaded or not shaded) or outdoor or indoor benches (Appendix A; Table 26c). There was some outdoor auditory annoyance that was not considered irritating. School 6 did not have any indoor auditory annoyance, areas of no grass or overgrown grass, evidence of alcohol or substance use or sex paraphernalia (Appendix A; Table 27a). There was a large amount of trash on the ground around the outdoor facility (greater than 11 items); however, there was no indoor litter, outdoor graffiti, dogs unattended or dog refuse, broken glass or vandalism (Appendix A; Table 27b).

PARA-School 7

School 7 (District 2) had two physical activity resources; one small outdoor resource and one medium indoor resource. The outdoor facility had one sign posting rules (Appendix A; Table 24). There were two basketball courts; one outdoor basketball court rated as poor and one indoor basketball court rated as good. There was one indoor volleyball court rated as poor. School 7 did not have a baseball field, soccer field, tennis court or an outdoor volleyball court (Appendix A; Table 25a). The outdoor facility had play equipment rated as mediocre. There were no exercise stations or outdoor walking/biking trail. There were no sidewalks, no pool or wading pool, sandbox or bike rack (Appendix A; Table 25b). The outdoor and indoor facilities had access points rated as poor. There was no outdoor lighting, landscaping or decorative fountain (Appendix A; Table 26a). There was one shower/locker room rated as poor and one drinking fountain rated as poor. There were three trash containers; one outdoor trash container rated as poor and two indoor trash containers rated as poor. There were no bathrooms (Appendix A; Table 26b). There was one indoor bench rated as poor. School 7 did not have an outdoor shelter, picnic tables (shaded or not shaded) or outdoor benches

(Appendix A; Table 26c). The outdoor facility had one moderate area of no grass and one small area with a little bit of overgrown grass. There was no auditory annoyance (outdoor or indoor), evidence of alcohol or substance use or sex paraphernalia (Appendix A; Table 27a). There was outdoor and indoor litter; the outdoor facility had many trash items on the ground (more than 11 items) and the indoor facility had a moderate amount of trash items on the ground (5-10 items). There was no outdoor graffiti, dogs unattended or dog refuse, broken glass or vandalism (Appendix A; Table 27b).

PARA-School 8

School 8 (District 3) had three physical activity resources; one large outdoor facility, one small indoor facility and one medium indoor facility. There was one indoor sign that posted rules (Appendix A; Table 28). There were two basketball courts; one outdoor basketball court rated as mediocre and one indoor basketball court rated as good. School 8 did not have a baseball field, soccer field, tennis court or volleyball court (Appendix A; Table 29a). The outdoor facility had play equipment rated as good, outdoor exercise stations rated as good and an outdoor walking/biking trail rated as good. There was not an outdoor sidewalk, a pool or wading pool, sandbox or bike rack (Appendix A; Table 29b). There were three access points; the outdoor facility had an access point rated as good and the indoor facilities had access points rated as mediocre. School 8 did not have outdoor lighting, landscaping or a decorative fountain (Appendix A; Table 30a). There was one indoor bathroom rated as poor and one drinking fountain rated as good. There were seven trash containers; five outdoor trash containers rated as good and two indoor trash containers rated as good. There was no shower/locker room (Appendix A; Table 30b). The outdoor facility had one shelter rated as good and two picnic tables (not shaded) rated as good. There were a total of 10 benches at School 8; nine outdoor benches rated as good and one indoor bench rated as good (Appendix A; Table 30c). There were both outdoor and indoor auditory annoyances; the outdoor facility had auditory annoyance that was not irritating and one of the indoor facilities had auditory annoyance that was very irritating and unpleasant. The outdoor facility had small areas of no grass. School 8 did not have any areas of overgrown grass, evidence of alcohol or substance use, evidence of sex paraphernalia (Appendix A; Table 31a). There were no areas of litter (outdoor or indoor), outdoor graffiti, dogs unattended or dog refuse, broken glass or vandalism (Appendix A; Table 31b).

PARA-School 9

School 9 (District 3) has one physical activity resource; a large outdoor facility. There is one outdoor sign posted with hours (Appendix A; Table 28). The outdoor facilities had one basketball court rated as mediocre and play equipment rated as good. School 9 does not have a baseball field, soccer field, tennis court, volleyball court (Appendix A; Table 29a). There were no exercise stations or an outdoor walking/biking trail. There was one long sidewalk rated as mediocre connecting several areas of the outdoor facility and the access point was rated as mediocre. School 9 did not have a pool or wading pool, sandbox or a bike rack (Appendix A; Table 29b). There was one outdoor access point rated as mediocre. There was no outdoor lighting, landscaping or decorative fountain (Appendix A; Table 30a). There were nine outdoor trash containers rated as good. There were no bathrooms, shower/locker rooms, drinking fountains or indoor trash containers (Appendix A; Table 30b). The outdoor facility had one shelter rated as good, six picnic tables (shaded) rated as good,14 picnic tables (not shaded) rated as good and six outdoor benches rated as good (Appendix A; Table 30c). There was some outdoor auditory annoyance that was not irritating and one moderate size area of no grass. There were no areas of overgrown grass, evidence of alcohol or substance use or evidence of sex paraphernalia (Appendix A; Table 31a). There were many trash items on the ground (more than 11 items) and one dog that was unattended. There was no graffiti, dog refuse, broken glass or vandalism (Appendix A; Table 31b).

PARA-School 10

School 10 (District 3) had two physical activity resources; one large outdoor resource and one medium indoor resource. There was one indoor sign posting rules (Appendix A; Table 28). There were two basketball courts; one outdoor basketball court rated as mediocre and one indoor basketball court rated as good. School 10 did not have a baseball field, soccer field, tennis court or volleyball court (Appendix A; Table 29a). The outdoor facility had play equipment rated as mediocre, outdoor exercise stations rated as good and an outdoor walking/biking trail rated as mediocre. School 10 did not have an outdoor sidewalk, a pool or wading pool, sandbox or a bike rack (Appendix A; Table 29b). There was one outdoor access point rated as mediocre and one indoor access point rated as poor. There was no outdoor lighting, landscaping or decorative fountain (Appendix A; Table 30a). There was one indoor bathroom rated as poor and a drinking fountain rated as mediocre. There were no showers or locker rooms. There were a total of 10 trash containers; seven outdoor trash containers rated as good and three indoor trash containers rated as mediocre (Appendix A; Table 30b). There were seven shaded picnic tables rated as mediocre and two outdoor benches rated as good. There were two indoor benches rated as mediocre. The outdoor facility did not have a shelter or picnic tables not shaded (Appendix A; Table 30c). The outdoor facility had one small area of no grass. There was no auditory annoyance (outdoor or indoor), areas of overgrown grass, evidence of alcohol or substance use or evidence of sex paraphernalia (Appendix A; Table 31a). The outdoor facility had many trash items on the grounds (greater than 11 items). There was no outdoor graffiti, dogs unattended or dog refuse, broken glass or vandalism (Appendix A; Table 31b).

PARA-School 11

School 11 (District 3) had two physical activity resources; one large outdoor facility and one medium indoor facility. There were no signs posted with hours or rules (Appendix A; Table 28). There were two basketball courts; one outdoor basketball court rated as mediocre and one indoor basketball court rated as good. School 11 did not have a baseball field, soccer field, tennis court or a volleyball court (Appendix A; Table 29a).The outdoor facility had play equipment rated as good. There were no outdoor exercise stations or a walking/biking trail. There was not a sidewalk, a pool or wading pool, sandbox or a bike rack (Appendix A; Table 29b). There were two access points; one outdoor access point rated as good and one indoor access point rated as good. There was no outdoor lighting, landscaping or decorative fountain (Appendix A; Table

30a). The outdoor facility had four trash containers rated as good. School 11 did not have a bathroom, shower/locker room, drinking fountain or indoor trash containers (Appendix A; Table 30b). There was one outdoor shelter rated as good, 12 shaded picnic tables and three outdoor benches rated as mediocre. There were no picnic tables not shaded or indoor benches (Appendix A; Table 30c). There was no auditory annoyance (outdoor or indoor), areas of no grass or overgrown grass, no evidence of alcohol or substance use, no evidence of sex paraphernalia (Appendix A; Table 31a), litter (indoor or outdoor), outdoor graffiti, dogs unattended or dog refuse, broken glass or vandalism (Appendix A; Table 31b).

Analysis of the School Built Environment Dependent Variables

One-way ANOVA was used to determine differences between District 1, District 2 and District 3 on the following school built environment variables: quality of school built environments features, amenities and incivilities. A priori the significance level was set at an alpha level of $p < 0.05$. Following the violation of normality the investigator set the significance level a posteriori at an alpha level of $p < 0.01$.

School Built Environment Features

There was not a significant difference between District 1 and District 2 ($F_{(2, 20)} = 1.488$, $p = 0.626$), District 1 and District 3 ($F_{(2, 20)} = 1.488$, $p = 0.646$), or District 2 and District 3 ($F_{(2, 20)} = 1.488$, $p = 0.222$). The mean score for the presence and quality of the school built environment features for District 1 was 3.88 ± 2.4 (95% CI = 2.028 –

5.749), the mean for District 2 was 2.5 $\pm$ 1.9 (95% CI = 0.427 – 4.572) and for District 3 was 5.12 $\pm$ 3.6 (95% CI = 2.07 – 8.17; Appendix B; Figure B-8).

School Built Environment Amenities

There was a significant difference between District 3 and District 1 ($F_{(2, 20)}$ = 6.77, p = 0.013) and between District 3 and District 2 ($F_{(2, 20)}$ = 6.77, p = 0.01). There was not a significant difference between District 1 and District 2 ($F_{(2, 20)}$ = 6.77, p = 0.933). The mean score for the presence and quality of the school built environment amenities for District 1 was 4.22 $\pm$ 2.9 (95% CI = 1.955 – 6.488), the mean for District 2 was 3.5 $\pm$ 1.8 (95% CI = 1.536 – 5.463) and for District 3 was 10.12 $\pm$ 5.4 (95% CI = 5.536 – 14.713; Appendix B; Figure B-8).

School Built Environment Incivilities

There was not a significant difference between District 1 and District 2 ($F_{(2, 20)}$ = 0.74, p = 0.501), District 1 and District 3 ($F_{(2, 20)}$ = 0.74, p = 0.993), or District 2 and District 3 ($F_{(2, 20)}$ = 0.74, p = 0.579). The mean score for the presence and quality of the school built environment incivilities for District 1 was 2.0 $\pm$ 1.65 (95% CI = 0.725 – 3.274), the mean for District 2 was 3.3 $\pm$ 2.4 (95% CI = 0.791 – 5.875) and for District 3 was 2.12 $\pm$ 2.5 (95% CI = -0.038 – 4.288; Appendix B; Figure B-8).

School Physical Activity Policy: Qualitative Analysis

The qualitative data were reported to identify common themes which emerged from in-depth interviews regarding school physical activity policy at the state, district and school levels. The data reported references the agreement among interviewees at their respective levels and references themes that were identified by some or one interviewee but not by all.

State Level School Physical Activity Policy

Two interviews were conducted with male personnel with the Mississippi Office of Healthy Schools. Both of the interviewees were familiar with Mississippi Senate Bill 2369, “Mississippi Healthy Students Act.” One of the interviewees was familiar with seven specific sections of the bill that pertain to physical activity and the other was familiar with only one. The interviewees agreed on only one aspect regarding the impact of the bill. Both interviewees agreed that strength of the bill was in its two-fold approach. The bill addresses two factors that are known to influence obesity, nutrition and physical activity. Both interviewees provided their perspective on how the bill impacts childhood obesity but their perspectives were different. One interviewee referenced the importance of several other factors: “the home environment is a key factor; our communities, as far as are they walkable or not, plays a key factor; advertising, marketing, all of those things influence childhood obesity.” Both interviewees agreed that an impact of the bill comes through support from the Office of Healthy Schools (2). Teachers have access to lesson plans, Health in Action, as a resource to incorporate physical activity into daily lessons (4). Both interviewees also reported that the state provides health education and physical education trainings for teachers state-wide (2). In addition, it was agreed that physical education did not have to be delivered by a certified physical education teacher and could be delivered by a regular classroom teacher (2).

Lack of funding was identified by both interviewees as a top barrier to implementation of the bill (3). Both interviewees reported that there are no funds that come from the state level specifically for physical activity or physical education implementation (8). Funds are distributed evenly (1) but the way in which funds are used is decided at the local level (2). Both interviewees identified grants (14) as source of funding and both referenced the Bower Foundation specifically (7). Interviewee one was able to identify three other specific sources of funding, was able to comment on how schools utilize grant opportunities and discussed how organizations ensure that grant money is spent appropriately. Only interviewee one commented on state funding for facilities and reported that facilities questions would be more adequately addressed through the facilities department (1). Interviewee one identified four other bill impacts that interviewee two did not identify, and interviewee two identified four other bill impacts that interviewee one did not identify.

Interviewee two commented on the potential variability among districts regarding the way in which the bill was implemented at the district level (9), but interviewee one did not. Both interviewees stated that the implementation of the bill is monitored through the Office of Child Nutrition (8). Both agreed that 30 schools are evaluated per year by reviewing master schedules and includes a needs assessment (2). If the state is notified that there is a problem or is reported for not meeting guidelines specified by the bill then the state goes in and audits the school even if it is not being evaluated during that year (2). There were specifics about the supervision and evaluation process that each of the interviewees commented on that were different. Both of the interviewees cited that there was procedure for schools that do not meet the requirements however, the nature of the procedure varied by interviewee. It was reported by both interviewees that the impact of the bill on obesity is not monitored by regular height and weight measurements of children (2) nor is it required that children be given regular fitness testing (4). Both interviewees commented on the role of the School Health Coordinator (3) but did not identify any similarity as to what that role entailed. Interviewee one commented extensively on the role of the School Wellness Council (5), how the council is monitored (5) and the purpose of the needs assessment (4) but interviewee two did not comment at all.

District Level School Physical Activity Policy

Personnel at each of the three districts were contacted and asked to participate in an in-depth interview. Only two districts provided personnel for the interview. District level interviews were conducted with a representative from District 1 and District 3 but not with District 2. The interviewee from District 1 was a female who was responsible for the district curriculum development. The interviewee from District three was a female and she was the district School Health Coordinator.

Policy was referenced a total of 32 times; 15 times with the District 1 interviewee and 17 times with the District 3 interviewee. Both interviewees were members of Mississippi Association for Health, Physical Education, Recreation and Dance (MAHPRD) and participated in annual professional development. Both interviewees were familiar with Mississippi Senate Bill 2369 “Mississippi Healthy Students Act” (3) and were familiar with the section of the bill that pertains to school vending machine guidelines (2). The interviewee from District 1 was familiar with four other specific sections of the bill too (4). Both of the interviewees were able to provide their perspective of how the bill effects childhood in Mississippi but no two perspectives were the same (15). There was agreement that districts in the state must follow the state mandates (2) but the way in which policy is disseminated was different between the two districts. Both districts reported having a School Wellness Council (4). Neither districts reported having a recess policy at the district level but District 3 reported there are recess policies at the school level (6). Both interviewees agreed that physical education policy was decided at the school level not the district level (2) and neither could recall any policies that might restrict physical activity (2). District 3 reported that there was collaboration with food services to provide a healthy environment as specified in the bill (1) but District 1 did not (1). Policies that support physical activity were mentioned but were different between districts (4). When asked to reference other barriers to physical activity the top response was in regards to academics and MCT test scores (5), followed by funding (1), space (2) and Mississippi weather (1). In regards to evaluation of policy implementation at the school level, District 1 reported that schools are evaluated by the district (2) but District 3 reported that there is no evaluation at the district school by the district (1).

Both interviewees reported having a physical education curriculum (3). District 1 uses the SPARK program (1); it was implemented first in the elementary schools, and then in the middle and high schools in years to follow. Both interviewees reported that the respective districts took advantage of a grant opportunity to adopt a physical education curriculum within the last 3-years (2). District 1 partnered with a local community learning center to write a grant for the SPARK program and District 3 utilized a coordinated school health grant through the Bower Foundation. Both districts reported that physical education curriculum was implemented by certified physical education teachers (2) and that a knowledge component was included in lessons (1) or was gradually being implemented (1). District 3 mentioned the schools in the district also participated in Hoops for Heart (1) and Jump Rope for Heart (1) programs but District 1 was did not participate in any extra programs. Both interviewees reported physical education classes in all of the schools within each district lasted greater than 41 minutes per class (2) and both reported greater than 15-minutes of recess per day (2). There was no set number of days which school are required to offer children physical education but both districts reported that schools are just required to meet 150-minutes of physical activity for children per week (2). The average physical education class size at schools in both districts were reported to be less than 25 students per class (2) and the largest class as being greater than 25 children (2). Both interviewees stated that the facilities within their districts were adequate and maintenance was adequate (3). District 1 reported that they had enough equipment for children to be physically active (1) but also reported equipment that would be useful that they do not currently have (9). District 3 reported having enough equipment but felt that the fourth and fifth graders did not have adequate age-appropriate equipment (3). There were no reported substitutions for physical education in either district (4). Fitness testing was reported as offered once per school year in District 1 and in District 3 was reported to only be given to fifth graders (3).

School Level Physical Activity Policy

Physical education instructors at each of the schools were asked to participate in an in-depth interview with the exception of School 9 because physical education was not offered to children at this school. Physical education instructors from School 1, School 2 and School 3 (District 1) were asked to participate, agreed to participate but when contacted by the principle investigator did not answer the phone and did not agree to reschedule. Therefore, school level interviews were conducted with physical education instructors at School 4 (District 1), School 5, School 6 and School 7 (District 2), and School 8, School 10 and School 11 (District 3). Three of the interviewees were male and four were female. Four reported participating in annual professional development and several reported being a member of a professional organization: MAHPRD (2) and AHPRD (1), and four reported not being affiliated with any organization. Most (4) of the schools have never applied for board certification. One school had applied and was accepted and one school reported plans to apply.

Four interviewees reported not being familiar with Mississippi Senate Bill 2369 “Mississippi Healthy Students Act” and three were familiar with the bill. Five physical education instructors were certain that there district had a School Wellness Coordinator; one said they did not have a School Wellness Coordinator and one was not certain. Four interviewees reported their respective districts had a School Wellness Council, one reported not having a School Wellness council and two reported not knowing. District 2 interviewees reported being under Conservatorship of the State and their physical activity policy came from the district level and interviewee from School 7 cited this as the reason their school did not have a recess policy. The interviewee from School 4

(District 1) had a policy to “just keep the kids moving” and recess was a decision left up to the individual classroom teachers. Two of the interviewees from District 3 reported not having physical education policy at the school level and each of the interviewees from this district reported something different concerning recess. Most (4) of the interviewees reported being evaluated by their school principal. Three interviewees stated that their school did not have any other programs or policies that supported physical education implementation. However, the physical education instructor from School 10 reported four additional programs that supported physical education implementation. When asked about policies that might constrain physical activity while children are at school all three interviewees from District 3 stated they do not have any activity on Tuesday’s and School 5 reported no activity on Friday’s. All stated the reason for these policies were for academic purposes. To facilitate recess both school 10 and School 11 reported providing classroom teachers with recess equipment and games for children to participate in during recess. School 4 reported classroom teachers were deterred from providing children with recess opportunities because that would cut into their planning time.

School 10 was the only interviewee that reported not having a set physical education curriculum but did say the lessons were consistent with Mississippi State Standards. All of the other interviewees reported having a structured curriculum that was consistent with the Mississippi State Standards. Three instructors reported developing lesson plans on their own but also pulling from other resources such as SPARK and Project Fit America. School 4 reported between greater than 25% of physical education classes were cancelled due to academics. All of the other interviewees reported 25% or less were cancelled due to either academics are school assemblies. When asked how many days per week children received physical education there were a variety of responses: once (2), one-to-two days per week (2), two-to-three days per week (1) and School 4 had differences in days per week by grade. School 10 reported physical education classes were scheduled for 40-minutes per class and all of the other interviewees reported greater than 41-minutes per class. School 5 reported recess time was less than 15-minutes per day, while School 10, School 11 and School 8 reported recess time greater than 15-minutes per day. None of the interviewees cited substitutions permitted for physical education except for School 7, substitution was tolerable for academic purposes. When asked about fitness testing there were a variety of responses. Two interviewees reported fitness testing was given two-times per year. Other responses included none (1), none but it is required (1), once (1), twice for fifth grade only (1) and three times (1).

There were many barriers cited regarding challenges instructors faced to encouraging children to be physically active. Three interviewees reported that children feel embarrassed, females lack motivation (2), special needs children incorporated into regular classes is difficult (2), children are too overweight (2), children have mood swings (2), lack of self confidence (2) and are lazy (2). One interviewee reported that there is too much competition in physical education and that discourages some children from participating. Several interviewees reported that children were sometimes withheld from physical activity for behavior (2), not completing academic assignments (3), and two interviewees cited that teachers have forced children to be active as punishment. When asked about other barriers children and teachers are faced with concerning physical activity the most often cited responses were academic priorities (3), time (3), lack of equipment (3) or unsafe and outdated equipment (3), poor facilities or no gymnasium space (3), weather not suitable for outdoor activities (3), shared gym space with middle school and high school students (2), and classroom teachers not incorporating physical activity into regular class time (2). When asked about other facilitators that encourage physical activity the most often cited responses were classroom teachers integrate activity time into the day (5), having ample outdoor space for children to play (3), ample outdoor equipment (3), nice weather (2) and music class (2).

All interviewees reported the average physical education class was less than 25-students per class however, one interviewee reporting having to share gym space with over 50 middle school and high school students. Four interviewees reported the largest class size as greater than 25-students and three reported less than 25-students. When asked about facility space used for physical education several reported using a classroom as space for physical education class (4), had a gymnasium (4), a band hall (1) and school’s football team house (1). Three interviewees reported sharing gym as a problem and two reported not having a gym as a problem. Four interviewees cited that facility maintenance was adequate and two reported maintenance as inadequate, one person did not provide a response. School 7 reported not having equipment necessary for physical education, while all of the other interviewees reported having what was needed but there were always things they could use. Some of the things teachers mentioned as “wish-list” items were dance programs, television for workout DVD’s, tennis equipment, dumbbells, basketball courts and nets, and volleyball equipment. Two schools mentioned that the SPARK program provided the equipment they needed. Three schools mentioned they also had enough equipment for children during recess and two mentioned they did not.

Test of Theoretical Hypotheses

H_{o1}: There is no relationship between the built environment of school recreational spaces and in-school physical activity of children ages 6- through 11-years in the Mississippi Delta.

Fail to reject the null hypothesis; with all schools combined there is not a significant relationship between the presence and quality of the features of the school built environment and the percent of time spent in MVPA during physical education class (r = 0.236; p = 0.512; Appendix A; Table A-32).

Fail to reject the null hypothesis; with all schools combined there is not a significant relationship between the presence and quality of the amenities of the school built environment and the percent of time spent in MVPA during physical education class (r = -0.217; p = 0.547; Appendix A; Table A-32).

Fail to reject the null hypothesis; with all schools combined there is not a significant relationship between the presence and quality of incivilities of the school built environment and the percent of time spent in MVPA during physical education class (r = 0.339; p = 0.338; Appendix A; Table A-32).

H_{O2}: There is no relationship between in-school physical activity and weight status of children ages 6- through 11-years in the Mississippi Delta.

BMI and In-School Physical Activity

Reject the null hypothesis; there is a significant relationship between the percent of time spent in MVPA during physical education class and BMI of children ages 6- through 11-years in the Mississippi Delta (r = 0.629; p = 0.051; Appendix A; Table A-33).

Waist-to-Height Ratio and In-School Physical Activity

Fail to reject the null hypothesis; there was not a significant relationship between the percent of time spent in MVPA during physical education class and waist-to-height ratio of children ages 6- through 11-years in the Mississippi Delta (r = 0.404; p = 0.247; Appendix A; Table A-33).

Waist Circumference and In-School Physical Activity

Fail to reject the null hypothesis; there was not a significant relationship between the percent of time spent in MVPA during physical education class and waist circumference of children ages 6- through 11-years in the Mississippi Delta (r = 0.411; p = 0.238; Appendix A; Table A-33).

Total Body Weight and In-School Physical Activity

Fail to reject the null hypothesis; there was not a significant relationship between the percent of time spent in MVPA during physical education class and total body weight of children ages 6- through 11-years in the Mississippi Delta (*r* = 0.591; *p* = 0.072; Appendix A; Table A-33).

H_{O3}: There is no relationship between weight status of children ages 6- through 11-years and the built environment of school recreational spaces in the Mississippi Delta.

BMI and the School Built Environment

Fail to reject the null hypothesis; with all schools combined there is not a significant relationship between BMI of students in first through fifth grades and the presence and quality of 13 features of the school built environment (*r* = -0.532; *p* = 0.092; Appendix A; Table A-34).

Reject the null hypothesis; with all schools combined there is a significant relationship between BMI of students in first through fifth grades and the presence and quality of 12 amenities of the school built environment (*r* = -0.619; *p* = 0.042; Appendix A; Table A-34).

Fail to reject the null hypothesis; with all schools combined there is not a significant relationship between BMI of students in first through fifth grades and quality of 12 incivilities of the school built environment (*r* = -0.286; *p* = 0.393; Appendix A; Table A-34).

WtHR and the School Built Environment

Reject the null hypothesis; with all schools combined there is a significant relationship between WtHR of students in first through fifth grades and the presence and quality of

13 features of the school built environment (*r* = -0.713; *p* = 0.014; Appendix A; Table A-34).

Reject the null hypothesis; with all schools combined there is a significant relationship between WtHR of students in first through fifth grades and the presence and quality of 12 amenities of the school built environment (*r* = -0.819; *p* = 0.002; Appendix A; Table A-34).

Fail to reject the null hypothesis; with all schools combined there is not a significant relationship between WtHR of students in first through fifth grades and the presence and quality of 12 incivilities of the school built environment (*r* = -0.056; *p* = 0.869; Appendix A; Table A-34).

Waist Circumference and the School Built Environment Quality

Fail to reject the null hypothesis; with all schools combined there is not a significant relationship between waist circumference of students in first through fifth grades and the presence and quality of 13 features of the school built environment (*r* = -0.405; *p* = 0.217; Appendix A; Table A-34).

Fail to reject the null hypothesis; with all schools combined there is not a significant relationship between waist circumference of students in first through fifth grades and the presence and quality of 12 amenities of the school built environment (*r* = -0.509; *p* = 0.110; Appendix A; Table A-34).

Fail to reject the null hypothesis; with all schools combined there is not a significant relationship between waist circumference of students in first through fifth grades and the presence and quality of 12 incivilities of the school built environment (r = -0.467; p = 0.147; Appendix A; Table A-34).

Total Body Weight and the School Built Environment

Fail to reject the null hypothesis; with all schools combined there is a significant relationship between total body weight of students in first through fifth grades and the presence and quality of 13 features of the school built environment (r = -0.548; p = 0.081; Appendix A; Table A-34).

Reject the null hypothesis; with all schools combined there is a significant relationship between total body weight of students in first through fifth grades and the presence and quality of 12 amenities of the school built environment (r = -0.615; p = 0.044; Appendix A; Table A-34).

Fail to reject the null hypothesis; with all schools combined there is not a significant relationship between total body weight of students in first through fifth grades and the presence and quality of 12 incivilities of the school built environment (r = -0.436; p = 0.181; Appendix A; Table A-34).

Chapter V

Conclusion and Discussion

The purpose of this investigation was to examine the social-ecological determinants of physical activity among youth. The primary objective of this investigation was to describe state, district and school level policy regarding physical activity, to describe the school built environment and to examine in-school physical activity of children ages 6 through 11 years.

The purpose of this chapter is to provide conclusions, to afford in-depth discussion of the findings, to impart implications of these findings and to advocate future recommendations. This chapter is divided into the following sections: 1) Conclusions and Discussion, 2) Implications, and 3) Recommendations.

Conclusions and Discussion

Discussion is provided to understand how state, district and school level physical activity policy and the school built environment influence in-school physical activity and weight status of children in first through fifth grades in the Mississippi Delta. Through the Healthy Students Act, Mississippi policy makers recognize the need to address the childhood obesity issue through comprehensive legislation aimed at transforming the environments of the state's schools to promote healthy eating and physical activity among students. The following conclusions describe how viable policy that affords students consistent and frequent opportunity to engage in unstructured in-school physical activity positively influences physical activity levels and may be one factor that influences weight status. The amount of time children spend being physically active, specifically in moderate-to-vigorous physical activity, appears to be a function of policy, and more specifically implementation and adherence to policy and less influenced by the school built environment. The results of this investigation demonstrate the importance of policy dissemination practices from state to district to school levels and more importantly, how the implementation of state mandates are evaluated.

There were several limitations that warrant recognition. First, there were 11 schools included in this investigation. One of those schools did not provide physical education as a means to reach state physical activity mandates and seven of the schools did not offer recess. While the sample size was sufficient to conduct statistical analyses on anthropometric, physical education and the built environment data there was not a large enough sample size to run any statistical analyses on collected recess data. Therefore, the recess data are provided for descriptive purposes only. Communication with district and school level personnel also proved to be a limiting factor. Three contacts were made to the curriculum coordinator in District 2 in an effort to schedule an interview and all three attempts failed. Even after soliciting the support of the Assistant Superintendent, the curriculum coordinator in District 2 did not reply to an invitation to either decline or accept an interview. Additionally, three physical education instructors in District 1 agreed to participate in an interview but when contacted the interviewee did not answer the phone. Attempts made to re-schedule also failed. Furthermore, District 2 was under conservatorship of the state and would likely have provided interesting and unique contributions from a policy perspective. There is also important qualitative data missing from the school level in District 1. Three out of the four physical education instructors from District 1 did not respond to invitations to participate in an interview. The information that is missing would likely have provided more insight into some of the conclusions that were drawn from the quantitative data and would have also provided unique perspectives that might have further explained some of the quantitative findings from this investigation.

A final limitation to this investigation was that the “team” of researchers consisted of the principle investigator and one research assistant. Researchers had no control over school level extracurricular activities or physical education and recess schedules. Several schools had inconsistent and infrequent physical education schedules and most schools (6) did not have a regular recess schedule. This made it very difficult for the research team to travel to all of the schools in the time that was available to collect all of the data needed for analysis. For this reason there are several schools that do not have the recommended 12 class observations for the SOFIT. With these limitations in mind, the following conclusions and discussions attempt to drawn on the importance of understanding social-ecological determinants of physical activity and weight status of children in the Mississippi Delta. Further research is warranted and should be conducted to confirm these findings and to further explore emergent hypotheses.

The School Built Environment, Weight Status and In-School Physical Activity

Understanding how children experience their environment and identifying which specific features of the environment are related to physical activity is crucial to reversing childhood obesity trends. Most literature supports a significant positive association between some aspect of the built environment and obesity (Papas et al., 2007). Based on a growing evidence base, it was hypothesized that there would be a relationship between children's weight status and the school built environment. There was a significant relationship between children's BMI and the presence and quality of amenities (r = -0.619; p = 0.042); between WtHR and the presence and quality of features (r = -0.713; p = 0.014) and amenities (r = -0.819; p = 0.002); and between total body weight and the presence and quality of amenities (r = -0.615; p = 0.044). These findings are similar to the work of Boehmer and colleagues (2006) that examined perceptions of neighborhood environments and found significant environmental correlates of obesity specific to rural communities. The findings of the current investigation contribute to the growing evidence base unique to rural settings, and in particular, to the role of the school environment on weight status and physical activity of children in the rural south.

It was hypothesized that there would be a difference between districts regarding the school built environment based on county sociodemographic characteristics. Furthermore, it was hypothesized that a school built environment that had more physical activity resources, with higher quality elements and fewer incivilities, would likely result in greater physical activity levels among children within that school. Contrary to the latter hypothesis, a significant relationship was not found between the school built environment and the amount of time children spent in MVPA during physical education class. One explanation for this finding is there was not a significant difference between districts regarding the number of physical activity resources at each school. Most schools had at least one indoor and one outdoor recreational facility (Mean = 2.09). This finding is similar to that of an investigation by Lee and colleagues (2005) that examined physical activity resources at the neighborhood level in an urban setting. These investigators found that the number of physical activity resources was comparable at the neighborhood level and most (82%) of these resources were accessible at no cost regardless of SES or ethnic concentration. Lee and colleagues (2005) did not assess physical activity levels of individuals in their investigation, thus did not examine the potential influence of these resources on physical activity levels or resource users, or if there were differences in activity levels between neighborhoods. In the current investigation, given that the accessibility to similar physical activity resources was comparable regardless of district and given that there was a significant difference between districts regarding physical activity, suggests that there are other factors influencing children's in-school physical activity levels.

Another possible explanation for there not being a significant relationship between the schools built environment and children's in-school physical activity regards the presence and quality of elements to the environment and the presence and severity of incivilities. There was a significant difference between districts regarding the presence and quality of amenities to school recreational spaces. Amenities include the following: access points, bathrooms, benches, drinking fountains, fountains, landscape efforts, lighting, picnic tables (shaded and not shaded), shelters, showers and locker rooms, and trash containers. There were a greater number and higher quality of amenities found at the schools in District 3 compared to those in District 1 and District 2. Interestingly, when given the opportunity to be active, the children in District 1 spent a greater percent of time in MVPA than did children in District 3. This suggests that, particularly in low SES, high minority rural school settings, the quality of the school built environment may not be as influential to children's in-school physical activity levels as is the mere presence of a place to be physically active and the opportunity to be so.

Differences between districts on the presence and quality of amenities and not on the presence and severity of incivilities to the school environment warrant further comment. Previous research suggests that physical activity resources found in lower income, more ethnically concentrated neighborhoods, similar to those of District 1 and District 2, have substantially worse incivility ratings than comparison neighborhoods, similar to that of District 3 (Lee et al., 2005). In the current investigation there was not a significant difference between districts regarding the presence and quality of incivilities. Lee and colleagues (2005) found incivilities at 80% of the resources in all of the lower income, more ethnically diverse neighborhoods and were found at only 11% of the physical activity resources in only half of the comparison neighborhoods. The school yards and indoor physical activity facilities in District 1 and District 2 were inaccessible to community members outside of school hours unless for a school or city sponsored event. This may be one explanation for the lack of incivilities found at the indoor and outdoor school recreation facilities within each of these districts. The outdoor facilities at schools in District 3 were accessible outside of school hours however, the indoor facilities were not. Recall that most of the physical activity resources in the study conducted by Lee et al. (2005) were freely accessible in both lower and higher deprived neighborhoods. Evidence suggests that by providing children with free access to school yards, particularly with fewer incivilities (Heinrich et al., 2007), results in a relative increase in children's out-of-school physical activity (Farley et al., 2007). Adolescents in lower-SES and ethnically concentrated areas in the U.S. have reduced access to recreational facilities, which is associated with deceased physical activity and increased overweight (Gordon-Larsen et al., 2006). This may helps to explain the lower BMI scores in District 3 compared to District 1. However, to make this statement definitively is outside the realm of this investigation. What remains unknown is whether or not unlocked school yards in rural settings outside of school hours will result in an increase in the presence and severity of incivilities, thus detracting from children's participation in physical activity during school hours. To date the principal investigator has not discovered any research specific to rural school settings regarding the following: 1) a relationship between access to school yards outside of school hours and the presence and severity of incivilities, or 2) a relationship between access to school yards outside of school hours and children's resulting physical activity levels and overweight. Furthermore, most investigations have been conducted in urban and suburban settings, thus the applicability of such findings to rural school settings is likely not plausible.

In-School Physical Activity and Weight Status

Ogden and colleagues (2010) report the prevalence of high BMI in U.S. children and adolescents from 2007-2008 defined at three levels: BMI for age at or above the 97th percentile, at or above the 95th percentile and at or above the 85th percentile. Results indicated among children and adolescents ages 2 through 19 years, 11.9% (95% CI: 9.8% - 13.9%) were at or above the 97th percentile; 16.9% (95% CI: 14.1% - 16.9%) were at or above the 95th percentile; and 31.7% (95% CI: 29.2% - 34.1%) were at or above the 85th percentile. Specifically among children ages 6 through 11 years, 14.5% were at or above the 97th percentile; 19.6% were at or above the 95th percentile; and 35.5% were at or above the 85th percentile. The participants in the current investigation included 1,136 first through fifth grade students, approximately ages 6 through 11 years, from two counties in the Mississippi Delta. Results indicated that 28.8% were at or above the 95th percentile and 47.1% were at or above the 85th percentile of BMI for age.

Interpretation of BMI status in children should be conducted prudently. In children, BMI is correlated with adiposity and the correlation is higher at higher levels of BMI for age than for lower levels of BMI for age (Ogden et al., 2010). In addition, adiposity is different between black and white individuals at the same BMI level (Freeman, Wang, Thornton, Mei, Pierson, Dietz & Horlick, 2008). BMI cut points relate to a reference population (CDC growth charts) and BMI varies by age and sex in children. Therefore, these cut points are not based on health outcomes (Ogden et al., 2010). However, it is known that as children move into adolescence the prevalence of high BMI increases and youth with high BMI often become obese adults (Serdula, Ivery, Coates, Freedman, Williamson & Byers, 1993). In adults, BMI is regarded as a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to weight-related health complications (CDC, 2009). What is of great concern to the principle investigator of the current study is that the BMI scores of children from the two Mississippi Delta counties are from a sample that included only children approximately ages 6 through 11 years. In comparison to national overweight and obesity levels of all youth (ages 2 through 19 years) and in comparison to national overweight and obesity levels of children ages 6 through 11 years, the sample population from the Mississippi Delta reported substantially higher levels of overweight and obesity based on BMI. In addition, Mississippi adults currently lead the nation in obesity (34.4%). This combined with the current BMI status of children in first through fifth grades in the Mississippi Delta provides a startlingly grim outlook on the future of Mississippians regarding obesity and subsequent health outcomes.

A methodological limitation in obesity research is that BMI is commonly used independently to examine the obesity-mortality association and to predict obesity-related health complications without considering body composition or location of excess body fat stores (Lee, Blair & Jackson, 1999). Location of body fat stores is a health risk predictor and abdominal adiposity is a greater risk factor for chronic disease than lower body adiposity (Janssen, Katzmarzyk & Ross, 2002; Ross, Freeman, Hudson & Janssen, 2007). The presence of low grade systemic inflammation has been found in youth ages 9 and 15 years with high waist circumference measures (Steene-Johannessen, Kolle, Reseland, Anderssen & Andersen, 2010). Further, a WtHR above 0.5 suggests excess abdominal adiposity at a level which increases the risk of weight-related comorbidities among children ages 5 through 16 years (McCarthy & Ashwell, 2006). Waist circumference and WtHR are effective ways of measuring abdominal adiposity in both adults (Pouliot, Despres, Lemieux, Moorjani, Bouchard, Tremblay, Nadeau & Lepien, 1994) and children (Taylor, Jones, Williams & Goulding, 2000), and may be a more accurate predictor of cardiovascular disease risk and other obesity-related chronic disease than BMI in both adults and children (Savva, Tornaritis, Savva, Kourides, Panagi, Silikiotou, Georgiou & Kafatos, 2000; Zhu, Wang, Heshka, Heo, Faith & Heymsfield, 2002).

The mean waist circumference of the children measured in this investigation was 27.7 inches. Based on waist circumference and according to age-, sex- and ethnicity-specific waist circumference percentiles, 59.9% of the participants were at increased risk of chronic disease associated with excess abdominal adiposity as measured by waist circumference (Fernandez, Redden, Pietrobelli & Allison, 2004). The mean WtHR of the children measured in this investigation was 50.5. According to WtHR cut off values, 42.0% of the participants were at increased risk of chronic disease associated with excess abdominal adiposity as measured by WtHR. Examination of all three weight and health risk measures collectively (BMI, WC and WtHR) revealed 36.7% of participants were considered overweight or obese (based on BMI) and identified at increased health risk due to excess abdominal adiposity based on both high waist circumference and WtHR. Almost half (41.5%) of these observations were from District 1.

Furthermore, it is important to specifically discuss some distinguishing characteristics of the 10.7% of the observations that were identified as outliers on BMI (above the hinge). Almost half (46.7%) of the outlier observations on BMI were from District 1, were black (90.2%), female (51.6%) and were between the ages of 9 and 11 years-old. Their mean BMI was 30.1 $\pm$3.1 (95% CI: 29.6 – 30.7), and thus most of these individuals could be classified as obese based on adult standards. Their mean waist circumference was 38.1 in. $\pm$4.2 (95% CI: 37.3 – 38.8), indicating that regardless of sex and race, all of these individuals were considered at increased health-risk based on waist circumference percentile estimates for sex and age. Among adults, waist circumference measures above 35 inches for females and above 40 inches for males are considered high (Wang, Stampfer, Willett & Hu, 2005). Hence, the majority of these individuals were also considered “at-risk” based on criteria used to classify adults, regardless of sex. In addition, their mean WtHR was 64.7 $\pm$5.8 (95% CI: 63.7 – 65.7) and 98.4% of these individuals were classified as “at-risk” for weight related health complications according to WtHR.

Recent trends show significant increases in the prevalence of high BMI among the heaviest 6 through 19 year-old males (Ogden et al., 2010) and on waist circumference and WtHR among youth of all ages (Li et al., 2008). Meanwhile, adult obesity prevalence does not appear to be increasing at a statistically significant rate although, 32.2% of males and 35.5% of females were reported obese in 2007-2008 (Flegal et al., 2010). If trends continue to progress even at the current rate, the children identified as outliers on BMI in this investigation combined with their health risk associated with high abdominal adiposity are faced with surmountable adverse health consequences and severely decreased quality of life. These individuals will also contribute to the substantial economic burden weight-related chronic disease morbidity and mortality places on the nation at large. A review by Finkelstein and colleagues (2005) reported adult individuals who are moderately obese (BMI $\geq$ 30) and severely obese (BMI $\geq$ 35) had 14% and 25% more physician visits, respectively. In addition, these individuals (BMI $\geq$ 30) reported six times the number of dispenses for diabetes medication and 3.4 times the number of dispenses for cardiovascular medications (Finkelstein et al., 2005). Specifically in the Black Belt (includes the Mississippi Delta), where poor socioeconomic conditions are most concentrated, policy and program attention that take into account rurality and race are needed in order to combat this growing epidemic (Allen-Smith, J.E., Wimberley, R.C. & Morris, L.V., 200). The anthropometric outcomes reported above support this need.

There are significant sociodemographic and socioeconomic disparities in obesity prevalence among children and adolescents in the U.S. (CDC, 2010). These differences were evident in the current investigation. District 1 and District 3 were consistently different on several measures of body weight and weight-related health risk. The participants in District 1 measured significantly higher than District 3 on total body weight, BMI, waist circumference and WtHR. One possible explanation for this finding is that demographically, these two districts were different. Ninety-seven percent (97%) of the participants in District 1 were black compared to 50.6% in District 3. Additionally, there were socioeconomic differences between the counties where these two districts were located. In County A where District 1 was located, the median household income in 2008 was $23,369 and 34.9% of persons were living below poverty level. Comparatively, in County B where District 3 was located, the median household income in 2008 was $34,866 and 25.1% of persons were living below poverty level (U.S. Census Bureau, 2010). Furthermore, evidence suggests that while physical activity is associated with environmental factors, inactivity appears to be most associated with sociodemographic factors (Gordon-Larsen et al., 2000).

Based on the anticipated findings regarding weight status investigators also hypothesized there would be differences between districts regarding the percent of time spent in MVPA during physical education. A relationship between in-school physical activity levels and weight status was also hypothesized. Results indicated there was a significant relationship between BMI and percent of time spent in MVPA during physical education. What was surprising about this finding was that the relationship was positive; the schools with higher mean BMI scores reported higher physical activity levels during physical education. This finding is in strong opposition to a previous investigation which demonstrated a strong graded inverse association between physical activity and obesity (Ness, Leary, Mattocks, Blair, Reily, Wells, Ingle, Tilling, Smith & Riddoch, 2007). Moreover, low levels of total physical activity and especially vigorous physical activity are suggested to play a significant role in central adiposity in youth (Ortega, Ruiz & Sjostrom, 2007). Aerobic activity may also be a protective factor against age-related increase in visceral adiposity (Kim & Lee, 2009) and higher intensity activity may actually be more important than total activity level (Ness et al., 2007). With consideration to the above findings there is continued support for the importance of viable in-school physical activity policy that provides children with ample opportunity to be active as means to diminish adverse health outcomes associated with abdominal adiposity, regardless of total body weight.

Further exploration of these findings revealed significant differences between districts on the percent of time spent in MVPA. District 1 (40.96%) reported significantly more time spent in MVPA than District 3 (32.8%). Recall the school built environments within these districts was comparable with the exception of amenities to the environment; District 3 reported the presence of higher quality amenities than did District 1. Hence, variability among the school built environment is not a viable explanation for these findings and further exploration was required. Subsequent analysis revealed three schools in particular that reported significantly more time spent in MVPA during physical education. Time spent in MVPA at School 3 (District 1), School 4 (District 1) and School 7 (District 2) was statistically different than the amount of time spent in MVPA at School 6 (District 2). Following careful examination of physical education class characteristics within these four schools, several important distinguishing features were identified. There was a significant difference between School 6 and Schools 3, 4 and 7 regarding the percent of physical education class time spent in unstructured free play. School 6 spent no time in unstructured free play, while School 3 (38.8%), School 4 (59.0%) and School 7 (65.2%) each spent the greatest percentage of physical education class time engaging in unstructured free play.

Further analyses also revealed significant relationships between percent of physical education class time spent in unstructured free play and time spent in MVPA ($r = 0.556$; $p = 0.00$), meeting the National Recommendation of spending 50% of physical education class time in MVPA ($r = 0.63$; $p = 0.00$), lesson location ($r = -0.342$; $p = 0.00$) and lesson length ($r = -0.201$; $p = 0.036$). None of the physical education classes observed at School 6 met the National Recommendation that children spend 50% of class time in MVPA, while 66.6% of classes at School 3, 62.5% of classes at School 4 and 53.8% of classes at School 7 successfully met this recommendation (accounting for 56.0% of all classes that met the recommendation). Children in first through fifth grades appear to spend more time in MVPA when physical education class is conducted outside as opposed to inside. In addition, the mean physical education class length was greater at School 6 (40.1 minutes) than at School 3 (38.47 minutes), School 4 (38.12 minutes) and School 7 (35.45 minutes). The combination of these findings describe an ideal physical education class characterized as approximately 37 minutes of unstructured physical activity, held outside in a recreational space that simply provides children with a place to be active.

What remains to be explored is the finding that schools with higher BMI scores spent a greater percentage of physical education class time in MVPA. Why then, are they more overweight than the children at schools that were not spending ample physical education class time in MVPA? Stringent consideration of these complex outcomes leads to the notion that the children at schools in District 3 were given more opportunity to be physically active through both physical education and recess due to superior physical activity policies, which were habitually enforced. Based on physical education and recess schedules obtained by the principle investigator, the schools in District 1 provided children a mean of 76.6 minutes of physical activity per week. The mean physical education class length in District 1 was 39.5 minutes. There was no recess policy and no recess schedules for any of the schools in District 1. School 1 offered one 50-minute physical education class for a total of 50-minutes of physical activity per week. School 2 offered one 50-minute physical education class for a total of 50-minutes of physical activity per week. School 3 offered two 50-minute physical education classes for a total of 100-minutes of physical activity per week. School 4 did not have a cohesive schedule for physical education. The first graders at School 4 were offered two 30-minute physical education classes for a total of 60-minutes of physical activity per week. Second and third graders were each offered one 50-minute physical education class and forth graders were offered three 50-minute physical education classes for a total of 50-minutes and 150-minutes of physical activity per week, respectively. Fifth graders at School 4 were not offered physical education or recess; hence children in this grade received no in-school physical activity per week.

Schools in District 2 offered a mean of 117.5 minutes of physical activity per week. The mean physical education class length was 39.8 minutes. With the exception of School 5, none of the schools in District 2 had policy concerning recess or had regularly scheduled recess times. School 5 offered one 55-minute physical education class and five 20-minute recess breaks for a total of 155-minutes of physical activity per week. However, recess policy was not stringently enforced and likely not monitored. On all occasions where investigators arrived to observe recess at School 5, none of the scheduled classes were making use of their recess time for recess activity. Therefore, it is assumed that children at School 5 likely received 55-minutes of physical activity per week. In addition, there was a policy at School 5 that restricted children from physical activity on Friday's. School 6 offered two to three 55-minute physical education classes for a total of either 100- or 150-minutes of physical activity every other week. School 7 offered three 55-minute physical education classes for a total of 165-minutes of physical activity per week.

The schools in District 3 had physical education and recess schedules that provided children a mean of 134 minutes of physical activity per week. The mean physical education class length was 38.2 minutes. There was a policy throughout District 3 that restricted children from physical activity on Tuesday's with the exceptions of fifth graders at School 8 and first graders at School 9. The only time fifth graders at School 8 had recess was on Tuesday's for 20-minutes. In addition, fifth graders at School 8 were offered two 50-minute physical education classes for a total of 120-

minutes of physical activity per week. The remainder of the grades at School 8 was offered one 50-minute physical education class and four 20-minute recess breaks for a total of 130-minutes of physical activity per week. School 9 did not offer physical education to children; instead children at School 9 had recess five-days per week for 30-minutes for a total of 150-minutes of physical activity per week. School 10 offered one 40-minute physical education class and four 20-minute recess breaks for a total of 120-minutes of physical activity per week. School 11 offered one 50-minute physical education class and four 25-minute recess breaks for a total of 150-minutes of physical activity per week. Inclusion of recess may be one explanation for why the children in District 3 had lower BMI scores than children in District 1 despite not spending greater than 50% of physical education class time in MVPA.

During recess 54.7% of both males and females engaged in MVPA in District 1. There was a significant relationship between the percentage of children engaging in MVPA and the presence of equipment (r = 0.233; p = 0.000) and the type of activity that was being engaged in among both males (r = 0.421; p = 0.000) and females (r = 0.431; p = 0.000). A greater percentage of males engaged in MVPA when playing tag or chasing games (80.4%), soccer or football (79.3%) and basketball (74.7%). Likewise a greater percentage of females engaged in MVPA when playing basketball (88.8%), tag or chasing games (76.9%) and soccer or football (76.3%). Furthermore, children of both sexes participated in both basketball and soccer or football when equipment such as a ball, was present. This finding is similar to that of Verstraete and colleagues (2006) in an investigation examining the effects of providing game equipment on children's (mean age: 10.8 $\pm$0.6) physical activity levels during recess at elementary schools. The results of the investigation revealed provision of game equipment was effective at increasing children's moderate-intensity physical activity levels. Additionally, in the current investigation organized play was only observed for 0.9% of the total observations made and supervision was observed for 36.2% of the total observations. Hence, supervision may not be as influential to participation in MVPA during recess among elementary school-aged children as it has been found to be among middle school-aged adolescents (McKenzie et al., 2000; Sallis et al., 2001). Perhaps providing recess where children have the opportunity to engage in unorganized play in areas with affordable equipment, such as balls, will result in a greater percentage of elementary school–aged children engaging in MVPA during recess. Due to a lack of power making this statement definitively is outside of the realm of this investigation and subsequent research is warranted.

Another important factor that is a potential explanation for higher BMI scores despite more time spent in MVPA during physical education at certain schools is in regards to gymnasium space. Although there was not a relationship between children's in-school physical activity and the school built environment measured by the PARA, several important characteristics of the environment not measured by the PARA emerged through the interviews. Despite having comparable numbers of physical activity resources among all three districts, the three schools (School 3, School 4 and School 7) that reported the highest percentages of physical education time spent in MVPA were each faced with the challenge of sharing gymnasium space simultaneously with high school physical education classes. Recall that the majority of the physical education classes at these schools were conducted outside and these observations were conducted mostly in March and April, months were the weather is conducive for outdoor activities in Mississippi. Therefore, in the months when the weather does not support outdoor activity physical education instructors at these schools are constrained to conducting class either in a gymnasium with middle school and high school students (School 3, School 4 and School 7), in a classroom (School 5 and School 6) or in a detached football field house (School 4). School 1, School 2, School 8, School 10 and School 11 each had a gymnasium that was not shared with any other physical education classes competing for space. Similarly however, during winter months and on days where the weather is not conducive for outdoor activities, the schools in District 3 did not have the opportunity for outdoor recess. It is unknown as to whether or not classroom teachers provided children with the opportunity for indoor play on days when the weather prohibited outside activity.

State, District and School Level Physical Activity Policy

Synthesis of the quantitative data suggests that variation among policy and how the mandates of the Healthy Students Act are implemented impact children's in-school physical activity. The qualitative data collected in this investigation helped to fill some of the gaps left from the quantitative analysis and provides meaningful insight into a complex epidemic. At the state level it was stated that one of the "strengths" of the bill was that implementation was "flexible." However, some of the particulars of the bill were not consistently recalled by either of the state level interviewees. One interviewee at the state level provided the following insight:

…K through 8 is a requirement for 150 minutes of activity-based

> instruction okay. I'm going to break that down. Fifty, a minimum of 50 of those 150 minutes has to be physical education class, age-appropriate, structurally planned, you know, so it has to be a true physical education class. The other 100 can be any sort of movement, whether it's recess, walking programs, intramural sports in the middle school level.

The other state level interviewee, both from the same office, stated that:

> …one of the strengths of the legislation is that there is some flexibility. Obviously in one school district they may have certified PE teachers that are providing all of the instruction, all the 150 minutes is coming through a physical education program, but another district may not have those same resources, so 100 of the 150 minutes are coming through the physical education program and 50 of the minutes are being integrated into the regular classrooms.

It is made clear by both state level personnel that implementation is left up to the discretion of administrators at the district and/or school levels. Following review of the physical education and recess schedules obtained from each of the schools and considering the quantitative results of the physical activity observations made, it is also clear that schools are not meeting the requirements. Only five of the schools had regularly scheduled recess and those that did not have recess were not providing children with ample physical activity opportunity through physical education. Perhaps there are some disconnect among the state, district and school levels in terms of dissemination of the requirements. Furthermore, based on the above statements made by the state level interviewees, it is not clear whether or not children are required to have 50 or 100 minutes of “structured” activity. The quantitative results suggest that there are differences in the amount of time children spent in MVPA during structured versus unstructured play. The impact of legislation seems to be left in the hands of the district and the schools to implement and enforce wellness policies while the particulars of what is required are unclear.

More importantly, because of the flexibility that surrounds the implementation of the mandates included in the Healthy Students Act, policy evaluation practices are vital to ensuring that districts and schools are not in violation of state law. At the district and school levels most interviewees had knowledge that the bill mandates a minimum of 150 minutes of physical activity per week, but still this requirement was not being met. School-level implementation practices to determine if state law is being met are evaluated once every five years and assessment is conducted by reviewing schedules. The quantitative results of this investigation reveal that what was scheduled did not reflect what was actually occurring. Not only is it important for evaluation to occur, but it is more important to consider how evaluation practices are conducted. Within each evaluation issues that are preventing schools from complying with state law should also be addressed and strategies to overcome implementation barriers should be discussed and applied.

Closer review of the interviews conducted at the district and school levels revealed barriers that are faced to implementing the required 150 minutes of physical activity per week. It was redundantly stated at both the district and school levels that academic priorities overshadow the need to provide children with time for physical activity. One district level interviewee stated:

I just really think the main thing, at this point, on everyone's mind is academics and then sometimes we don't see how academics and physical education – and we realize that physical education is a part of it, it's a requirement; however, it's like, well how do I use PE to really promote MCT scores or to promote subject area scores or something like that and so those two things sometimes don't quite go together.

At the state level it was reported that there is a relationship between children's physical activity levels and academic performance. It seems that this knowledge is not being disseminated to district level administrator nor is it being used to assure administrators that providing time for physical activity will likely not harm academic performance. This information is important and should be provided to districts and schools in support of physical activity policy.

The interviewee at District 1 went on to state:

…if the student is in severe need of continued academic instruction, then we have to pull that time from somewhere. In the guidelines for RTI, it says it has to occur during the school day – and so there's only so many minutes in the school day. So, you have to look at where you are going to pull that extra time from and most often it is pulled from either like the student's support schedule or support classes."

Children are excluded from physical activity opportunities in order to spend more time in the classroom in anticipation of meeting academic standards. This is concerning, considering at some schools, children were not scheduled to meet 150-minutes of physical activity per week to begin with and then of those minutes that were allocated to physical activity some children were not given the opportunity to be active. At one school, children in fifth grade were purposely not scheduled to have physical education until after the Mississippi Curriculum Test (MCT) was over. MCT occurs in May, the school year typically commences the second week of May. At two other schools, one day out of the week children were restricted from physical activity for academic purposes; mostly to provide extra tutoring in preparation for the MCT. Furthermore, evidence suggest that physical activity can be added to school curriculum by taking time away from other subjects without hindering student academic achievement (Trudeau & Shephard, 2008). Again, it appears that this information is not being disseminated to administrators at the district and school levels, nor are personnel at the state level using this information to encourage districts and schools to provide consistent opportunity for physical activity.

Another barrier affirmed at the state, district and school levels was funding. Funding is evenly distributed to schools throughout the state. Budget allocation is left up to the discretion of the district. Additionally, the Healthy Students Act is not a funded mandate. Therefore, schools do not receive additional funds to support the implementation of 150 minutes of physical activity per week. What seemed to add to the financial barriers was the issue mentioned previously regarding space. The reality of this barrier is inconsistent between state and school level personnel. One state interviewee commented:

> …there are some preconceived barriers that people have, such as facilities. They don't have the ideal facility to provide the instruction or they don't have the funding or they don't have a certified PE teacher or

> they don't have enough equipment; and so I think that's really where we try to come in, in the Office of Healthy Schools is to show them that there are many different ways of using the classroom, of using the gymnasium, of using a field outside as the facility, or how, you know, you can make equipment to use in your classrooms, or how many different games there are that don't even require equipment, and then that's what Health in Action does, is actually details all of those things that would be required for that activity to be taught. So, it's just giving them all the information they need to eliminate those barriers."

Theoretically, there are some viable solutions here. For example providing classroom teachers with Health in Action lesson plans to incorporate physical activity into the classroom. At the school level, physical education instructors adapted class lessons to accommodate, as best as possible, large class sizes in spaces other than a gymnasium in order to conduct a physical education class. However, these resources have very little space making it impossible for a class of 25-students to be active at one time. A Mississippi appropriations committee convened in 2003 and determined that 1,542 square feet of space should be allocated for a physical education class. Mississippi guidelines also suggest 50 square feet per student during physical education class; thus for a class of 25 students, a minimum of 1,250 square feet are needed. The average classroom in the state of Mississippi is 867 square feet.

While indoor space appears to be lacking for physical education instructors at these schools, outdoor space is not. The physical education instructors made use of the plethora of outdoor space the rural setting has to offer. Unfortunately, the weather does not allow for outdoor activities for a majority of the time that children are in school. This was another frequently cited barrier to physical activity at the school level. August through October and March through May can be ideal for outdoor activities, with the exception of days that it rains and in some instances, the days following rain. A rural setting does provide ample space, but in the Mississippi Delta where most of the land was once farm land, when it rains the ground stays wet for days making outdoor space unusable on days following heavy rain. Therefore, while many schools have made use of what little resources they had, there were still limitations linked to inadequate indoor space for physical activity. Inequality of facility resources that were not captured by the PARA became evident and emerged from the interviews.

Implications

A public health approach to develop population-based strategies for the prevention of obesity is imperative. However, public health intervention programs have had limited success in preventing the rise in obesity prevalence. Schools can provide many opportunities for children to be active and can play an important role in motivating young people to stay active (Burgeson et al., 2001). Similar to some of the schools in this investigation, previous research suggests that there are schools that have policies and practices that support physical activity, although unfavorable practices exist (Young et al., 2007). What is clear from this investigation is that if you give children a place to be active, and if there is policy that supports children being active, then they will be. Special considerations should to be given to schools that do not provide children with an indoor place to be active. Challenges such as sharing gymnasium space with middle school and high school students and utilizing a classroom for physical education class does not adequately provide space for a class of 25 students to be physically active. Despite the evidence that in-school physical activity interventions have not had a significant effect on BMI scores, physical activity does have an effect on health status and regardless of weight loss will likely provide health benefits. The children in this investigation that were the most overweight and had the greatest health-risk associated with abdominal adiposity were also the most active children when given the opportunity. The problem is that among the schools where children are at greatest risk they lack policy to support provision of physical activity opportunities. Confounding this issue are academic priorities. Hence, the overall findings of this investigation add to Sallis et al. (2001) in their comment coined from *Field of Dreams*, "If we build it, they will come – and be active." Not only must we build it but, we must give them the opportunity to use it. To that I add, "If we give them the time, they will use it – and be active."

Furthermore, in regards to physical education the results of this investigation are in contrast to most of the literature which supports structured physical education as opposed to unstructured. To date the researchers of this investigation have not hit upon any literature specific to elementary school-aged children and the types of lesson context that yields the most activity among children. The literature that supports implementing structured activities during physical education and during recess opportunities are based on investigations that include middle-school aged adolescents (Mota et al., 2002; Cawley et al., 2005). The current investigation is not refuting this evidence; however, suggests that the physical activity environment conducive for encouraging activity among elementary school aged children is different than that of adolescents. For this particular age group unstructured play appears to the most influential lesson context in support of children engaging in MVPA.

Recommendations

In light of the findings of this investigation, the first recommendation is for state and district administrators to provide more stringent and more frequent evaluation to determine whether or not schools are in compliance with Mississippi state law. While examination of school schedules provides insight to how time is being allocated, it does not determine if what appears on paper is actually occurring, nor does it speak to the type of activity that is occurring during activity time or the number of students that are using such time to be active. This recommendation faces similar barriers to those of implementing 150 minutes of activity time per week by way of funding. The cost of the above mentioned evaluation strategies are greater than the costs associated with current assessment practices. However, if state level personnel took the time to train district level personnel on how to provide a more interactive assessment of school-level practices, then perhaps observational assessments could be a success. This would provide the districts with yearly and continual assessment of the schools, identifying those that are successful and those that are not, and would also serve to identify best practices that could then be disseminated district-wide. With this on-going evaluation at the district level, the state could continue to evaluate each district once every five years knowing that at the district level, continual interaction is occurring annually and schools are being provided with strategies to overcome barriers that hinder compliance with state law.

Secondly, the social-ecological factors that support physical activity among elementary-aged children appear to be different than those that encourage activity among middle school- and high school-aged adolescents. Hence, the degree of flexibility provided to districts and schools to implement the 150 minute physical activity mandate should be accompanied with models most suitable for children by age. This recommendation will not only provide successful strategies for administrators at the local level but it will also lessen the burden of a non-funded mandate. Providing children with a place to be active and the opportunity to be so does not require expenditure of additional funds. Furthermore, allowing children to engage in unstructured activities does not require supervision of a trained physical education instructor. Classroom teachers can easily provide children with activity time without adding to pre-existing preparation and instruction commitments. Even among schools that reported space as a barrier to physical activity, children were still able to be somewhat active when given the opportunity. A more looming barrier appears to be academic distress. State level administrators should be more intent on disseminating strategies to overcome barriers reported at the school level and providing knowledge that activity time does not hinder academic performance. Providing children with the opportunity to be physically active is similar to exposing an artist to a blank canvas. When the environment is conducive for physical activity, children will use it for play in ways their imagination sees fit.

From a broader perspective, the findings of this investigation support the use of a social-ecological model that is applied at various social and environmental levels. Several interviewees made reference to the complexity of the obesity epidemic and realize that the school environment alone is not enough to make the impact on obesity that is needed. In order to reverse current trends a multidisciplinary approach that encompasses various ecological levels is indispensable to reversing recent obesity trends. The current investigation makes several important contributions to what is known about children's in-school physical activity, specifically in underprivileged rural settings. Multidisciplinary work is necessary and should include physicians, sociologists, psychologists, city planners, political affiliates and most importantly community members. Future investigations should consider biological influences, familial factors, the neighborhood environment and city policy regarding active transport, land use and zoning guidelines.

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APPENDIX A

Table A-1

Comparison Data

	United States	Mississippi	Delta Counties
Percent black, 2009	12.9%	37.2%	60.8%
Median household income, 2008	$52,029	$37,818	$26,841
Per capita money income, 1999	$21,587	$20,468	$12,824
Living below poverty level, 2008	13.2%	20.8%	27.4%
Person per Square Mile, 2000	79.6	60.6	

Table A-2

County Demographics

		County A	County B
County Population, 2009		20,290	35,245
Race, 2009	Black	80.9%	47.8%
	White	18.0%	51.3%
Median household income, 2008		$23,369	$34,866
Per capita money income, 1999		$10,683	$13,075
Living below poverty level, 2008		34.9%	25.1%
Persons per square mile, 2000		28.6	50.1

Table A-3

School District Demographics

		District 1	District 2	District 3
Number of students (2007)		3,508	1,834	4,671
Spending per student		$6,307	$7,122	$6,285
Race	Black	99.9%	97.0%	56.1%
	White	0.01%	2.7%	42.7%
Gender	Female	50.0%	48.4%	48.7%
	Male	50.0%	51.5%	51.3%

Table A-4a

School Demographics; District 1, Schools 1 - 4

		School 1	School 2	School 3	School 4
Grade levels		K-6	K-5	K-6	K-6
Number of students		338	672	110	453
Race	Black	100%	99.9%	100%	99.3%
	White	0.0%	0.0%	0.0%	0.0%
Gender	Female	48.9%	50.3%	51.8%	50.3%
	Male	51.1%	49.7%	48.2%	49.7%

Table A-4b

School Demographics; District 2, Schools 5 - 7

		School 5	School 6	School 7
Grade levels		K-8	K-8	K-8
Number of students		644	263	456
Race	Black	94.7%	97.0%	98.0%
	White	4.4%	2.7%	2.0%
Gender	Female	45.0%	47.9%	48.9%
	Male	55.0%	52.1%	51.1%

Table A-4c

School Demographics; District 3, Schools 8 - 11

		School 8	School 9	School 10	School 11
Grade levels		K-8	PK-1	2-3	4-5
Number of students		512	672	660	584
Race	Black	28.7%	60.3%	64.1%	58.9%
	White	70.5%	38.5%	35.0%	39.2%
Gender	Female	46.5%	47.0%	47.6%	49.3%
	Male	53.5%	53.0%	52.4%	50.7%

Table A-5

Project Management/Time Line

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept
Interviews with Key Informants			**X**	**X**	**X**	**X**	**X**	**X**				
Interview Transcription							**X**	**X**	**X**			
Anthropometric Data Collection		**X**	**X**	**X**	**X**							
Built Environment Assessment					**X**	**X**	**X**	**X**				
SOPLAY Preparation					**X**	**X**	**X**					
SOPLAY Data Collection							**X**	**X**				
SOFIT Preparation	**X**	**X**	**X**	**X**	**X**							
SOFIT Data Collection				**X**	**X**	**X**	**X**					
Data Management	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Analyses/Syntheses of Findings								**X**	**X**	**X**	**X**	**X**
Dissemination of Findings												**X**

Table A-6

Sample Distribution

	Sample Size	Kurtosis	Skewness	Levene's Statistic	Significance Value
Height	N = 1,136	-0.054	0.312	3.256	p = 0.039
Weight	N = 1,136	1.684	1.299	11.516	p = 0.000
BMI	N = 1,136	1.252	1.220	9.83	p = 0.000
Waist Circumference	N = 1,136	1.610	1.345	7.660	p = 0.000
Waist-to-Height Ratio	N = 1,136	1.284	0.991	4.633	p = 0.010
%MVPA	N = 109	0.837	0.726	0.137	p = 0.872
Features of BE	N = 10	0.597	0.870	1.532	p = 0.240
Amenities of BE	N = 10	-0.114	0.989	3.848	p = 0.039
Incivilities of BE	N = 10	-0.701	0.530	1.376	p = 0.276

Table A-7

Outlier Demographics

		Height	Weight	BMI	WC	WtHR
Total Number of Outliers		15	99	122	106	128
District	1	46.7%	54.5%	46.7%	50.9%	46.9%
	2	26.7%	24.2%	27.9%	29.2%	27.3%
	3	26.7%	21.2%	25.4%	19.8%	25.8%
Race	Black	100.0%	91.9%	90.2%	89.6%	84.4%
	White	0.0%	8.1%	9.8%	10.4%	15.6%
Sex	Male	46.7%	52.5%	48.4%	48.1%	47.7%
	Female	53.3%	47.5%	51.6%	51.9%	52.3%
Percent in 4^{th}- 5^{th} Grade		86.7%	81.8%	63.9%	71.7%	53.1%
Percent between 9- and 11-years of age		66.7%	82.9%	70.5%	80.1%	64.9%
Mean Height (in.)		57.4 (±4.3)	61.7 (±3.2)	58.8 (±4.2)	60.2 (±3.4)	57.4 (±4.3)
Mean Weight (lbs.)		137.6 (±35.3)	160.5 (±21.3)	149.2 (±28.4)	153.6 (±27.2)	137.6 (±35.3)
Mean BMI		29.8 (±4.0)	29.8 (±4.0)	30.1 (±3.1)	29.8 (±3.9)	28.9 (±4.2)
Percent BMI at or above 95^{th} percentile		26.7%	96.0%	100.0%	98.1%	96.1%
Mean WC (in.)		37.7 (±4.3)	38.9 (±3.8)	38.1 (±4.2)	39.4 (±3.1)	37.7 (±4.2)
"At Risk" (WC)			100.0%	99.2%	100.0%	100.0%
Mean WtHR		65.3 (±7.0)	63.3 (±7.4)	64.7 (±5.8)	65.5 (±5.3)	65.3 (±7.0)
Percent "at-risk" according to WtHR		46.7%	98.0%	98.4%	99.1%	97.7%

Table A-8a

Participant Demographics

		District 1	District 2	District 3	Total/ Mean (s.d.)
Number of Schools		4	3	4	11
Number of Participants		426	303	407	1136
First Grade		18.8%	24.4%	20.6%	21%
Second Grade		18.8%	23.8%	21.4%	21%
Third Grade		21.8%	18.8%	16.2%	19%
Fourth Grade		19.7%	19.8%	22.9%	20.9%
Fifth Grade		20.9%	13.2%	18.9%	18.1%
Mean Age		8.7 (±1.6)	8.6 (±1.7)	8.5 (±1.6)	8.7 (±1.6)
Race	Black	97.7%	95.4%	56.3%	82.2%
	White	0.9%	3.3%	41.0%	15.9%
Sex	Female	46.5%	49.2%	49.5%	48.2%
	Male	53.5%	50.8%	50.6%	51.8%

Table A-8b

Participant Anthropometric Descriptive Data

	District 1	District 2	District 3	Total/ Mean (s.d.)
Height	55.5” (±4.9)	54.8” (±4.8)	53.9” (±4.4)	54.8” (±4.7)
Weight	91.3 lbs. (±34.8)	85.9 lbs. (±31.7)	80.2 lbs. (±27.1)	85.9 lbs. (±31.7)
BMI	20.3 (±5.3)	19.6 (±4.7)	19.0 (±4.1)	19.7 (±4.8)
Underweight (BMI)	0.5%	0.7%	1.0%	0.7%
Normal Weight (BMI)	49.1%	52.5%	55.3%	52.9%
Overweight (BMI)	18.5%	17.8%	18.4%	18.3%
Obese (BMI)	31.9%	29.0%	25.3%	28.8%
Waist Circumference	28.9” (±5.6)	27.9 (±4.9)	26.4” (+4.5)	27.7” (±5.1)
“At-Risk” (WC)	71.4%	62.7%	45.7%	59.9%
WtHR	51.7 (±8.1)	50.9 (±6.9)	48.8 (+6.7)	50.5 (±7.4)
“At-Risk” (WtHR ≥ 0.50)	46.5%	46.5%	33.9%	42%

Table A-9a

Participant Demographics: District 1, Schools 1-4

		School 1	School 2	School 3	School 4
Number of Participants		149	94	98	85
First Grade		18.1%	17.0%	16.3%	24.7%
Second Grade		19.5%	20.2%	20.4%	14.1%
Third Grade		21.5%	22.3%	23.5%	20.0%
Fourth Grade		21.5%	20.2%	15.3%	21.2%
Fifth Grade		19.5%	20.2%	24.5%	20.0%
Mean Age		8.7 ($\pm$1.6)	8.6 ($\pm$1.6)	8.7 ($\pm$1.4)	8.8 ($\pm$1.8)
Race	Black	98.7%	96.8%	96.9%	97.6%
	White	1.3%	3.2%	1.0%	1.2%
Sex	Female	51.0%	42.6%	46.9%	42.4%
	Male	49.0%	57.4%	53.1%	57.6%

Table A-9b

Participant Anthropometrics: District 1, Schools 1-4

	School 1	School 2	School 3	School 4
Height	55.6” (±4.8)	55.4” (±4.9)	55.6” (±4.9)	55.5” (±4.9)
Weight	94.5 lbs. (±38.7)	85.4 lbs. (±28.9)	89.5 lbs. (±34.5)	94.2 lbs. (±33.4)
BMI	20.9 (±5.9)	19.2 (±4.3)	19.8 (±5.3)	20.9 (±4.8)
Underweight (BMI)	0.0%	1.1%	1.0%	0.0%
Normal Weight (BMI)	48.3%	53.2%	56.1%	37.6%
Overweight (BMI)	16.1%	23.4%	13.3%	23.5%
Obese (BMI)	35.6%	22.3%	29.6%	38.8%
Waist Circumference	29.55” (±6.13)	27.7” (±4.5)	28.5” (±5.7)	29.4” (±5.4)
WtHR	52.9 (±8.6)	49.7 (±7.0)	51.2 (±7.9)	52.5 (±8.2)
“At-Risk” (WtHR ≥ 0.50)	53.7%	35.1%	41.8%	51.8%

Table A-10a

Participant Demographics: District 2, Schools 5-7

		School 5	School 6	School 7
Number of Participants		83	129	91
First Grade		20.5%	29.5%	20.8%
Second Grade		21.7%	24.0%	25.4%
Third Grade		22.9%	17.0%	17.6%
Fourth Grade		24.1%	16.3%	20.8%
Fifth Grade		10.8%	13.2%	15.4%
Mean Age		8.7 (±1.6)	8.4 (+1.7)	8.8 (±1.8)
Race	Black	88.0%	97.7%	98.9%
	White	7.2%	2.3%	1.1%
Sex	Female	51.8%	51.9%	42.9%
	Male	48.2%	48.1%	57.1%

Table A-10b

Participant Anthropometrics: District 2, Schools 5-7

	School 5	School 6	School 7
Height	54.7” (±4.4)	54.1” (±4.6)	55.8” (±5.2)
Weight	84.6 lbs. (±30.9)	81.7 lbs. (±30.3)	93.1 lbs. (±33.5)
BMI	19.4 (±4.5)	19.1 (±4.5)	20.6 (±4.9)
Underweight (BMI)	0.0%	1.6%	0.0%
Normal Weight (BMI)	55.4%	52.7%	49.5%
Overweight (BMI)	18.1%	20.9%	13.2%
Obese (BMI)	26.5%	24.8%	37.4%
Waist Circumference	28.2 (±4.8)	27.4 (±4.8)	28.4 (±5.2)
WtHR	51.5 (±6.5)	50.6 (±6.7)	50.8 (±7.6)
“At-Risk” (WtHR ≥ 0.50)	50.6%	45.0%	44.0%

Table A-11a

Participant Demographics: District 3, School 8-11

		School 8	School 9	School 10	School 11
Number of Participants		118	68	108	113
First Grade		13.5%	-	-	-
Second Grade		15.3%	100%	-	-
Third Grade		22.9%	-	63.9%	-
Fourth Grade		26.3%	-	36.1%	54.9%
Fifth Grade		22.0%	-	-	45.1%
Mean Age		8.8 (±1.6)	6.6 (±0.6)	7.9 (±0.8)	10.0 (+0.9)
Race	Black	28.0%	61.8%	69.4%	69.9%
	White	70.3%	35.3%	25.9%	28.3%
Sex	Female	46.6%	57.4%	49.1%	47.8%
	Male	53.4%	42.6%	50.9%	52.2%

Table A-11b

Participant Anthropometrics: District 3, School 8-11

	School 8	School 9	School 10	School 11
Height	54.5” ($\pm$4.3)	49.4” ($\pm$2.6)	52.5” ($\pm$3.0)	57.4” ($\pm$3.4)
Weight	81.2 lbs. ($\pm$25.6)	61.5 lbs. ($\pm$13.1)	72.3 lbs. ($\pm$18.5)	98.1 lbs. ($\pm$30.9)
BMI	18.8 ($\pm$3.7)	17.7 ($\pm$3.1)	18.3 ($\pm$3.7)	20.7 ($\pm$5.0)
Underweight (BMI)	1.7%	0.0%	1.9%	0.0%
Normal Weight (BMI)	57.6%	52.9%	56.5%	53.1%
Overweight (BMI)	16.9%	25.0%	18.5%	15.9%
Obese (BMI)	23.7%	22.1%	23.1%	31.0%
Waist Circumference	26.9 ($\pm$4.9)	24.5 ($\pm$3.1)	25.3 ($\pm$3.7)	27.9 ($\pm$4.9)
WtHR	49.3 ($\pm$6.9)	49.7 ($\pm$5.6)	48.0 ($\pm$6.4)	48.6 ($\pm$7.6)
“At-Risk” (WtHR $\geq$ 0.50)	33.9%	41.2%	25.9%	37.2%

Table A-12

Participant Physical Activity Data

		District 1	District 2	District 3	Total
PE Classes Observed		39	35	35	109
Class Length		39.56 ±7.49	39.8 ±7.53	38.2 ±9.44	39.2 ±8.13
%MVPA		40.96% ±17.8	35.0% ±0.14	32.8% ±15.3	36.4% ±15.0
Minutes MVPA		16.02 ±6.02	13.7 ±5.63	11.95 ±4.98	13.9 ±5.78
50% Class Time in MVPA		13	7	5	25
	% Management	28.7% ±18.4	24.1% ±17.0	33.4% ±21.4	28.7% ±19.1
	Min Management	11.4 ±7.33	15.4 ±17.74	15.0 ±13.38	13.88 ±13.33
	%Knowledge	10.69% ±13.0	8.5% ±8.8	9.52% ±10.5	9.61% ±10.9
	Min Knowledge	4.39 ±5.44	3.5 ±3.73	3.43 ±3.17	3.77 ±4.26
	%Fitness	17.63% ±23.5	17.64% ±16.6	19.77% ±25.6	18.32% ±22.1
Lesson Context	Minutes Fitness	7.16 ±9.55	7.63 ±7.78	6.78 ±7.14	7.1 ±8.2
	%Skill	13.3% ±23.1	10.28% ±17.4	5.8% ±17.7	9.93% ±19.7
	Minutes Skill	5.3 ±9.03	3.94 ±6.55	1.9 ±5.82	3.7 ±7.41
	%Game	8.18% ±10.5	14.27% ±21.0	22.05% ±21.7	14.59% ±19.0
	Minutes Games	3.23 ±4.27	6.2 ±9.11	9.31 ±9.75	6.1 ±8.29
	%Other	21.49% ±37.8	24.8% ±40.2	9.39% ±24.7	18.7 % ±35.3
	Minutes Other	7.93 ±14.32	8.7 ±14.39	2.96 ±7.60	6.6 ±12.73
	%In-Class	38.42% ±26.9	57.55% ±25.2	34.67% ±19.5	43.36% ±25.9
	Min In-Class	15.2 ±11.13	23.65 ±11.34	13.3 ±7.01	17.3 ±10.92
Teacher Interaction	%Out-of-Class	0.02% ±0.6	0.02% ±0.6	0%	0.1% ±0.4
	Min Out	0.12 ±0.29	.009 ±0.05	0	0.04 ±0.18
	%Neither	61.3% ±0.27	42.18% ±25.5	64.08% ±18.9	56.1% ±25.8
	Minutes Neither	24.2 ±11.63	16.06 ±8.66	24.86 ±10.75	21.8 ±11.1

Table A-13

Participant Physical Activity Data; District 1, Schools 1 -4

		School 1	School 2	School 3	School 4
PE Classes Observed		10	12	9	8
Class Length		38.3 ±9.45	42.3 ±5.24	38.4 ±8.61	38.1 ±6.51
%MVPA		36.3% ±8.2	32.7% ±14.1	49.9% ±13.4	48.9% ±16.4
Minutes MVPA		13.6 ±3.45	14.1 ±6.74	18.7 ±5.54	18.7 ±6.58
50% Class Time in MVPA		1	1	6	5
	% Management	47.8% ±17.4	28.5% ±6.1	13.0% ±8.4	22.6% ±0.21
	Min Management	18.7 ±7.94	12.05 ±2.92	5.59 ±3.96	8.1 ±6.79
	%Knowledge	9.6% ±4.4	19.6% ±19.5	5.6% ±53.1	4.2% ±7.1
	Min Knowledge	3.7 ±1.69	8.3 ±8.08	2.4 ±2.31	1.5 ±2.73
	%Fitness	3.2% ±3.5	36.3% ±16.9	16.8% ±34.1	8.31% ±14.7
Lesson Context	Minutes Fitness	1.2 ±1.45	15.3 ±7.06	6.7 ±13.3	2.8 ±5.04
	%Skill	19.1% ±25.4	8.34% ±11.2	23.8% ±35.8	1.5% ±2.8
	Minutes Skill	7.06 ±8.76	3.74 ±5.01	9.77 ±5.01	0.62 ±1.158
	%Game	18.4% ±12.3	7.0% ±8.2	1.8% ±4.1	4.1% ±7.7
	Minutes Games	7.1 ±5.08	2.9 ±3.65	0.85 ±2.0	1.4 ±2.78
	%Other	1.64% ±5.1	0%	38.8% ±46.8	59.0% ±43.3
	Minutes Other	0.4 ±1.26	0	13.1 ±15.87	23.4 ±18.05
	%In-Class	25.4% ±13.8	46.5% ±15.9	59.8% ±15.9	18.2% ±25.4
	Min In-Class	9.7 ±5.70	19.8 ±7.41	22.8 ±13.88	6.5 ±9.13
Teacher Interaction	%Out-of-Class	0%	0.93% ±0.9	0%	0%
	Min Out	0	0.3 ±0.42	0	0
	%Neither	74.5% ±13.8	52.5% ±16.3	40.1% ±32.9	81.7% ±25.4
	Minutes Neither	28.5 ±8.51	28.5 ±8.51	15.6 ±14.01	31.5 ±12.53

Table A-14

Participant Physical Activity Data; District 2, Schools 5 - 7

		School 5	School 6	School 7
PE Classes Observed		10	12	13
Class Length		45.1 ±5.43	40.1 ±6.61	35.4 ±7.36
%MVPA		32.5% ±9.9	23.8% ±4.9	47.2% ±13.1
Minutes MVPA		14.8 ±5.3	9.66 ±3.06	16.6 ±5.76
50% Class Time in MVPA		0	0	7
	% Management	31.8% ±9.3	30.06% ±15.8	12.6% ±17.1
	Min Management	27.4 ±22.41	14.9 ±11.85	6.5 ±13.47
	%Knowledge	12.9% ±7.9	12.5% ±9.2	1.2% ±2.4
	Min Knowledge	5.6 ±3.5	5.02 ±3.78	0.4 ±0.8
	%Fitness	31.7% ±17.6	14.09% ±4.9	10.0% ±17.0
Lesson Context	Minutes Fitness	14.8 ±8.7	5.7 ±2.23	3.8 ±2.23
	%Skill	6.3% ±11.3	24.5% ±21.7	0.1% ±0.5
	Minutes Skill	2.4 ±4.26	9.3 ±8.11	0.07 (±0.27
	%Game	14.7% ±21.1	18.4% ±21.1	10.0% ±21.8
	Minutes Games	6.9 ±9.79	8.24 ±9.81	3.8 ±9.81
	%Other	2.37% ±3.9	0%	65.2% ±42.1
	Minutes Other	1.0 ±1.78	0	22.7 ±15.69
	%In-Class	62.9% ±12.8	63.1% ±18.8	48.6% ±35.0
	Minutes In-Class	28.4 ±9.13	25.2 ±8.88	18.4 ±13.95
Teacher Interaction	%Out-of-Class	0.08% ±0.2	0%	0%
	Minutes Out	0.03 ±0.1	0	0
	%Neither	37.53% ±12.7	36.8% ±18.8	50.7% ±35.7
	Minutes Neither	16.6 ±5.11	14.8 ±8.67	16.7 ±11.04

Table A-15

Participant Physical Activity Data; District 3, Schools 8 - 11

		School 8	School 10	School 11
PE Classes Observed		12	11	12
Class Length		44.9 ±9.56	31.2 ±2.6	38. ±9.28
%MVPA		33.3% ±15.1	31.0% ±9.7	33.9% ±20.1
Minutes MVPA		14.2 ±6.53	9.7 ±6.53	11.6 ±3.55
50% Class Time in MVPA		3	1	1
	% Management	38.6% ±27.7	21.6% ±13.8	38.9% ±16.4
	Min Management	18.4 ±14.82	6.8 ±4.64	19.1 ±14.71
	%Knowledge	2.6% ±2.8	17.7% ±2.8	8.8% ±4.8
	Min Knowledge	1.2 ±1.43	5.4 ±4.26	3.5 ±1.85
	%Fitness	29.1% ±32.9	4.6% ±6.4	24.3% ±23.7
Lesson Context	Minutes Fitness	10.5 ±9.8	1.5 ±2.10	7.8 ±3.66
	%Skill	0.06% ±2.0	16.0% ±29.5	1.6% ±4.3
	Minutes Skill	0.3 ±1.05	5.0 ±9.72	0.6 ±1.81
	%Game	27.1% ±25.4	11.9% ±17.1	26.2% ±20.1
	Minutes Games	13.0 ±12.34	3.9 ±12.34	10.4 ±8.13
	%Other	1.8% ±6.4	27.8% ±38.4	0%
	Minutes Other	0.9 ±15.69	8.3 ±11.7	0
	%In-Class	36.11% ±22.6	30.3% ±19.9	37.1% ±16.6
	Minutes In-Class	14.7 ±7.63	10.8 ±6.29	14.2 ±6.97
Teacher Interaction	%Out-of-Class	0%	0%	0%
	Minutes Out	0	0	0
	%Neither	63.8% ±22.6	65.5% ±18.7	62.9% ±16.6
	Minutes Neither	29.7 ±14.00	20.3 ±5.63	24.1 ±9.26

Table A-16

Built Environment PARA-Resource Types

		District 1	District 2	District 3	Total
Total Number of Physical Activity Resources		9	6	8	23
Total number of Outdoor Resources		4	3	4	11
Outdoor Resources	Small	2	2	0	4
	Medium	2	1	0	3
	Large	0	0	4	4
Total Number of Indoor Resources		5	3	4	12
Indoor Resources	Small	3	2	1	6
	Medium	2	1	3	6
	Large	0	0	0	0
Signage	Hours	0	0	1	1
	Rules	2	2	2	6
Outdoor Signage	Hours	0	0	1	1
	Rules	0	1	0	1
Indoor Signage	Hours	0	0	0	0
	Rules	2	1	2	5

Table A-17a

Built Environment PARA-Features by District

		District 1	District 2	District 3	Total
Baseball Field		1	0	0	1
Baseball Field	Poor	0	-	-	0
	Mediocre	1	-	-	1
	Good	0	-	-	0
Basketball Court		7	4	7	18
Outdoor Basketball Court		4	3	4	11
Outdoor Basketball Court	Poor	3	3	0	6
	Mediocre	1	0	4	5
	Good	0	0	0	0
Indoor Basketball Court		3	1	3	7
Indoor Basketball Court	Poor	1	0	0	1
	Mediocre	2	0	0	2
	Good	0	1	3	4
Soccer Field		0	0	0	0
Tennis Court		0	0	0	0
Volleyball Court		0	2	0	2
Outdoor Volleyball Court		0	1	0	1
Outdoor Volleyball Court	Poor	-	1	-	1
	Mediocre	-	0	-	0
	Good	-	0	-	0
Indoor Volleyball Court		0	1	0	1
Indoor Volleyball Court	Poor	-	1	-	1
	Mediocre	-	0	-	0
	Good	-	0	-	0

Table A-17b

Built Environment PARA-Features by District con't

		District 1	District 2	District 3	Total
Play Equipment-Outdoor		4	3	4	11
Play Equipment-Outdoor	Poor	0	1	0	1
	Mediocre	2	1	1	4
	Good	2	1	3	6
Exercise Stations		3	0	2	5
Outdoor Exercise Stations		0	0	2	2
Exercise Stations	Poor	-	-	0	0
	Mediocre	-	-	0	0
	Good	-	-	2	2
Indoor Exercise Stations		3	0	0	3
Indoor Exercise Stations	Poor	2	-	-	2
	Mediocre	0	-	-	0
	Good	1	-	-	1
Trails-Outdoor		0	0	2	2
Trails-Outdoor	Poor	-	-	0	0
	Mediocre	-	-	1	1
	Good	-	-	1	1
Sidewalk- Outdoor		2	1	1	4
Sidewalk- Outdoor	Poor	1	1	0	2
	Mediocre	1	0	1	2
	Good	0	0	0	0
Pool > 3ft. Deep		0	0	0	0
Wading Pool < 3ft. Deep		0	0	0	0
Sandbox		0	0	0	0
Bike Rack		0	0	0	0

Table A-18a

Built Environment PARA-Amenities by District

		District 1	District 2	District 3	Total
Access Points		9	6	8	23
Outdoor Access Points		4	3	4	11
Outdoor Access Points	Poor	2	1	0	3
	Mediocre	2	2	2	6
	Good	0	0	2	2
Indoor Access Points		5	3	4	12
Indoor Access Points	Poor	5	1	1	7
	Mediocre	0	2	2	4
	Good	0	0	1	1
Lighting-Outdoor		2	0	0	2
Lighting-Outdoor	Poor	0	-	-	0
	Mediocre	2	-	-	2
	Good	0	-	-	0
Landscaping		0	0	0	0
Decorative Fountain		0	0	0	0

Table A-18b

Built Environment PARA-Amenities by District con't

		District 1	District 2	District 3	Total
Bathrooms-Indoor		2	0	2	4
Bathrooms-Indoor	Poor	2	-	2	4
	Mediocre	0	-	0	0
	Good	0	-	0	0
Shower/Locker Room		3	1	0	4
Shower/Locker Room	Poor	3	1	-	4
	Mediocre	0	0	-	0
	Good	0	0	-	0
Drinking Fountains		1	2	2	5
Drinking Fountains	Poor	0	1	0	1
	Mediocre	1	1	1	3
	Good	0	0	1	1
Trash Containers		5	4	6	15
Outdoor Trash Containers		1	1	4	6
Outdoor Trash Containers	Poor	0	1	0	1
	Mediocre	1	0	0	1
	Good	0	0	4	4
Indoor Trash Containers		4	3	2	9
Indoor Trash Containers	Poor	2	1	0	3
	Mediocre	2	2	1	5
	Good	0	0	1	1

Table A-18c

Built Environment PARA-Amenities by District con't

		District 1	District 2	District 3	Total
Shelters-Outdoor		0	0	3	3
Shelters-Outdoor	Poor	-	-	0	0
	Mediocre	-	-	0	0
	Good	-	-	3	3
Picnic Tables-Shaded		0	0	3	3
Picnic Tables-Shaded	Poor	-	-	0	0
	Mediocre	-	-	1	1
	Good	-	-	2	2
Picnic Tables-Not Shaded		0	0	2	0
Picnic Tables-Not Shaded	Poor	-	-	0	0
	Mediocre	-	-	0	0
	Good	-	-	2	2
Benches		4	1	21	26
Outdoor Benches		1	0	20	21
Outdoor Benches	Poor	0	-	0	0
	Mediocre	0	-	3	3
	Good	1	-	17	18
Indoor Benches		3	1	3	7
Indoor Benches	Poor	1	1	0	2
	Mediocre	2	0	2	4
	Good	0	0	1	1

Table A-19a

Built Environment PARA-Incivilities by District

		District 1	District 2	District 3	Total
Auditory Annoyance		1	2	3	6
Outdoor Auditory Annoyance		0	1	2	3
Outdoor Auditory Annoyance	Not irritating	-	1	2	3
	Noticeable	-	0	0	0
	Unpleasant	-	0	0	0
Indoor Auditory Annoyance		1	1	1	3
Indoor Auditory Annoyance	Not irritating	0	0	0	0
	Noticeable	1	1	0	2
	Unpleasant	0	0	1	1
No Grass		3	2	3	8
No Grass	Small Area	2	1	1	4
	Moderate	1	1	2	4
	Large Area	0	0	0	0
Overgrown Grass		0	2	0	2
Overgrown Grass	A little bit	-	1	-	1
	Moderate	-	0	-	0
	A lot	-	1	-	1
Evidence of Alcohol Use		0	0	0	0
Evidence of Substance Use		0	0	0	0
Evidence of Sex Paraphernalia		0	0	0	0

Table A-19b

Built Environment PARA-Incivilities by District con't

		District 1	District 2	District 3	Total
Litter		5	4	2	11
Outdoor Litter		2	3	2	7
Outdoor Litter	< 5 items	0	0	0	0
	5-10 items	1	1	0	2
	11 > items	1	2	2	5
Indoor Litter		3	1	0	4
Indoor Litter	< 5 items	0	0	-	0
	5-10 items	3	1	-	4
	11 > items	0	0	-	0
Graffiti-Outdoor		1	0	0	1
Graffiti-Outdoor	1-3 small	1	-	-	1
	1 large	0	-	-	0
	2+ large	0	-	-	0
Dogs Unattended-Outdoor		0	0	1	1
Dogs Unattended-Outdoor	1 dog	-	-	1	1
	2-4 dogs	-	-	0	0
	5 > dogs	-	-	0	0
Dog Refuse		0	0	0	0
Broken Glass		0	0	0	0
Vandalism		0	0	0	0

Table A-20

Built Environment PARA-Resource Types by School (District 1)

		School 1	School 2	School 3	School 4
Total Number of Physical Activity Resources		2	2	2	3
Total number of Outdoor Resources		1	1	1	1
Outdoor Resources	Small	0	1	0	1
	Medium	1	0	1	0
	Large	0	0	0	0
Total Number of Indoor Resources		1	1	1	2
Indoor Resources	Small	0	1	1	1
	Medium	1	0	0	1
	Large	0	0	0	0
Signage	Hours	0	0	0	0
	Rules	0	1	1	0
Outdoor Signage	Hours	0	0	0	0
	Rules	0	0	0	0
Indoor Signage	Hours	0	0	0	0
	Rules	0	1	1	0

Table A-21a

Built Environment PARA-Features by School (District 1)

		School 1	School 2	School 3	School 4
Baseball Field		0	0	1	0
Baseball Field	Poor	-	-	0	-
	Mediocre	-	-	1	-
	Good	-	-	0	-
Basketball Court		2	2	1	2
Outdoor Basketball Court		1	1	1	1
Outdoor Basketball Court	Poor	1	1	0	1
	Mediocre	0	0	1	0
	Good	0	0	0	0
Indoor Basketball Court		1	1	0	1
Indoor Basketball Court	Poor	0	0	-	0
	Mediocre	1	0	-	0
	Good	0	1	-	1
Soccer Field		0	0	0	0
Tennis Court		0	0	0	0
Volleyball Court		0	0	0	0

Table A-21b

Built Environment PARA-Features by School (District 1)

		School 1	School 2	School 3	School 4
Play Equipment-Outdoor		1	1	1	1
Play Equipment-Outdoor	Poor	0	0	0	0
	Mediocre	1	1	0	0
	Good	0	0	1	1
Indoor Exercise Stations		0	1	1	1
Indoor Exercise Stations	Poor	0	0	1	1
	Mediocre	0	0	0	0
	Good	0	1	0	0
Trails-Outdoor		0	0	0	0
Sidewalk- Outdoor		0	0	1	1
Sidewalk- Outdoor	Poor	-	-	0	1
	Mediocre	-	-	1	0
	Good	-	-	0	0
Pool > 3ft. Deep		0	0	0	0
Wading Pool < 3ft. Deep		0	0	0	0
Sandbox		0	0	0	0
Bike Rack		0	0	0	0

Table A-22a

Built Environment PARA-Amenities by School (District 1)

		School 1	School 2	School 3	School 4
Access Points		2	2	2	3
Outdoor Access Points		1	1	1	1
Outdoor Access Points	Poor	1	1	0	0
	Mediocre	0	0	1	1
	Good	0	0	0	0
Indoor Access Points		1	1	1	2
Indoor Access Points	Poor	1	1	1	2
	Mediocre	0	0	0	0
	Good	0	0	0	0
Lighting-outdoor		0	1	1	0
Lighting-outdoor	Poor	-	0	0	-
	Mediocre	-	1	1	-
	Good	-	0	0	-
Landscaping		0	0	0	0
Decorative Fountain		0	0	0	0

Table A- 22b

Built Environment PARA-Amenities by School (District 1) con't

		School 1	School 2	School 3	School 4
Bathrooms-Indoor		0	1	0	1
Bathrooms-Indoor	Poor	-	1	-	1
	Mediocre	-	0	-	0
	Good	-	0	-	0
Shower/Locker Room		0	1	0	2
Shower/Locker Room	Poor	-	1	-	2
	Mediocre	-	0	-	0
	Good	-	0	-	0
Drinking Fountains		0	1	0	0
Drinking Fountains	Poor	-	0	-	-
	Mediocre	-	1	-	-
	Good	-	0	-	-
Trash Containers		1	2	3	3
Outdoor Trash Containers		0	0	2	0
Outdoor Trash Containers	Poor	-	-	0	-
	Mediocre	-	-	2	-
	Good	-	-	0	-
Indoor Trash Containers		1	2	1	3
Indoor Trash Containers	Poor	0	0	1	3
	Mediocre	1	2	0	0
	Good	0	0	0	0

Table A-22c

Built Environment PARA-Amenities by School (District 1) con't

		School 1	School 2	School 3	School 4
Shelters-Outdoor		0	0	0	0
Picnic Tables-Shaded		0	0	0	0
Picnic Tables-Not Shaded		0	0	0	0
Benches		2	2	2	1
Outdoor Benches		0	0	2	0
Outdoor Benches	Poor	-	-	0	-
	Mediocre	-	-	0	-
	Good	-	-	2	-
Indoor Benches		2	2	0	1
Indoor Benches	Poor	0	0	-	1
	Mediocre	2	2	-	0
	Good	0	0	-	0

Table A-23a

Built Environment PARA-Incivilities by School (District 1)

		School 1	School 2	School 3	School 4
Auditory Annoyance		0	0	0	1
Outdoor Auditory Annoyance		0	0	0	0
Indoor Auditory Annoyance		0	0	0	1
Indoor Auditory Annoyance	Not irritating	-	-	-	0
	Noticeable	-	-	-	0
	Unpleasant	-	-	-	1
No Grass		1	1	0	1
No Grass	Small Area	1	1	-	0
	Moderate	0	0	-	1
	Large Area	0	0	-	0
Overgrown Grass		0	0	0	0
Evidence of Alcohol Use		0	0	0	0
Evidence of Substance Use		0	0	0	0
Evidence of Sex Paraphernalia		0	0	0	0

Table A-23b

Built Environment PARA-Incivilities by School (District 1) con't

		School 1	School 2	School 3	School 4
Litter		1	0	1	3
Outdoor Litter		0	0	1	1
Outdoor Litter	< 5 items	-	-	0	0
	5-10 items	-	-	0	1
	11 > items	-	-	1	0
Indoor Litter		1	0	0	2
Indoor Litter	< 5 items	0	-	-	0
	5-10 items	1	-	-	2
	11 > items	0	-	-	0
Graffiti-Outdoor		0	0	1	0
Graffiti-Outdoor	1-3 small	-	-	1	-
	1 large	-	-	0	-
	2+ large	-	-	0	-
Dogs Unattended-Outdoor		0	0	0	0
Dog Refuse		0	0	0	0
Broken Glass		0	0	0	0
Vandalism		0	0	0	0

Table A-24

Built Environment PARA-Resource Types by School (District 2)

		School 5	School 6	School 7
Total Number of Physical Activity Resources		2	2	2
Total number of Outdoor Resources		1	1	1
Outdoor Resources	Small	1	0	1
	Medium	0	2	0
	Large	0	0	0
Total Number of Indoor Resources		1	1	1
Indoor Resources	Small	1	1	0
	Medium	0	0	1
	Large	0	0	0
Signage	Hours	0	0	0
	Rules	1	0	1
Outdoor Signage	Hours	0	0	0
	Rules	0	0	1
Indoor Signage	Hours	0	0	0
	Rules	1	0	0

Table A-25a

Built Environment PARA-Features by School (District 2)

		School 5	School 6	School 7
Baseball Field		0	0	0
Basketball Court		1	1	2
Outdoor Basketball Court		1	1	1
Outdoor Basketball Court	Poor	1	1	1
	Mediocre	0	0	0
	Good	0	0	0
Indoor Basketball Court		0	0	1
Indoor Basketball Court	Poor	-	-	0
	Mediocre	-	-	0
	Good	-	-	1
Soccer Field		0	0	0
Tennis Court		0	0	0
Volleyball Court		0	1	1
Outdoor Volleyball Court		0	1	0
Outdoor Volleyball Court	Poor	-	1	-
	Mediocre	-	0	-
	Good	-	0	-
Indoor Volleyball Court		0	0	1
Indoor Volleyball Court	Poor	-	-	1
	Mediocre	-	-	0
	Good	-	-	0

Table A-25b

Built Environment PARA-Features by School (District 2) con't

		School 5	School 6	School 7
Play Equipment-Outdoor		1	1	1
Play Equipment- Outdoor	Poor	0	1	0
	Mediocre	0	0	1
	Good	1	0	0
Exercise Stations		0	0	0
Trails-Outdoor		0	0	0
Sidewalk-Outdoor		0	1	0
Sidewalk- Outdoor	Poor	-	1	-
	Mediocre	-	0	-
	Good	-	0	-
Pool > 3ft. Deep		0	0	0
Wading Pool < 3ft. Deep		0	0	0
Sandbox		0	0	0
Bike Rack		0	0	0

Table A-26a

Built Environment PARA-Amenities by School (District 2)

		School 5	School 6	School 7
Access Points		2	2	2
Outdoor Access Points		1	1	1
Outdoor Access Points	Poor	0	1	0
	Mediocre	1	0	1
	Good	0	0	0
Indoor Access Points		1	1	1
Indoor Access Points	Poor	0	0	1
	Mediocre	1	1	0
	Good	0	0	0
Lighting-Outdoor		0	0	0
Landscaping		0	0	0
Decorative Fountain		0	0	0

Table A-26b

Built Environment PARA-Amenities by School (District 2) con't

		School 5	School 6	School 7
Bathrooms-Indoor		0	0	0
Shower/Locker Room		0	0	1
Shower/Locker Room	Poor	-	-	1
	Mediocre	-	-	0
	Good	-	-	0
Drinking Fountains		0	1	1
Drinking Fountains	Poor	-	0	1
	Mediocre	-	1	0
	Good	-	0	0
Trash Containers		2	1	3
Outdoor Trash Containers		0	0	1
Outdoor Trash Containers	Poor	-	-	1
	Mediocre	-	-	0
	Good	-	-	0
Indoor Trash Containers		2	1	2
Indoor Trash Containers	Poor	0	0	2
	Mediocre	2	1	0
	Good	0	0	0

Table A-26c

Built Environment PARA-Amenities by School (District 2) con't

		School 5	School 6	School 7
Shelters-Outdoor		0	0	0
Picnic Tables-Shaded		0	0	0
Picnic Tables-Not Shaded		0	0	0
Benches		0	0	1
Outdoor Benches		0	0	0
Indoor Benches		0	0	1
Indoor Benches	Poor	-	-	1
	Mediocre	-	-	0
	Good	-	-	0

Table A-27a

Built Environment PARA-Incivilities by School (District 2)

		School 5	School 6	School 7
Auditory Annoyance		1	1	0
Outdoor Auditory Annoyance		0	1	0
Outdoor Auditory Annoyance	Not irritating	-	1	-
	Noticeable	-	0	-
	Unpleasant	-	0	-
Indoor Auditory Annoyance		1	0	0
Indoor Auditory Annoyance	Not irritating	0	-	-
	Noticeable	1	-	-
	Unpleasant	0	-	-
No Grass		1	0	1
No Grass	Small Area	1	-	0
	Moderate	0	-	1
	Large Area	0	-	0
Overgrown Grass		1	0	1
Overgrown Grass	A little bit	0	-	1
	Moderate	0	-	0
	A lot	1	-	0
Evidence of Alcohol Use		0	0	0
Evidence of Substance Use		0	0	0
Evidence of Sex Paraphernalia		0	0	0

Table A-27b

Built Environment PARA-Incivilities by School (District 2) con't

		School 5	School 6	School 7
Litter		1	1	2
Outdoor Litter		1	1	1
Outdoor Litter	< 5 items	0	0	0
	5-10 items	1	0	0
	11 > items	0	1	1
Indoor Litter		0	0	1
Indoor Litter	< 5 items	-	-	0
	5-10 items	-	-	1
	11 > items	-	-	0
Graffiti-Outdoor		0	0	0
Dogs Unattended		0	0	0
Dog Refuse		0	0	0
Broken Glass		0	0	0
Vandalism		0	0	0

Table A-28

Built Environment PARA-Resource Types by School (District 3)

		School 8	School 9	School 10	School 11
Total Number Physical Activity Resources		3	1	2	2
Total number of Outdoor Resources		1	1	1	1
Outdoor Resources	Small	0	0	0	0
	Medium	0	0	0	0
	Large	1	1	1	1
Total Number of Indoor Resources		2	0	1	1
Indoor Resources	Small	1	-	0	0
	Medium	1	-	1	1
	Large	0	-	0	0
Signage	Hours	0	1	0	0
	Rules	1	0	1	0
Outdoor Signage	Hours	0	1	0	0
	Rules	0	0	0	0
Indoor Signage	Hours	0	-	0	0
	Rules	1	-	1	0

Table A-29a

Built Environment PARA-Features by School (District 3)

		School 8	School 9	School 10	School 11
Baseball Field		0	0	0	0
Basketball Court		2	1	2	2
Outdoor Basketball Court		1	1	1	1
Outdoor Basketball Court	Poor	0	0	0	0
	Mediocre	1	1	1	1
	Good	0	0	0	0
Indoor Basketball Court		1	0	1	1
Indoor Basketball Court	Poor	0	-	0	0
	Mediocre	0	-	0	0
	Good	1	-	1	1
Soccer Field		0	0	0	0
Tennis Court		0	0	0	0
Volleyball Court		0	0	0	0

Table A-29b

Built Environment PARA-Features by School (District 3) con't

		School 8	School 9	School 10	School 11
Play Equipment- Outdoor		1	1	1	1
Play Equipment- Outdoor	Poor	0	0	0	0
	Mediocre	0	0	1	0
	Good	1	1	0	1
Outdoor Exercise Stations		1	0	1	0
Outdoor Exercise Stations	Poor	0	-	0	-
	Mediocre	0	-	0	-
	Good	1	-	1	-
Trails-Outdoor		1	0	1	0
Trails-Outdoor	Poor	0	-	0	-
	Mediocre	0	-	1	-
	Good	1	-	0	-
Sidewalk-Outdoor		0	1	0	0
Outdoor Sidewalk	Poor	-	0	-	-
	Mediocre	-	1	-	-
	Good	-	0	-	-
Pool > 3ft. Deep		0	0	0	0
Wading Pool < 3ft. Deep		0	0	0	0
Sandbox		0	0	0	0
Bike Rack		0	0	0	0

Table A-30a

Built Environment PARA-Amenities by School (District 3)

		School 8	School 9	School 10	School 11
Access Points		3	1	2	2
Outdoor Access Points		1	1	1	1
Outdoor Access Points	Poor	0	0	0	0
	Mediocre	0	1	1	0
	Good	1	0	0	1
Indoor Access Points		2	0	1	1
Indoor Access Points	Poor	0	-	1	0
	Mediocre	2	-	0	0
	Good	0	-	0	1
Lighting		0	0	0	0
Landscaping		0	0	0	0
Decorative Fountains		0	0	0	0

Table A-30b

Built Environment PARA-Amenities by School (District 3) con't

		School 8	School 9	School 10	School 11
Bathrooms-Indoor		1	0	1	0
Bathrooms-Indoor	Poor	1	-	1	-
	Mediocre	0	-	0	-
	Good	0	-	0	-
Shower/Locker Room		0	0	0	0
Drinking Fountains		1	0	1	0
Drinking Fountains	Poor	0	-	0	-
	Mediocre	0	-	1	-
	Good	1	-	0	-
Trash Containers		7	9	10	4
Outdoor Trash Containers		5	9	7	4
Outdoor Trash Containers	Poor	0	0	0	0
	Mediocre	0	0	0	0
	Good	5	9	7	4
Indoor Trash Containers		2	0	3	0
Indoor Trash Containers	Poor	0	-	0	-
	Mediocre	0	-	3	-
	Good	2	-	0	-

Table A-30c

Built Environment PARA-Amenities by School (District 3) con't

		School 8	School 9	School 10	School 11
Shelters-Outdoor		1	1	0	1
Shelters-Outdoor	Poor	0	0	-	0
	Mediocre	0	0	-	0
	Good	1	1	-	1
Picnic Tables-Shaded		0	6	7	12
Picnic Tables-Shaded	Poor	-	0	0	0
	Mediocre	-	0	7	0
	Good	-	6	0	12
Picnic Tables-Not Shaded		2	14	0	0
Picnic Tables-Not Shaded	Poor	0	0	-	-
	Mediocre	0	0	-	-
	Good	2	14	-	-
Benches		10	6	2	3
Outdoor Benches		9	6	2	3
Outdoor Benches	Poor	0	0	0	0
	Mediocre	0	0	0	3
	Good	9	6	2	0
Indoor Benches		1	0	2	0
Indoor Benches	Poor	0	-	0	-
	Mediocre	0	-	2	-
	Good	1	-	0	-

Table A-31a

Built Environment PARA-Incivilities by School (District 3)

		School 8	School 9	School 10	School 11
Auditory Annoyance		2	1	0	0
Outdoor Auditory Annoyance		1	1	0	0
Outdoor Auditory Annoyance	Not irritating	1	1	-	-
	Noticeable	0	0	-	-
	Unpleasant	0	0	-	-
Indoor Auditory Annoyance		1	0	0	0
Indoor Auditory Annoyance	Not irritating	0	-	-	-
	Noticeable	0	-	-	-
	Unpleasant	1	-	-	-
No Grass		1	1	1	0
No Grass	Small Area	0	0	1	-
	Moderate	1	1	0	-
	Large Area	0	0	0	-
Overgrown Grass		0	0	0	0
Evidence of Alcohol Use		0	0	0	0
Evidence of Substance Use		0	0	0	0
Evidence of Sex Paraphernalia		0	0	0	0

Table A-31b

Built Environment PARA-Incivilities by School (District 3) con't

		School 8	School 9	School 10	School 11
Litter		0	1	1	0
Outdoor Litter		0	1	1	0
Outdoor Litter	< 5 items	-	0	0	-
	5-10 items	-	0	0	-
	11 > items	-	1	1	-
Indoor Litter		0	-	0	0
Graffiti-Outdoor		0	0	0	0
Dogs Unattended		0	1	0	0
Dogs Unattended	1 dog	-	1	-	-
	2-4 dogs	-	0	-	-
	5 > dogs	-	0	-	-
Dog Refuse		0	0	0	0
Broken Glass		0	0	0	0
Vandalism		0	0	0	0

Table A-32

Correlation Table Between the School Built Environment and In-School Physical Activity

	BE Features	BE Amenities	BE Incivilities	%MVPA
BE Features	-	0.767**	-0.323	0.236
BE Amenities		-	-0.526	-0.217
BE Incivilities			-	0.339
%MVPA				-

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Table A-33

Correlation Table Between In-School Physical Activity and Weight Status

	% MVPA	BMI	WtHR	WC	Total Body Weight
% MVPA	-	0.629*	0.404	0.411	0.591
BMI		-	0.613	0.512	0.959**
WtHR			-	0.122	0.498
WC				-	0.663*
Total Body Weight					-

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Table A-34

Correlation Table Between Weight Status and the School Built Environment

	BMI	WtHR	WC	Total Body Weight	BE Features	BE Amenities	BE Incivilities
BMI	-	0.688*	0.620*	0.964*	-0.532	-0.619*	-0.289
WtHR		-	0.317	0.610*	-0.713*	-0.819**	-0.056
WC			-	0.752**	-0.405	-0.509	-0.467
Total Body Weight				-	-0.548	-0.615*	-0.436
BE Features					-	0.851**	0.295
BE Amenities						-	0.409
BE Incivilities							-

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

APPENDIX B

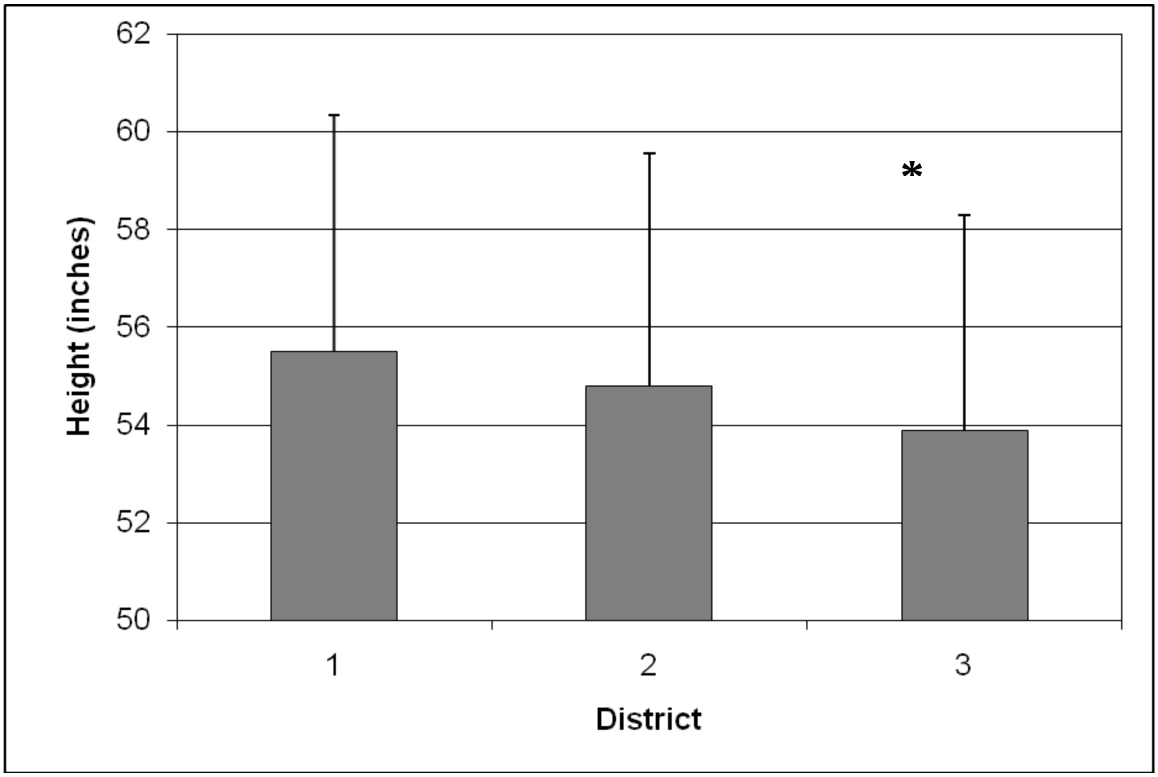

Figure B-1. Mean height score (±SD) between District 1 (n = 426), District 2 (n = 303) and District 3 (n = 407). A significant difference was found between District 1 and District 3* (*p* = 0.000). There was no significant difference between District 1 and District 2 (*p* = 0.082), and District 2 and District 3 (*p* = 0.039).

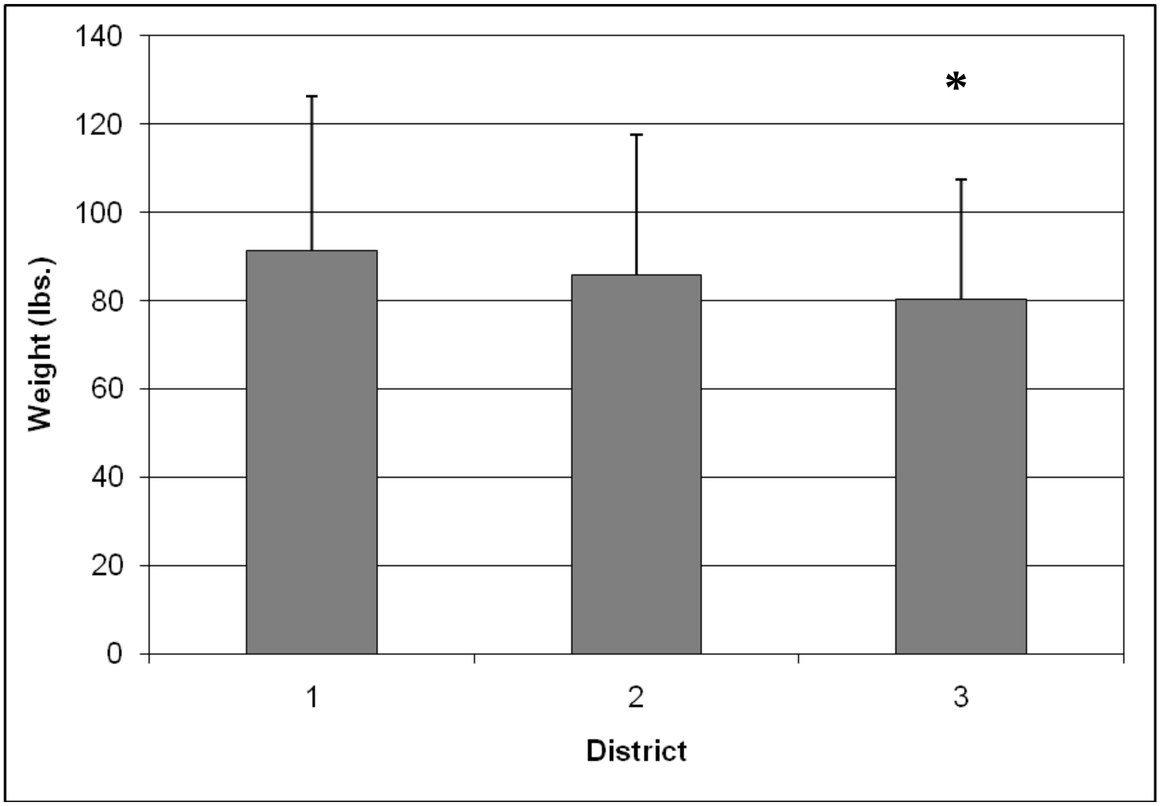

Figure B-2. Mean total body weight score (+SD) between District 1 (n = 426), District 2 (n = 303) and District 3 (n = 407). A significant difference was found between District 1 and District 3* (p = 0.000). There was no significant difference between District 1 and 2 (p = 0.060), and between District 2 and District 3 (p = 0.044).

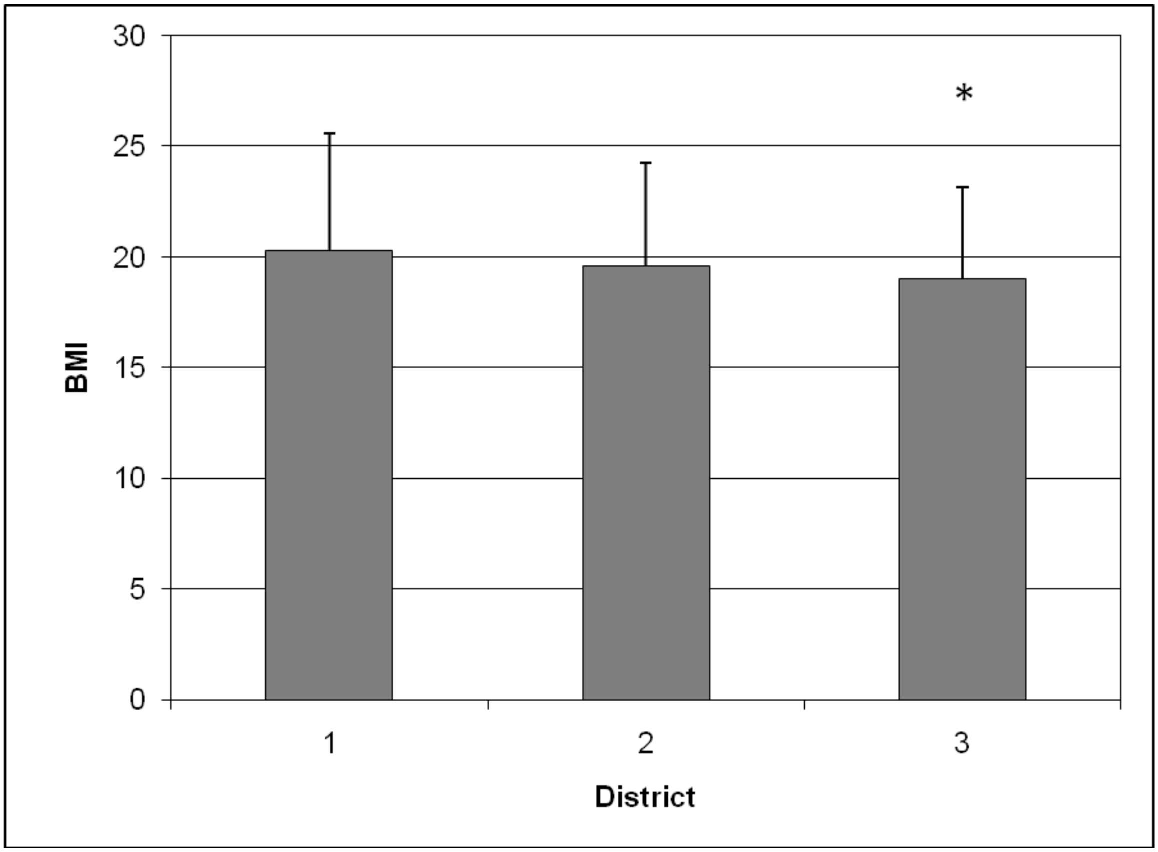

Figure B-3. Mean BMI score (±SD) between District 1 (n = 426), District 2 (n = 303) and District 3*(n = 407). A significant difference was found between District 1 and District 3 (*p* = 0.000). There was no significant difference between District 1 and District 2 (*p* = 0.155) and District 2 and District 3 (*p* = 0.207).

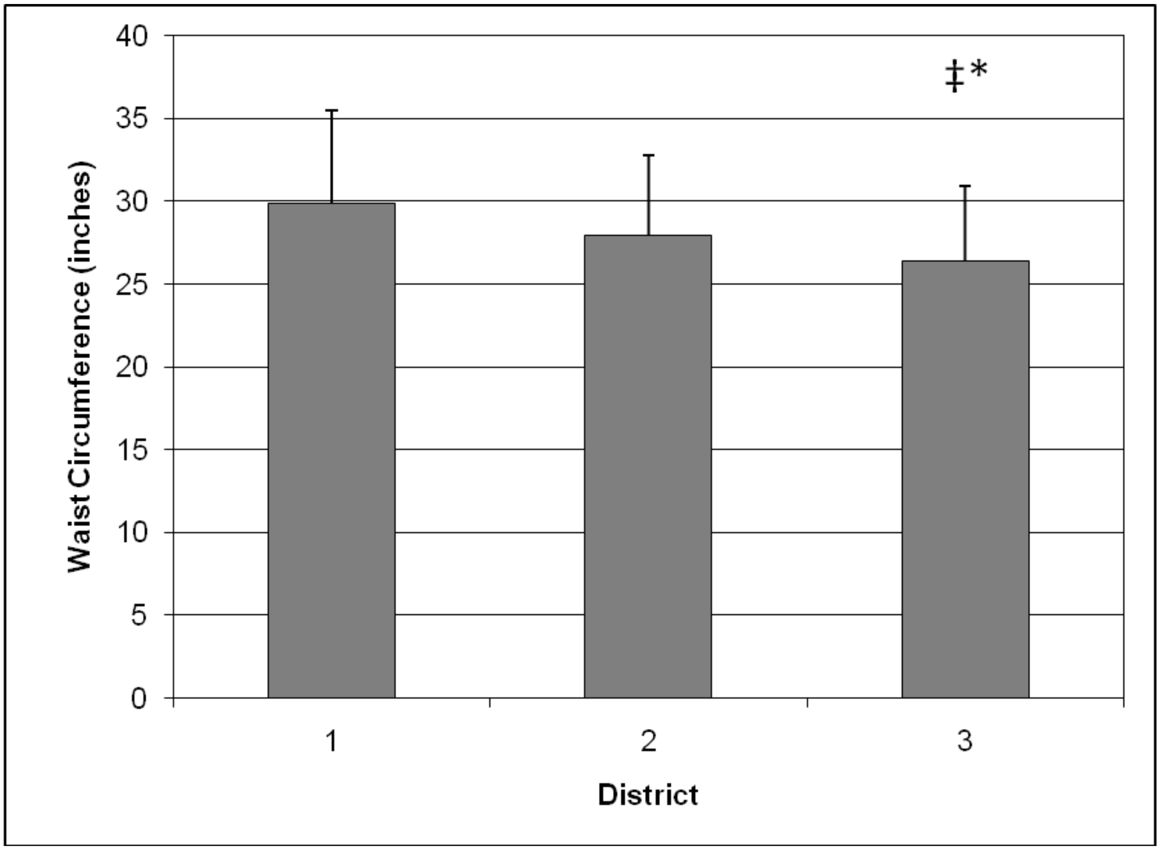

Figure B-4. Mean waist circumference (±SD) between District 1 (n = 426), District 2 (n = 303) and District 3 (n = 407). A significant difference was found between District 1 and District 3[‡] (*p* = 0.000), and District 2 and District 3[*] (*p* = 0.000). There was no significant difference between District 1 and District 2 (*p* = 0.038).

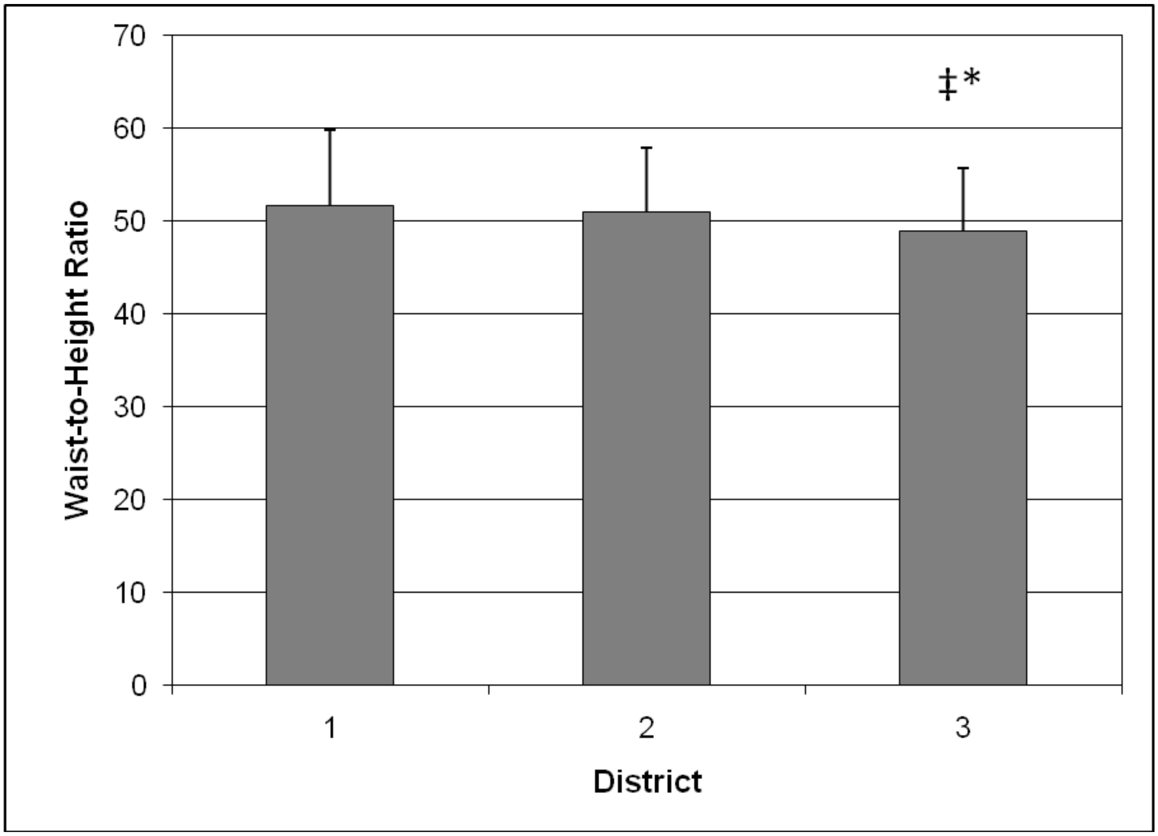

Figure B-5. Mean waist-to-height ratio (±SD) between District 1 (n = 426), District 2 (n = 303) and District 3 (n = 407). A significant difference was found between District 1 and District 3‡ (*p* = 0.000), and District 2 and District 3* (*p* = 0.001). There was no significant difference between District 1 and District 2 (*p* = 0.288).

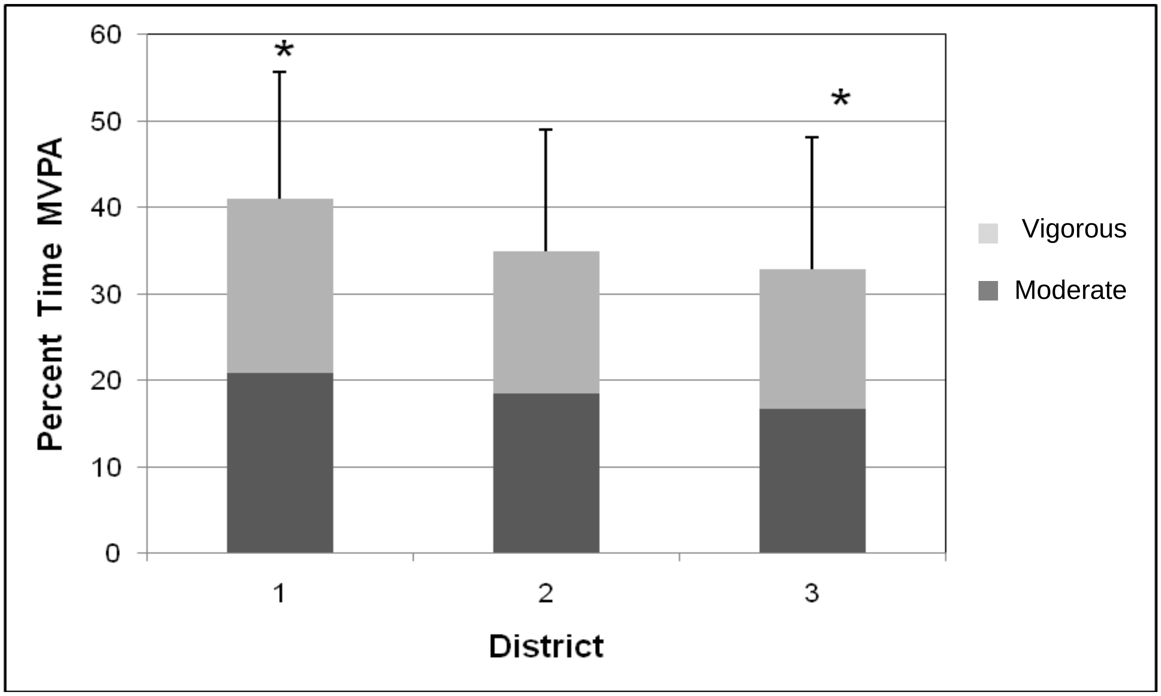

Figure B-6. Mean %MVPA (±SD) between District 1 (n = 39), District 2 (n = 35) and District 3 (n = 35). A significant difference was found between District 1 and District 3* (*p* = 0.051). There was no significant difference between District 1 and District 2 (*p* = 0.198) or District 2 and District 3 (*p* = 0.809).

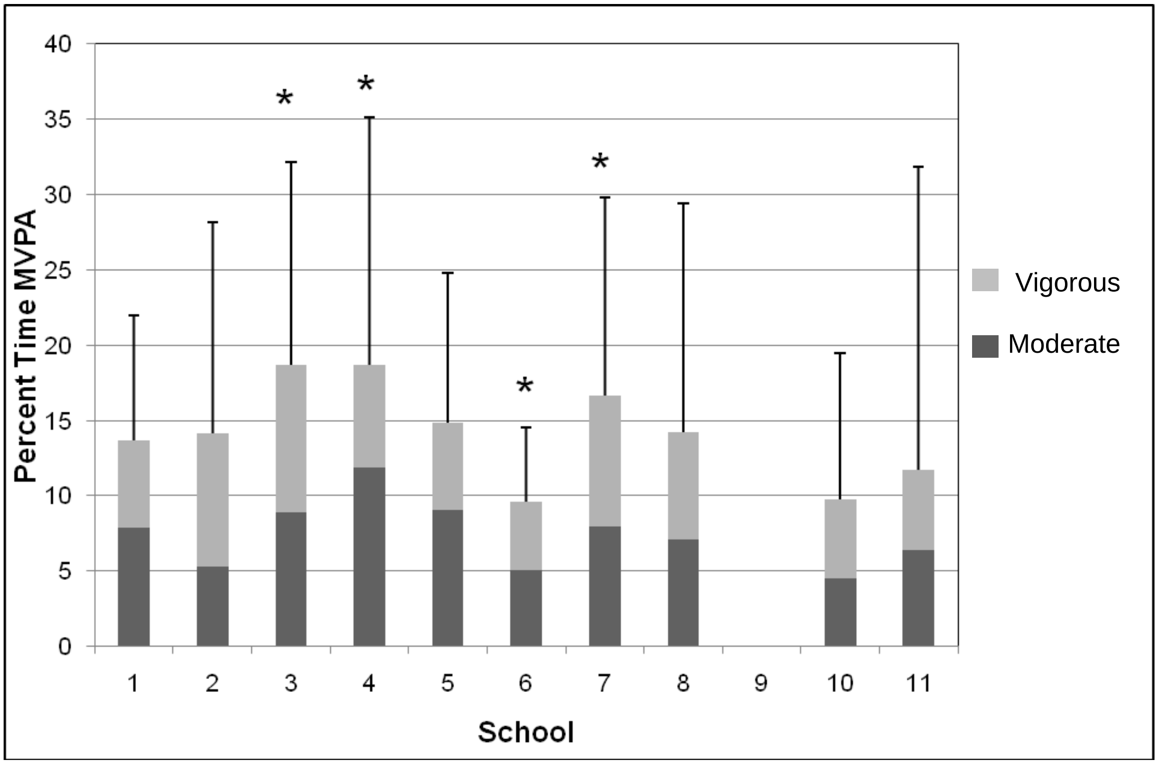

Figure B-7. Mean %MVPA (±SD) between School 1 (n = 10), School 2 (n = 12), School 3 (n = 9), School 4 (n = 8), School 5 (n = 10), School 6 (n = 12), School 7 (n = 13), School 8 (n = 12), School 9 (n = 0), School 10 (n = 11) and School 11 (n = 12). A significant difference was found between School 6* and the following schools: School 3* (p = 0.001), School 4* (p = 0.003) and School 7 * (p = 0.001). There was no significant difference between any other schools.

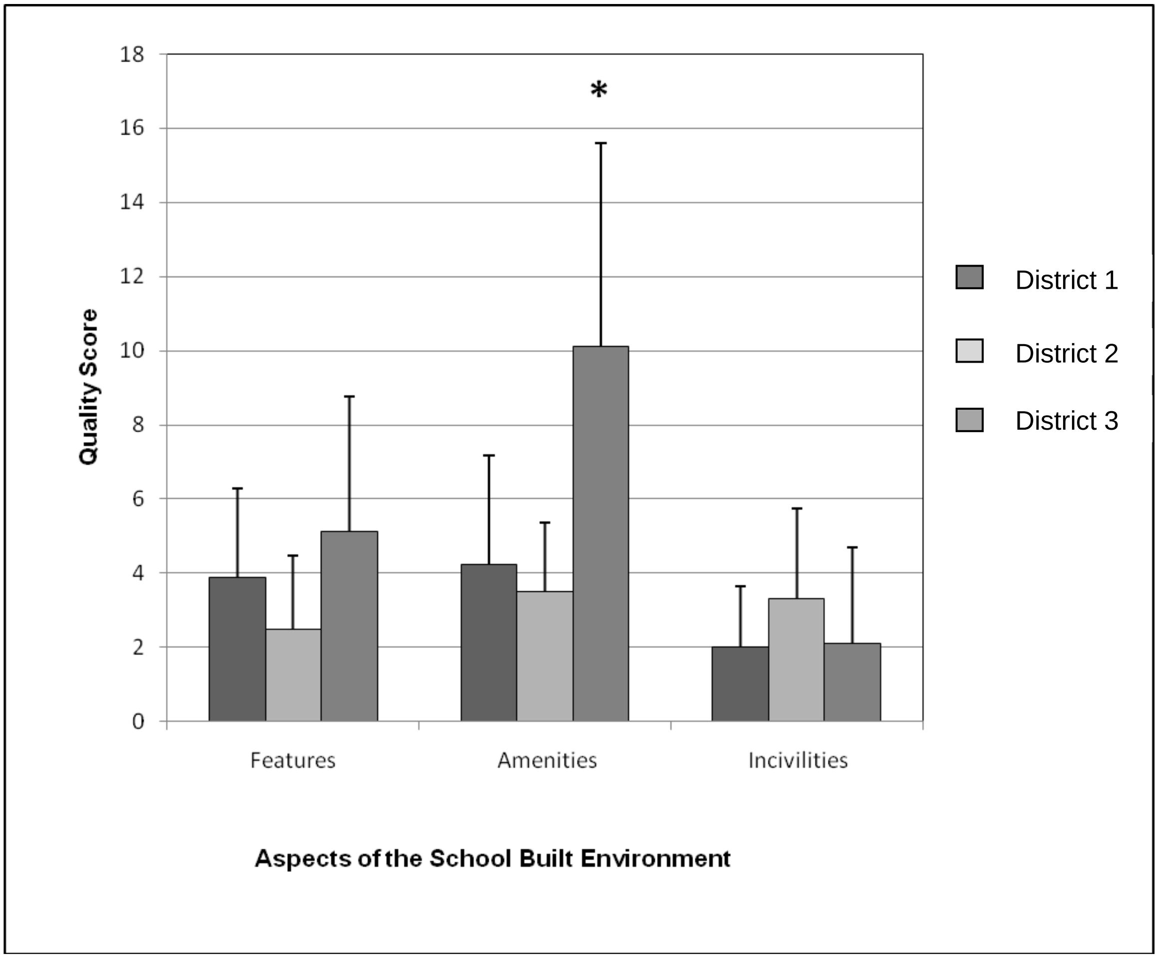

Figure B-8. Mean quality score (±SD) of aspects of the school built environment between District 1 (n=9), District 2 (n=6) and District 3 (n=8). There were no significant differences between any Districts on the presence and quality of the features of the school built environments. There was a significant difference between District 3 and District 1 (p = 0.013)*****, and District 3 and District 2 (p = 0.013)***** on the presence and quality of amenities of the school built environment. There were no significant differences between any Districts and the presence and quality of incivilities of the school built environment.

APPENDIX C

Physical Activity Resource Assessment Instrument (PARA)

1) **Date** ____________ 4) **Time** **start:**_____ **stop:**_____	2) **Data col** ____ 5) **Phone Call** **arrival:** ☐ **departure:** ☐	3) **HD/PA Resource ID** ___________
6) **Type of Resource** **1** fitness club **2** park **3** sport facility **4** trail **5** community center **6** church **7** school **8** combination ___________________		7) **Approximate Size:** **1** sm **2** med **3** lg 8) **Capacity (indoor)** ______________ 9) **Cost** **1** Free **2** Pay at the door **3** Pay for only certain programs **4** Other _______________________
10) **Hours** a) open _______ b) close ______		

11) **Signage** – Hours yes ☐ no ☐					12) **Signage** – Rules	yes ☐ no ☐			
Feature	**Rating**				**Amenity**	**Rating**			
13) Baseball field	0	1	2	3	26) Access Points	0	1	2	3
14) BB courts	0	1	2	3	27) Bathrooms	0	1	2	3
15) Soccer field	0	1	2	3	28) Benches	0	1	2	3
16) Bike Rack	0	1	2	3	29) Drinking fountain	0	1	2	3
17) Exercise Stations	0	1	2	3	30) Fountains	0	1	2	3
18) Play equipment	0	1	2	3	31) Landscaping efforts	0	1	2	3
19) Pool > 3 ft deep	0	1	2	3	32) Lighting	0	1	2	3
20) Sandbox	0	1	2	3	33) Picnic tables shaded	0	1	2	3
21) Sidewalk	0	1	2	3	34) Picnic tables no-shade	0	1	2	3
22) Tennis courts	0	1	2	3	35) Shelters	0	1	2	3
23) Trails – running/biking	0	1	2	3	36) Shower/Locker room	0	1	2	3
24) VB courts	0	1	2	3	37) Trash containers	0	1	2	3
25) Wading Pool < 3 ft.	0	1	2	3					
Incivilities	**Rating**				**Incivilities**	**Rating**			
38) Auditory annoyance	0	1	2	3	44) Graffiti/tagging	0	1	2	3
39) Broken glass	0	1	2	3	45) Litter	0	1	2	3
40) Dog refuse	0	1	2	3	46) No grass	0	1	2	3
41) Dogs Unattended	0	1	2	3	47) Overgrown grass	0	1	2	3
42) Evidence of alcohol use	0	1	2	3	48) Sex paraphernalia	0	1	2	3
43) Evidence of substance use	0	1	2	3	49) Vandalism	0	1	2	3

Comments:

UNDO Projects 2005*Dr. Rebecca Lee, Principal Investigator*releephd@yahoo.com

School ID : ___ ___

Date:__ __/__ __/__ __

D8 D9 D10 D11

SOPLAY

(System for Observing Play and Leisure Activity in Youth)

Obs. ID #: ___ ___ Reliability: 0. No 1. Yes Temp: ___ ___F Period: **1.** BS **2.** L1s1 L1s2 **3.** L2s1 L2s2 **4.** L3s1 L3s2 **5.** AS1 **6.** AS2 **7.** AS3

START TIME	AREA	CONDITION					GIRLS				BOYS			
		A	U	S	O	E	S	W	V	Act.	S	W	V	Act.
__ __:__ __	**1**	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	____	____	____	____	____	____	____	____
__ __:__ __	**2**	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	____	____	____	____	____	____	____	____
__ __:__ __	**3**	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	____	____	____	____	____	____	____	____
__ __:__ __	**4**	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	____	____	____	____	____	____	____	____
__ __:__ __	**5**	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	____	____	____	____	____	____	____	____
__ __:__ __	**6**	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	____	____	____	____	____	____	____	____
__ __:__ __	**7**	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	____	____	____	____	____	____	____	____
__ __:__ __	**8**	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y	0. N 1. Y								

Activity Codes: 0=No identifiable activity 1=Aerobics 2=Baseball/Softball 3=Basketball 4=Dance 5=Football 6=Gymnastics 7=Martial Arts 8=Racquet sports 9=Soccer 10=Swimming 11=Volleyball 12=Weight Training 13=Other playground games 14=None of the above

SOPLAY Recording Form 1/10/06 SJM

SOFIT RECORDING FORM

Date ______ School __________ Grade __ /Period ___ Teacher ___________ Tchr Gen: M F SERIES____
Time start ______ Observer ______ Rel obs ____ No girls ____ boys ____ Location: O I
Time end ______ Lesson Length _____ No of obs. ____ Page 1 2 3 4 of __

Interval		Student Activity	Lesson Context	Interactions	NOTES
	1	1 2 3 4 5	M K F S G O	I O N	
	2	1 2 3 4 5	M K F S G O	I O N	
	3	1 2 3 4 5	M K F S G O	I O N	
o	4	1 2 3 4 5	M K F S G O	I O N	
n	5	1 2 3 4 5	M K F S G O	I O N	
e	6	1 2 3 4 5	M K F S G O	I O N	
	7	1 2 3 4 5	M K F S G O	I O N	
m/f	8	1 2 3 4 5	M K F S G O	I O N	
	9	1 2 3 4 5	M K F S G O	I O N	
	10	1 2 3 4 5	M K F S G O	I O N	
	11	1 2 3 4 5	M K F S G O	I O N	
	12	1 2 3 4 5	M K F S G O	I O N	
	13	1 2 3 4 5	M K F S G O	I O N	
	14	1 2 3 4 5	M K F S G O	I O N	
	15	1 2 3 4 5	M K F S G O	I O N	
t	16	1 2 3 4 5	M K F S G O	I O N	
w	17	1 2 3 4 5	M K F S G O	I O N	
o	18	1 2 3 4 5	M K F S G O	I O N	
	19	1 2 3 4 5	M K F S G O	I O N	
	20	1 2 3 4 5	M K F S G O	I O N	
m/f	21	1 2 3 4 5	M K F S G O	I O N	
	22	1 2 3 4 5	M K F S G O	I O N	
	23	1 2 3 4 5	M K F S G O	I O N	
	24	1 2 3 4 5	M K F S G O	I O N	
	25	1 2 3 4 5	M K F S G O	I O N	
	26	1 2 3 4 5	M K F S G O	I O N	
	27	1 2 3 4 5	M K F S G O	I O N	
t	28	1 2 3 4 5	M K F S G O	I O N	
h	29	1 2 3 4 5	M K F S G O	I O N	
r	30	1 2 3 4 5	M K F S G O	I O N	
e	31	1 2 3 4 5	M K F S G O	I O N	
e	32	1 2 3 4 5	M K F S G O	I O N	
	33	1 2 3 4 5	M K F S G O	I O N	
m/f	34	1 2 3 4 5	M K F S G O	I O N	
	35	1 2 3 4 5	M K F S G O	I O N	
	36	1 2 3 4 5	M K F S G O	I O N	
	37	1 2 3 4 5	M K F S G O	I O N	
	38	1 2 3 4 5	M K F S G O	I O N	
	39	1 2 3 4 5	M K F S G O	I O N	
f	40	1 2 3 4 5	M K F S G O	I O N	
o	41	1 2 3 4 5	M K F S G O	I O N	
u	42	1 2 3 4 5	M K F S G O	I O N	
r	43	1 2 3 4 5	M K F S G O	I O N	
	44	1 2 3 4 5	M K F S G O	I O N	
	45	1 2 3 4 5	M K F S G O	I O N	
m/f	46	1 2 3 4 5	M K F S G O	I O N	
	47	1 2 3 4 5	M K F S G O	I O N	
	48	1 2 3 4 5	M K F S G O	I O N	

SOFIT SUMMARY FORM

School ______________________________

Teacher name ______________________________

Observer ID _______ Date ________ Grade ___ Lesson length ______ min

Total observed intervals _______

	PAGE 1	2	3	4	5	TOTAL
Student activity						
1. lying down						
2. sitting						
3. standing						
4. walking						
5. vigorous						
Lesson context						
Management (M)						
Knowledge (K)						
Fitness activity (F)						
Skill practice (S)						
Game play (G)						
Other (O)						
Interactions						
Promotes in class PA/fitness (I)						
Promotes out-of-class PA/fitness (O)						
No PA/fitness promotion (N)						

SPECIAL NOTES:

PEOF Observation Form

District: ____________ School : ________________ Assessor ID#: ____________

Name of Classroom Teacher: ______________ Name of Teacher of PE Lesson : ______________

Date __ __/__ __/__ __
m m d d y y

Time Start ___ ___ : ___ ___

FOR THE LESSON YOU JUST OBSERVED:

1. A warm-up was included	0. No	1. Yes			
2. A cool-down was included	0. No	1. Yes			
	Observed **NONE** of the time	Observed **SOME** of the time	Observed **MOST** of the time	Observed **ALL** of the time	
3. Students were encouraged to be physically active	1	2	3		
4. Students received praise for their active participation	1	2	3		
5. Most students appeared to enjoy themselves (e.g. smiling, laughing, engaged, etc.)	1	2	3	4	
6. Students understood management and instruction tasks	1	2	3	4	
7. Lesson had adequate student:equipment ratio	1	2	3	4	N/A
8. Group sizes were appropriate to activity	1	2	3	4	N/A
9. Students were prompted/rewarded for out-of-class MVPA engagement	1	2			
10. Teachers showed enthusiasm for teaching	1	2	3	4	

RECORD HOW MUCH PE THIS CLASS RECEIVED TODAY AND DURING THE FOUR PREVIOUS SCHOOL DAYS:

	# minutes
Monday	________
Tuesday	________
Wednesday	________
Thursday	________
Friday	________

Total lessons ______ Total minutes ________

HAD THIS TEACHER PARTICIPATED IN A PE TRAINING? **NO** **YES**
DID THIS TEACHER USE A DESIGNATED LESSON/CURRICULUM? **NO** **YES**

PE "No-Show" Form

This form documents instances of a failed attempt to complete a SOFIT observation with a scheduled lesson (i.e., class cancelled).

School : ___________________ Assessor ID#: ______________

Grade _________________Name of Classroom Teacher: ________________

Date __ __/__ __/__ __
m m d d y y

Time Start Scheduled ___ ___ : ___ ___

CHECK REASON(S) GIVEN FOR CANCELLATION:

__ Special school events (photos, speakers, etc)
__ Academic priorities (testing, extra work)
__ Holiday events (Halloween, Christmas)
__ Usual teacher of PE not available
__ Weather/facilities/equipment
__ Field trip
__ OTHER (specify) ____

COMMENTS: