

ABSTRACT

CARLTON, TROY ALAN. Examining the Interrelationships of Partnerships, the Built Environment and Leisure Time Physical Activity in Rural Public Schools. (Under the direction of Dr. Michael Kanters).

Having access to recreational spaces and facilities has been positively associated with higher physical activity (PA) rates. Governmental agencies have identified shared use agreements (SUAs) as a potential combatant for the continued physical inactivity epidemic. Although the sharing of public school facilities can provide opportunities for PA, limited information exists into the environmental and policy contexts of SUAs within school environments and how active people are when given access to these facilities. The purpose of this study is to investigate the effect of public school level SUAs of facilities during non-school hours on the amount and type of leisure time physical activity (LTPA) of outside community members and programs in rural North Carolina communities. In addition, this study seeks to quantify the association that facility quality has on LTPA. A mixed methodology approach using the Structured Physical Activity Survey (SPAS), School Physical Activity Resource Assessment (S-PARA) and System for Observing Play and Recreation in Communities (SOPARC) was employed. Observational data were collected by trained observers for various facility types at 20 school sites coding individuals' gender, age, and PA level. Observations (9,140) were recorded within 115 facilities. Despite having open access policies for public use, very little PA occurred in schools during after school hours and on weekends (87.7% were empty). Per observations, outdoor tracks had one of the highest average METs (0.86), participants (1.44), and proportion of moderate-to-vigorous PA levels (63.2%). Baseball/softball fields had the most people in any facility category but the highest proportion of sedentary participants (57.6%) and lowest average METs (0.29). The

amount of programming sessions offered through SUAs was positively correlated with number of participants observed in target areas and higher levels of PA. Facility quality was a significant predictor of the number of people observed using facilities and average energy expenditure. Specifically, the quality of amenities was a strong predictor of PA across all facility types. The results of this study can help better inform school administrators' and stakeholders' decisions on engaging in SUA partnerships. Findings suggest that additional strategies are needed to complement the creation of a SUA, particularly the inclusion of organized programming and improved facility quality. Multifaceted approaches that couple facility quality improvements and shared use programming are likely needed to ensure more PA opportunities for community members and for facility use to be optimized.

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Examining the Interrelationships of Partnerships, the Built Environment
and Leisure Time Physical Activity in Rural Public Schools

by
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DEDICATION

One of my favorite authors, John Eldredge, writes that through the course of his life, a man is in constant search for the answer to one central question on his heart. From boyhood to sage, one dominating question fuels a man's desires, pursuits, and actions. *Do I have what it takes?* I would like to dedicate this work to those people in my life who have helped me answer this question for myself: a resounding YES! Looking back at my journey, I can so clearly see how God has intentionally placed people in my path, at just the right time, to help encourage and challenge me to take the next step in faith. None greater than my beautiful wife, Marella. When I would come home discouraged or doubting myself (which was weekly, no.....daily!), she was quick to lift my spirits and remind me that I do, in fact, have what it takes. Marella, I love you. Thank you for always being my biggest cheerleader.

BIOGRAPHY



Troy Carlton is a candidate to receive his Master of Science degree in Parks, Recreation and Tourism Management. Troy was born and raised in Hickory, NC with his three siblings, Ben, Jill, and Wade. Sports played an influential role in Troy's life, participating in year round soccer and basketball at both the interscholastic and club level. He received his undergraduate degree, with a Bachelor of Science in Leisure/Sport Management, from Elon University. After graduating in 2009, Troy worked in the banking industry for three years before applying to graduate school. In October 2012, he received acceptance into the N.C. State graduate program and enrolled full-time in January 2013 as a Research Assistant for the North Carolina Community Transformation Grant (CTG), funded by the Department of Health and Human Services. Under his graduate appointment, Troy served as the project manager for the CTG Joint Use Agreement Evaluation. Troy lives in Apex, NC with his wife and son.

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CHAPTER ONE: INTRODUCTION

“An unused facility is a terrible thing to waste”
– Dr. Thomas McKenzie, Emeritus Professor at San Diego State University

Regular physical activity (PA) embodies healthy living and a higher quality of life (Haskell, Lee, Pate, et al., 2007; Institute of Medicine, 2013). Children and adults who meet the recommended levels of PA receive an array of physical, mental, social, and emotional health benefits while reducing the risk of cardiovascular disease, Type II diabetes, and premature mortality (Beighle, Beets, Erwin & Moore, 2010; Kahn, Ramsey, Brownson, et al., 2010; The North Carolina Institute of Medicine, 2011; U.S. Department of Health & Human Services, 2009; 2011). Despite the many benefits of PA, a significant proportion of people in the United States spend a majority of their time engaging in sedentary behaviors with little or no moderate-to-vigorous physical activity (MVPA) performed on a regular basis (Ogden, Carroll, Kit, & Flegal, 2014; Troiano, Berrigan, Dodd, Masse, Tilert & McDowell, 2008).

The physical inactivity crisis in the United States has been well-documented over recent years causing some to label physical inactivity as a growing public health problem (Addy, Wilson, Kirtland, Ainsworth, Sharpe & Kimsey, 2004; Beighle et al., 2010; Brink, Nigg, Lampe, Kingston, Mootz & Van Vliet, 2010; Kumanyika et al., 2008; Parker, Burns, & Sanchez, 2009; Sallis & Glanz, 2009). Physical inactivity is the fourth leading preventable risk factor for mortality in the United States, behind only tobacco smoking, high blood pressure, and obesity-overweight (Danaei, Ding, Mozaffarian, Taylor, Rehm, Murray & Ezzati, 2009). These risk factors are attributable to 1 out of every 10 deaths in the United States.

Americans are not engaging in sufficient amounts of PA, especially in rural, low-income and minority communities (Floyd, Bocarro, Smith, Baran, Moore, Cosco & Fant, 2011; McAlexander, Banda, McAlexander, & Lee, 2009; Powell, Slater, Chaloupka, & Harper, 2006; Diez Roux, Evenson, McGinn, Brown, Moore, Brines & Jacobs, 2007). Eighty percent of American adults do not meet the aerobic and muscle strengthening recommendations for PA (Centers for Disease Control and Prevention (CDC), 2014). Additionally, according to the Healthy People 2020 report by the U.S. Department of Health & Human Services (2008), nearly 30 percent of U.S. adults do not engage in any leisure-time physical activity (LTPA).

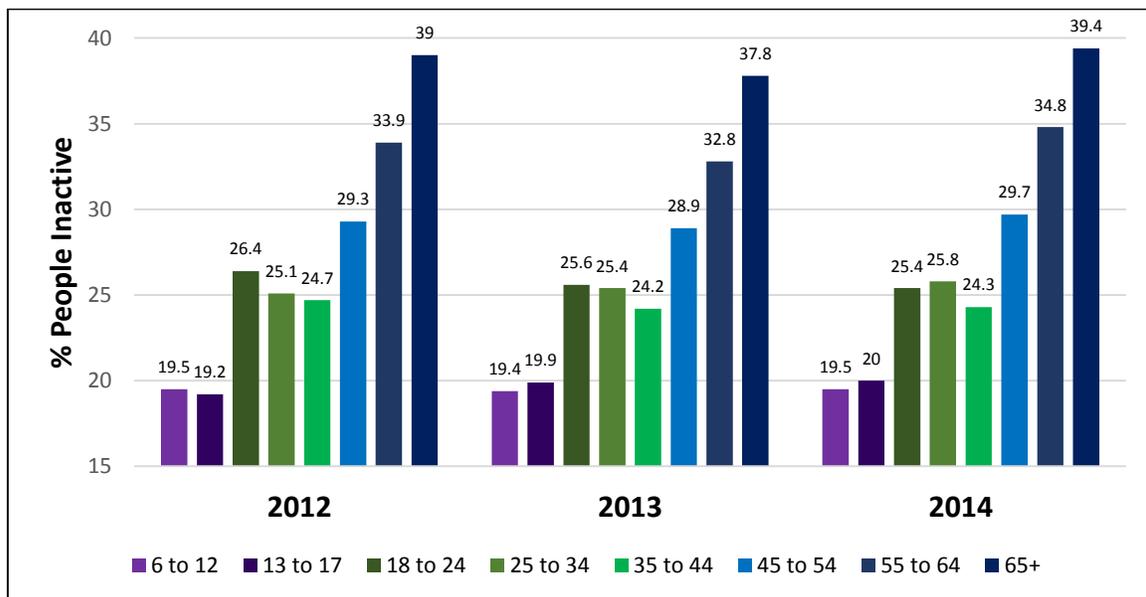


Figure 1: Physical Inactivity Levels in the U.S. by Age (Physical Activity Council, 2015)

The most recent report by the Physical Activity Council (2015) illustrates how physical inactivity remains an urgent public health issue. As seen in Figure 1, the percentage of people who are physically inactive has risen marginally over the past three years and

progress for decreasing the physically inactive population remains stagnant. Indeed, the U.S. is experiencing the highest percentage of physically inactive people over the last six years. The physical inactivity crisis has led researchers and practitioners to seek innovative models and methods to inform strategies to increase LTPA. Also, several national and international organizations like the CDC (2011), American Heart Association (2011), World Health Association (2008), The Australian National Health and Medical Research Council, have recognized the issue of increased physical inactivity and have prioritized the need to find solutions to address this (Keener, Goodman, Lowry, Zaro, S., & Kettel Khan, 2009; Sacks et al., 2008; Young et al., 2013).

A complex web of genetic, behavioral, lifestyle, community structural, policy, and built environment factors contribute to high rates of physical inactivity. To address this complex and seemingly intractable issue, interventions that target key social, environmental, and policy levers that yield broad-based community health benefits are required. Ecological models offer the conceptual scope and strategic orientation needed to address various physical inactivity influences among children, adolescents and adults (Giles-Corti & Donovan, 2002; Stokols, Grzywacz, McMahan & Phillips, 2003).

Under social ecological models, human behavior is posited to have multiple levels of influence (Fleury & Lee, 2006; Sallis, Bauman, & Pratt, 1998; Spence & Lee, 2003). Various conceptualizations of the levels of influences on behavior have emerged, but most factors are generally categorized under one of five domains: (a) intrapersonal (e.g., socioeconomic status and educational level), (b) interpersonal (e.g., social support and cultural norms), (c) institutional (e.g., organizations and schools), (d) community (e.g.,

access to resources) or (e) policy (e.g., local, state and national laws) (Fleury & Lee, 2006; Sallis et al., 2006; Sallis, Bauman, & Pratt, 1998; Spence & Lee, 2003). Because there are multiple levels of influences, behavioral change, such as encouraging more PA, is maximized when interventions under all five domains are combined (Brownson, Baker, Housemann, Brennan, & Bacak, 2001; Heath, Parra, Sarmiento et al., 2012; Sallis et al., 1998; Sallis, 2008). More recently, the Social Ecological Model (SEM) has adapted the general ecological framework to explain and change PA behavior and inform multi-level interventions, including those that address the policy and built environments (Bocarro, Kanters, Cerin, Floyd, Casper, Suau & McKenzie, 2012; Durant et al., 2009; Jones, Brener, McManus, 2003, McLeroy, Bibeau, Steckler & Glanz, 1988).

In light of the evidence showing the growing sedentary behavior in the U.S. population and the health consequences of not being physically active, stakeholders have been searching for ways to increase PA. Access to recreational spaces and facilities has been positively associated with higher LTPA, lower obesity rates, beneficial health outcomes and lifelong active living behaviors (Durant et al., 2009; Giles-Corti & Donovan, 2002; Kahn et al., 2010; Norman, Nutter, Ryan, Sallis, Calfas & Patrick, 2006). LTPA may be most affected by access to, and characteristics of, public recreational facilities (Keener et al., 2009; Young, Spengler, Frost, Evenson, Vincent & Whitsel, 2013). Having easy, safe, affordable access to spaces and programs designed for PA has been positively associated with PA behavior across multiple studies, especially in low income and minority communities in rural areas (Cohen, McKenzie, Sehgal, Williamson, Golinelli & Lurie, 2007; Kanters, Bocarro, Edwards, Casper & Floyd, 2013; Roemmich, Epstein, Raja, Yin, Robinson & Winiewicz,

2006; Sallis et al., 2001). A recent study approximated that 50% of all vigorous PA occurring in local public parks were attributed to residents living within a half mile radius of the park boundaries (Han, Cohen, & McKenzie, 2013). Moreover, Norman et al. (2006) concluded that access to recreation facilities is significantly associated with MVPA for adults and adolescents. Yet, the proportion of the population living within half of a mile of a public park is 39.2 percent in the U.S. and 13.5 percent in North Carolina. A majority of the population lacks convenient access to public facilities conducive to PA, particularly in states such as North Carolina.

A key element in fostering an active lifestyle is an environment that facilitates opportunities for PA, like that of local parks and schools (Spengler, Carroll, Connaughton, & Evenson, 2010). One of the challenges in increasing PA for communities is committing resources to construct activity-friendly environments such as school playgrounds, ball fields, parks, walking trails and other recreational facilities. Schools can play a similar role as that of public parks in providing available and accessible places for the facilitation of programs and people to be more physically active. School facilities are important in facilitating both children and adult PA but are only valuable when being used (Spengler, 2012). Despite public schools being conducive to LTPA, as many as 68% of designated sport and recreation areas have been found to be completely vacant during after school hours (Bocarro et al., 2012).

Community entities often seek use of public school facilities because of the unique advantages that these spaces provide. For instance, public schools have established infrastructure and inherently capable of handling a multitude of programs and serving large

volumes of people (Keener et al., 2009). Having accessibility to schools during non-school hours through policy initiatives is growing in popularity among local government officials (Institute of Medicine, 2009). Access to school resources can be thought of as quick and easy solutions to positively influence LTPA behavior in that school facilities are often centrally located complete with gymnasiums, playgrounds, sports fields, tracks and basketball courts and built using public funds. Furthermore, public middle and high schools are also readily available and safe environments for active play and recreation through after school programs and youth sport organizations (Bassett, Fitzhugh, Heath, Erwin, Frederick, Wolff, Welch & Stout, 2013; Coleman, Geller, Rosenkranz, & Dzewaltowski, 2008; Dzewaltowski, Rosenkranz, Geller, Coleman, Welk, Hastmann & Milliken, 2010; Pate & O'Neill, 2009; Spengler, 2012).

Recent reports by governmental agencies have called on the 'joint' or shared use of recreational or public facilities to help combat physical inactivity in the U.S. population by providing access to more resources (CDC, 2014; Eat Smart Move More North Carolina, 2013; Leadership for Healthy Communities, 2011; Physical Activity Council, 2015; Trust for America's Health, 2014; U.S. Department of Health & Human Services, 2004; 2012). A shared use agreement (SUA), also referred to as joint use agreements, is broadly defined as an organizational policy that allows the sharing of facilities or land between two or more groups or entities where the terms and responsibilities are mutually agreed upon (Choy, McGurk, Tamashiro, Nett, & Maddock, 2008; Spengler, Young, & Linton, 2007). Spengler et al. (2011) described SUAs simply as a contract between two entities that provides the terms for sharing a public property or facility. For example, a SUA can be implemented with

a written agreement between a school district and a private organization setting the terms and conditions for sharing the school district's facilities, costs and risks associated with opening the property for after-hours use (ChangeLab Solutions, 2010; Evenson, Wen, Lee, Heinrich, & Eyler, 2010). The terms of the SUA can be communicated in a formal, written contract or more informally agreed upon verbally, otherwise known as "handshake agreements". As a form of public policy, SUAs are increasingly being explored and examined as a vehicle for driving active living initiatives. For instance, one of the 15 goals stated in the Healthy People 2020 report was to increase the percent of public schools that provide access to PA facilities outside of normal school hours by 10 percent (U.S. Department of Health & Human Services, 2008).

Regardless of the favorable arguments to opening school facilities to outside programs, a relatively recent report indicated that only 28.8% of the nation's public and private schools provide access to their PA spaces and facilities for all persons outside of normal school hours (i.e., before and after the school day, on weekends, and during summer and other vacations) (U.S. Department of Health & Human Services, 2008). According to the Trust for America's Health (2014), approximately 70% of school districts nationwide have no policy regarding the facilitation of SUAs. Thus, school PA facilities are a largely untapped community asset for PA.

However, studies on the prevalence of shared use are beginning to surface reporting that shared use is on the rise, particularly in North Carolina. A survey of all N.C. public school principals indicated that most (89%) share PA facilities during after school hours with outside groups/individuals (Kanters, Bocarro, Moore, Floyd & Carlton, 2014b). In fact, N.C.

is one of only 20 states that provide policy guidance for schools on SUAs (CDC, 2014). Nationally, nearly 60% of 988 surveyed schools made their PA facilities available for people after school and on weekends (Lee, Burgeson, Fulton, & Spain, 2007). Similarly, the 2012 School Health Policies and Practices Study reported that 61.6% of school districts have formal SUAs (Everett-Jones & Wendel, 2015). Given these studies, it is difficult to determine an accurate status of shared use with so many fluctuating reports.

Nonetheless, just the presence or absence of facilities may not be a valid way to investigate access to resources (Lee, Boothe, Reese-Smith, Regan, Howard, 2005; Sallis, Floyd, Rodriguez, & Saelens, 2012). In addition to policy interventions, the level of quality that public facilities has been hypothesized to be a major factor in influencing PA behavior (McKenzie, Moody, Carlson, Lopez, & Elder, 2013). According to Kent & Thompson (2014), built environmental supports such as facility quality can be modified to facilitate or constrain PA and have been shown to vary based on population groups (e.g., economically disadvantaged) and in diverse contexts (e.g., inner city, suburban, regional, and rural). So while the evidence for strong policy interventions is growing, to be effective, these should be supported with built environment interventions to maximize effectiveness (Kent & Thompson et al., 2014).

Recently, there has been a widespread proliferation of community initiatives aimed at increasing people's access to and quality of recreational centers, parks, trails, and schools in an effort to reduce physical inactivity. Increasingly, we are seeing links being identified between PA and various characteristics of the built environment like the presence or absence of amenities (Brownson, Hoehner, Day, Forsyth & Sallis, 2009; Ferdinand, Sen, Rahrkar,

Engler & Menachemi, 2012). Increasingly, studies have shown that PA can be dependent on the number and condition of facilities and amenities, perceived safety, and aesthetics (Cohen, Han, Derose, Williamson, Marsh, Rudick, & McKenzie, 2012a; Cohen et al., 2007; Cohen, Lapham, Evenson, Williamson, Golinelli, Ward, Hillier, & McKenzie, 2013; McCormack, Rock, Toohey, & Hignell, 2010). For example, Heinrich et al. (2008) found that neighborhoods with more amenities, higher-quality PA feature ratings and fewer incivilities resulted in lower obesity rates among residents. Additionally, the quality of publicly available recreational facilities has been cited in multiple studies as a better indicator for PA than the mere absence or presence of facilities (Frost et al., 2010; Heinrich, Lee, Suminski, et al., 2007; Lee et al., 2005; Lee & Cubbin, 2009; McAlexander et al., 2009).

Although some studies suggest a beneficial relationship between desirable health outcomes and the built environment, others have reported mixed results (Cohen, Golinelli, Williamson, Sehgal, Marsh, McKenzie, 2009; Evenson, Murray, Birnbaum, & Cohen, 2010; Heinrich et al., 2007). For example, Heinrich et al. (2007) found that the quality of features and amenities used for PA was not related to self-reported PA data but mentioned that more walking occurred in neighborhoods with fewer incivilities. Hence, some researchers have recommended the employment of a wider array of variables when studying the effect of the built environment on PA (Ferdinand et al., 2012). Others have expressed the need to gather higher-quality evidence since the link between facility quality and PA behavior is still unclear (Sallis & Glanz, 2006). Nevertheless, the limited information that we have on the effect of environmental variables calls for more focused research in the policy and built environments.

Existing research regarding the relationship between SUAs and PA is limited, and primarily delimited to urban environments. For example, in 12 Los Angeles schools that permitted their grounds to be used by the entire community, 10 schools included organized PA programs being implemented either some or all of the time that the facilities were open to shared use (Lafleur, Gonzalez, Schwarte, Banthia, Kuo, Verderber & Simon, 2013). Findings showed that community use and PA was higher at school sites with shared use programs versus schools without such programs. Other researchers have found that the relationship between shared use of school facilities and school operating costs is not significant, supporting the notion that if more afterschool programs were available, more people could participate in PA (Kanters, Bocarro, Filardo, Edwards, McKenzie & Floyd, 2014a).

The few studies directly measuring the effect of SUAs have been primarily focused in urban areas. Research has shown that people living in rural areas are more likely to be economically disadvantaged, lack resources for extracurricular activity, and have less supportive environments than urbanized communities (Edwards, Bocarro & Kanters, 2012). Disparities in regards to access to adequate PA facilities among rural and urban areas have been researched (Edwards, Kanters & Bocarro, 2011; Everett-Jones, Brener & McManus, 2003; Frost et al., 2010; Shores & West, 2010) but not in the context of shared use programming in schools. More research is needed to assess the effectiveness of SUAs in creating and sustaining more LTPA behavior, particularly with public school facilities not located in urban settings (Beighle et al., 2010; Evenson et al., 2010b).

Limited research suggests opening facilities to people after school hours can increase LTPA. Programmed activities through SUAs has been found to be a key factor in generating more use of public resources (Lafleur et al., 2013). The amount of programming offered in parks has also been strongly correlated with the number of people and intensity of PA observed (Cohen et al., 2007; Cohen, Stetodji, Evenson, Ward, Lapham, Hillier & McKenzie, 2011; Floyd et al., 2011). The availability of organized programs can also reduce sedentary behaviors like watching television and playing video games (Durant et al., 2009). The strong argument, and one that is addressed in this study, is that the addition of SUAs provide more opportunities for PA programming to occur. Thus, indirectly affecting PA by providing more options and closer proximity to programs.

Moreover, the limited evidence on the role that both SUAs and facility quality play in promoting PA, especially in non-urban environments calls for further study. For example, Kanters et al. (2014b) discussed the need to not only fully explore the extent of shared use, the quantity and type of programs, and the amount of PA resulting from SUAs but also the quality of public school facilities. Access to and the quality of community recreation facilities were found to be relevant in occurrence of PA (McKenzie et al., 2013). Adding environmental context to shared use may give a richer insight into the influence of SUAs and facility quality on accomplishing PA strategies.

Furthermore, research examining shared use in rural environments and the interplay of the built environment have on LTPA would generate positive contributions to multiple academic disciplines (e.g., parks and recreation, public health, urban planning). Examining accessibility of resources in rural environments as opposed to urban environments is different

in several ways. For instance, rural communities are less likely than urbanized communities to have the same opportunities for people to participate in extracurricular sport programs and public spaces for PA outside of school (Edwards et al., 2011; Kanters et al., 2013). Rural schools generally offer fewer programs, facilities, social supports, and transportation offerings than more urbanized areas do (Edwards et al., 2011). The presence of features such as sidewalks has been positively associated with increased PA around schools (Brownson et al., 2009). However, sidewalks are almost meaningless if not directly linked with an urbanized neighborhood (Hutch, Bouye, Skillen, Lee, Whitehead & Rashid, 2011). People living in rural areas may lack the transportation and financial means to acquire access to public facilities. With higher amounts of environmental barriers existing for rural areas, limited empirical research supports the notion that rural populations are disadvantaged in regards to PA and accessibility.

Statement of the Problem

Although studies suggest policies allowing access to school PA facilities and resources increase LTPA, activity in schools with SUAs have not been observed nor described in the research, particularly in rural settings. Additionally, the association between LTPA and facility quality has not been extensively addressed in previous work on LTPA and shared use of school resources. Therefore, the purpose of this study is to investigate the effect of public school level SUAs of facilities during non-school hours on the amount and type of LTPA of outside community members and programs in rural communities. In addition, this study seeks to quantify the association that facility quality has on LTPA. Given the interest and cited potential of SUAs and other environmental variables, this study

provides valuable evidence to better inform decisions about the impact of community-wide sharing of facilities in rural communities as well as the absence or presence of various amenities and incivilities in these spaces.

Significance of the Study

Schools are unique in having the ability to promote PA and increase energy expenditure for both children and adults (Story et al., 2014). Public health advocates have identified school spaces as an important resource for increasing PA among children and adults. In some cases, neighborhood schools may be the only place for people to be active (Filardo, Vincent, Allen & Franklin, 2010).

The need to find creative and innovative answers to sustaining active living initiatives has never been greater. Although policies such as SUAs have been identified as a potential combatant to unhealthy PA behaviors, very little is known about the effects that access policies like SUAs have on LTPA. SUAs come in many diverse shapes and sizes with various levels of content. For example, a general open use policy for an outdoor track looks significantly different than a formal written contract specifying the conditions of a youth basketball team using a gymnasium to play their games. These agreements can also vary widely depending on location, culture, and demographic makeup of a community. Given the difficulty of successfully applying and sustaining SUAs to a broad range of communities, we simply do not know how much PA occurs as a result of shared use and what policy components facilitate more PA. Additionally, relatively few studies have examined the influence of the physical environment on LTPA levels (Giles-Corti & Donovan, 2002). For example, a school may allow open use to their football field on weekends, but if the field is

of poor quality with high grass and evidence of litter or vandalism, few people would be inclined to be physically active regardless of the SUA in place.

Are SUAs really enough to increase LTPA? This study is needed to add context to the existing literature by offering empirical evidence on the interplay between policy and built environments on LTPA in rural settings. Previous studies have noted there may be more needed to change sedentary behaviors than just incorporating a SUA (Kanters, et al., 2014b; Schmid et al., 2006). That is, even the most organized, clear, and mutually beneficial SUA can fail at facilitating increased LTPA behavior due to various environmental factors. In general, very little research on SUAs has been done. Additionally, what little research that exists has primarily been conducted in urban areas (Everett-Jones & Wendel, 2015). Rural areas are more at risk to having fewer accessible PA resources and higher levels of health disparities than urban areas (Trust for America's Health, 2014). However, attention to rural areas is lacking. A major contribution of this study is the inclusion and analysis of diverse, rural public schools not located in highly urbanized areas.

More research is needed not only on the relationship between shared use and LTPA, but the relationships between LTPA and the built environment as well. Associations between built environmental factors and PA levels in schools have received relatively little empirical study (Eyler, 2003; Jackson, Dannenberg, & Frumkin, 2013; Sallis et al., 2012). An in depth study connecting PA to the policy and built environments in North Carolina could fill a gap in research by not only connecting LTPA to shared use, but relating objectively measured LTPA with the quality of each facility and providing context into the types of programs/activities that occur (Bocarro et al., 2012; Cohen et al., 2007; Lafleur et al., 2013;

Tester & Baker, 2009). This study will contribute to the knowledge of SUAs and their potential role in creating positive LTPA environments while also quantifying the impact of facility and resource quality on LTPA. Most of the public schools included in this study are situated in rural areas where little attention to research has been devoted. The overarching goal is to turn research into practice by providing real findings to help inform local stakeholder decisions on the creation of open access policies for greater after school utilization of safe, accessible, and available resources.

Further, North Carolina was included in the list of the top 10 most inactive states in America with a 26.9% completely inactive population (Physical Activity Council, 2015). North Carolina is also unique in that it has the second highest rural population in the country (U.S. Bureau of the Census, 2006). Hence, from a regional perspective, if there is any state that would benefit most from a study focused on active living solutions for rural communities, North Carolina is arguably one of the strongest candidates.

The lack of studies in rural settings remains to be a gap in research surrounding LTPA. Few researchers have assessed the availability of PA resources in rural settings (Edwards et al., 2012). In fact, much of the research has only focused on neighborhood disparities within cities (Giles-Corti & Donovan, 2002; McKenzie et al., 2013).

Understanding the context of shared use in rural environments is important because these populations mainly consist of disadvantaged groups. Access to PA programs and facilities should be distributed equitably across the population. However, the limited economic resources available for sport, recreation, and PA programs often times prevents residents in rural areas from fully accessible environments (Edwards et al., 2012). Therefore, the lack of

attention in the area of place disparities greatly limits our understanding of population wide PA behavior. In addition, almost all studies of shared use have examined urban areas (Hodge, 2015; Kanters et al., 2014a; Spengler, 2012). Initiatives that increase LTPA for people living in rural environments needs to be further explored, especially in regards to the utility of SUAs in providing available and accessible PA programming. Examining the efficacy of SUAs in rural communities could have huge implications for practitioners in rural settings who may be contemplating how a multi-level intervention such as incorporating more shared use programming could translate into a viable solution to promote active living.

This study will offer objective, empirical LTPA data from a selection of North Carolina public schools who participate in SUAs during non-school hours. This study will add to the body of literature by providing valuable baseline LTPA data in rural North Carolina communities, inform policy intervention strategies, and identify possible environmental barriers to sharing facilities.

Research Questions

The focus of this thesis was to investigate the association between SUAs and LTPA levels and to measure the impact of built environment variables (i.e., facility quality) in facilitating more opportunities for people to be more physically active. The primary goal is to provide a clearer picture into the context of active SUAs, provide the number and type of participants and programs that result from SUAs, determine if shared use translates into more LTPA, and to see if the quality of facilities has any relationship on the level of use.

Therefore, this study will address the following research questions:

1. How much leisure-time physical activity (LTPA) occurs at school facilities as a result

- of outside/shared use programs?
2. What is the relationship between LTPA and outside/shared use programs?
 3. What is the relationship among LTPA, type of facility, and facility quality?

Delimitations

This study was delimited by the following conditions:

1. Schools whose principals provided survey responses related to shared use.
2. Only public middle and high schools in North Carolina were included in the study.
3. Observations were delimited to after school hours (3:00PM to 7:30PM on weekdays) and weekend days (9:00AM to 7:00PM). Before school hour observations were not recorded.
4. No pre- and post- test intervention and evaluation of SUAs was conducted.

Definition of Terms

1. Physical Activity (PA): Any bodily movement produced by skeletal muscles that requires energy expenditure – including activities undertaken while working, playing, carrying out household chores, travelling, and engaging in recreational pursuits (World Health Organization, 2008).
2. Moderate-to-Vigorous Physical Activity (MVPA): According to the CDC (2012a), moderate physical activity is defined as the expenditure of between 3.0 and 6.0 METs (or 3.5-7.0 kcal/min), while vigorous physical activity is defined as an expenditure of over 6.0 METs (or >7.0 kcal/min).

- a. MET: “The ratio of exercise metabolic rate. One MET is defined as the energy expenditure for sitting quietly, which, for the average adult, approximates 3.5 ml of oxygen uptake per kilogram of body weight per minute (1.2 kcal/min for a 70-kg individual). For example, a 2-MET activity requires two times the metabolic energy expenditure of sitting quietly” (CDC, 2012a, p. 4).
3. CDC Recommended Levels of Physical Activity: Set at 60 minutes of MVPA/day for children and adolescents and 30 minutes of MVPA/day for adults (CDC, 2012b).
4. Leisure-time Physical Activity (LTPA): Exercise, sports, recreation, or hobbies that are not associated with activities as part of one’s regular job duties, household, and transportation (Brown et al., 2010).
5. Shared Use: When a space is used by the school during the school hours and by a non-school user after school hours. For example, a grassy field for physical education instructors during the school day and for after school youth sports activities during after school hours (Filardo et al., 2010).
6. Public Education Use: The primary uses for public school buildings and grounds (Filardo et al., 2010).
7. Civic Use: The occasional shared use of school buildings and ground by individuals, groups, or organizations. For example, use of schools for voting, community meetings, special events, as emergency shelters, as well as the casual use of grounds by the public for recreational use (Filardo et al., 2010).
8. Non-school hours: Any time prior to and after regular classroom instruction on a school day, and any time during weekends, holiday and vacation breaks (American

- Heart Association, 2012).
9. Barriers: Obstacles that inhibit or prevent one's ability to adopt and, once begun, to adhere to an activity over time (Frank, Engelke & Schmid, 2003).
 10. Policy: Legislative or regulatory action taken by federal, state, city, or local governments, government agencies, or nongovernmental organizations such as schools or corporations that influence or guide behavior (Schmid, et al., 2006).
 11. Organizational Policy: A policy instituted within specific organizations that define appropriate behavior within the confines of the organization (e.g., corporations, schools, or health departments) (Schmid, 1995).
 12. Built Environment: The form and character of communities, made up of specific places (e.g., homes, streets, offices, parking lots, shopping malls, restaurants, parks, movie theaters) that constitute a city, town or suburb (Brown et al., 2010).
 13. Rural: Census-defined rural territory that is greater than or equal to 5 miles from an urbanized area. (U. S. Department of Education, 2015).

CHAPTER TWO: LITERATURE REVIEW

The primary purpose of this study was to investigate the interrelationships between SUAs, the built environment, and LTPA behavior. Literature specific to previous academic research examined several relevant topics. The review presents the theoretical framework guiding this study as well as providing an overview of policy and environmental approaches in community based PA. This section will summarize what I have learned from these studies and how they serve as the foundation for my current research. I will subsequently discuss the social ecological framework, benefits and measurements of PA, policy environment, role of public schools, previous studies on the utility of SUAs, and the applications of both observational and survey instruments.

The Foundation and Application of the Social Ecological Model

An ecological approach to explaining human development concerns itself with understanding the contexts and interactions between the individual and his or her surroundings. There has been significant increase in the application of ecological models in guiding health promotion research (Cochrane & Davey, 2008; Fleury & Lee, 2006; Richard, Gauvin, & Raine, 2011; Sallis, Owen, & Fisher, 2008).

The conceptual framework used to ground this study will be the social ecological model (SEM). A social ecological framework designed to explain human behavior was first surmised by Rudolph Moos (1980). In his model, four categories of environmental factors (physical settings, organizational settings, sociocultural characteristics, and the social climate) all contribute to influencing people's behavior. The interrelationships between environmental conditions and human behavior and well-being are at the core of this

framework. Hence, the social ecological framework is interdisciplinary by nature and is used in fields of epidemiology, medical sociology, public health, health psychology and others (McLeroy et al., 1988). A social ecological perspective is based on a broad, overarching paradigm that bridges several different fields of research, rather than from one theory (Stokols, 1996b).

Many studies have adapted the SEM to help examine the behavior of people in various environments including areas devoted to sport and recreation (Blanchard, McGannon, Spence, Rhodes, Nehl, Baker & Bostwick, 2005; Elder, Lytle, Sallis, et al., 2007; Etnner & Grzywacz, 2001; Fleury & Lee, 2006; King & Sallis, 2009; Riley, Taylor, & Elliott, 2001; Robertson-Wilson, Leatherdale & Wong, 2008). Others have recommended using the SEM to address the current obesity epidemic and low levels of PA (Sallis et al., 1998).

As stated earlier, the premise behind social ecological approaches is that environments and particular social factors either enable or constrain behavior by promoting or discouraging particular actions. Stokols (1992) used the framework of social ecology to develop his own social ecological model under four assumptions. First, health behavior is influenced by physical environments, social environments and personal attributes. Second, human-environment interactions occur at varying levels of combination (individuals, families, groups, whole populations). Third, people influence their settings and the changed settings then promote either positive or negative health behaviors. The final assumption is that environments are multidimensional.

Further testing of ecological models of PA has been recommended by multiple researchers as well as being the main guide for the CDC (Humpel, Owen & Leslie, 2002; Riley et al., 2001; Robertson-Wilson et al., 2008; Sallis et al., 2006b; Stokols, 1996b). Behavior change is expected to be maximized when environments and policies support healthful choices, motivate and educate people to make those choices. Lastly, ecological models are most powerful when they are behavior-specific. The strength of using a social ecological framework is that more models can be developed for specific PA behaviors and population subgroups. For example, the use of parks by rural community members.

Despite the well-documented benefits of PA, close to 83 million Americans continue to live a predominantly sedentary lifestyle (Physical Activity Council, 2015). Giles-Corti (2006) suggests that targeting interventions to both at both the individual and environment are required to increase PA. There is also evidence that supports that interventions across multiple levels are the most effective in influencing PA.

A defined ecological model for PA promotion was developed by Spence and Lee (2003) explaining PA behavior as being influenced by the relationship between environmental settings and biological and psychological factors. Sallis et al. (2006) also developed an ecological model of four domains of active living (Figure 2) and will be the guiding model for this research project focusing on behavior settings and the policy environment. All multiple levels of influences are represented.

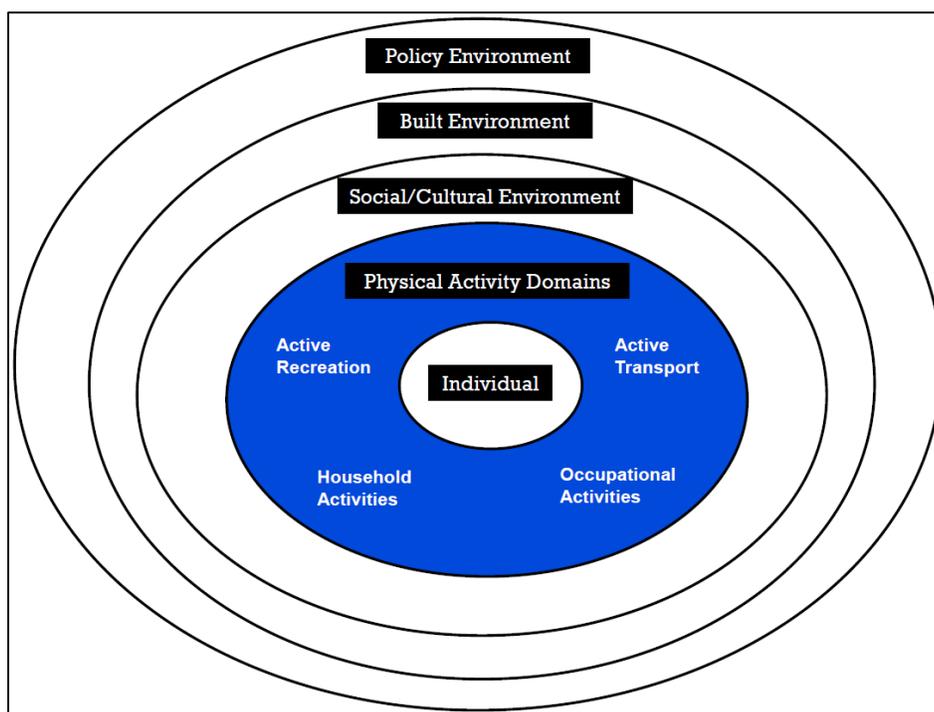


Figure 2: Ecological model of four domains of active living (Sallis et al., 2012).

There are also practical limitations that are inherent in using the social ecological framework for guiding research. Interventions require the integration of knowledge from several different disciplines across multiple settings. Close collaboration from several sectors using various methods can create a logistical nightmare. Additionally, tendencies to make ecological models over-inclusive to involve every possible facet of a health program reduces the effectiveness of the model (Stokols, 1996a). This complexity of ecological approaches to health promotion can be seen as the highest factor for the reduced utility of interventions. Despite these critiques, the opportunities for adapting the social ecological framework for any social science project are emerging given the many adaptations one can make to satisfy research goals.

There has been a significant increase in the application of social ecological models in guiding health promotion research. In fact, the combination of environmental, policy, social, and individual intervention strategies is being recommended for various unhealthy behaviors (Brownson, Kelly, Eyster, et al. 2008; Schmid et al., 2006). Previous researchers have adapted the SEM to explain human behavior but the one that is most applicable is model of active living (Sallis et al., 2006a). The model shown in Figure 3 best illustrates the SEM through four environments. The first level are intrapersonal influences such as age, gender, race, and socio-economic status. The next level is the social or cultural environment pertaining to family, peers and social groups. The physical or built environment includes resources, facilities, and the geography. The outer most level of influence is the policy environment encompassing all governmental laws, regulations and policies. As intervention strategies move from addressing the intrapersonal factors to focusing on the policy environment, change in behavior is more likely to happen. Research has shown that the further we move from the bottom to the top (see Figure 3) in interventions, the more people are reached and the change is more likely to be sustained over time and become more permanent.

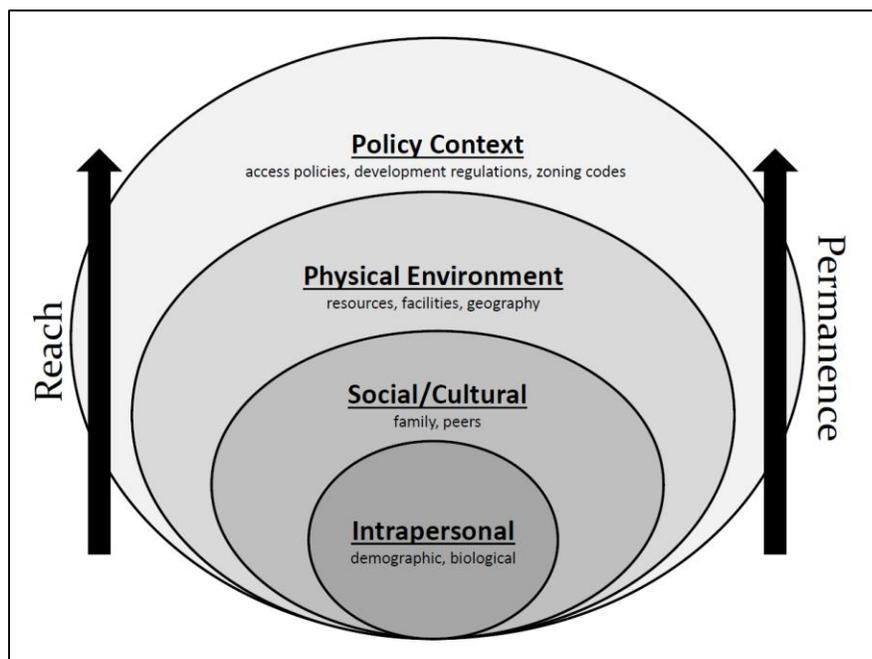


Figure 3: Model showing strength of reach and permanence across ecological influences (Sallis, 2014, p. 8)

This study will use the SEM as a guiding theoretical framework in examining the interrelationships between policies, and built/physical environments and LTPA.

Policy Approaches in Health Promotion

Health-related public policy can be described as laws or legislation impacting directly or indirectly on health. In other words, public health policies create supportive environments encouraging people toward health enhancing behaviors (Woods & Mutrie, 2012). An example at the national level may be a law that prevents smoking at the workplace. At the local level, a school district may adopt a policy that facilitates active school transportation for students.

Environmental and policy strategies have been cited as being more effective than individual behavior modification approaches at reaching target populations (Eyler, 2003; Schmid, Pratt, & Hovze, 1995). The reason being that policies can benefit *all* people exposed to the environment rather than devoting change efforts to one person's behavior at a time. For example, counseling to prevent alcohol abuse has been shown to be ineffective without the help of policy interventions such as increasing taxes or controlling the number of alcohol outlets in communities (Institute of Medicine, 2011). The literature surrounding health promotion through policy strategies has focused heavily on (a) nutrition or dietary behaviors and (b) PA. Public health efforts to improve nutrition and increase PA have previously emphasized changes at the individual level of ecological models, yielding ineffective and unsustainable results (Lyn, Aytur, Davis, et al., 2013). However, organizations such as the CDC and Institute of Medicine have led the movement from addressing intrapersonal and social levels of the SEM framework to policy solutions aimed at altering the environment in a way that positively influences population-level dietary and PA behaviors (Institute of Medicine, 2011).

Sacks et al. (2008) set out state and local policy actions for both the PA and nutrition system environments. These actions were a result of a systematic review of proposed solutions/options from practitioners for positively influencing both environments. Examples cited for the nutrition system included production subsidies and taxes, laws restricting marketing unhealthy foods, products sold in schools, land-use management in food production, and location of fresh food retailers. Some of the examples of policy areas that influence the PA environments listed were public transportation, urban planning, facilities

and open spaces for physical activities, equipment for schools, public liability, physical education in schools, building design standards, and access of general community to school sports facilities (Sacks, Swinburn, & Lawrence, 2008).

A PA policy has been defined as a public health policy that defines PA as a priority area, identifies specific population goals and targets, and offers a plan of action to accomplish the stated goals (Bellew, Schöeppe, Bull, & Bauman, 2008). Successful policies have the potential to influence all individuals within a geographical area like a school or workplace (Edwards, Kanters, & Bocarro, 2014; Spengler, Young, & Linton, 2007; Ward, 2011; Woods & Mutrie, 2012). Dunton et al. (2010) outlined the four PA policy strategies: (1) provide information about the behavior, (2) increase/decrease opportunities for behavior, (3) provide incentives/disincentives for behavior, and (4) require/prohibit behavior. To date, there is little research on which type of policy strategy is the most effective in increasing PA at the population level (Beets, Huberty, Beighle, Moore, Webster, Ajja & Weaver, 2013; Dunton, Cousineau, & Reynolds, 2010). However, a conceptual model was developed to help visualize the connection between policy strategies, various theoretical constructs, and PA, shown in Figure 4.

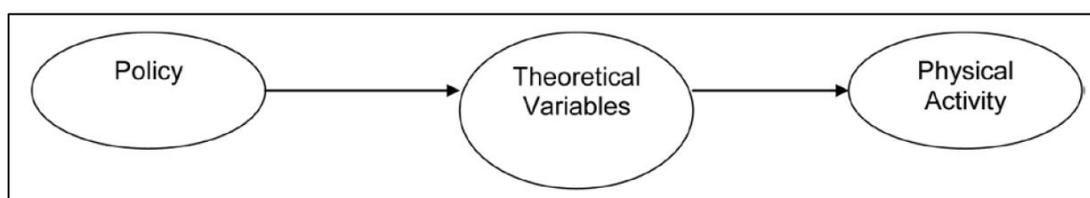


Figure 4: Proposed linkages between policy, theoretical variables, and PA (Dunton et al., 2010).

Persuading people to adopt and sustain recommended levels of PA remains a major public health challenge (Giles-Corti, 2006). Policy research and intervention strategies for PA has only recently become relevant for public health practice (Dunton et al., 2010; McCann, 2006; Schmid et al., 2006). According to Schmid et al. (2006), policy provides an organizing structure and guidance for collective and individual behavior. Policy and environmental interventions have been an important part of the public health approach to physical activity promotion (Lyn et al., 2013; Sacks et al., 2008; Schmid et al., 2006). For promoting greater physical activity, public policy studies have primarily focused on (a) selecting and funding investments in physical activity resources, and (b) creating or terminating regulations that promote or discourage physical activity (Sallis et al., 2006a). The evidence concerning the efficacy of policy implementation and uptake within the public health sector is limited (Cox, Berends, Sallis, Marie, John, Gonzalez & Agron, 2011; Sallis et al., 1998). Additionally, evaluating the impact of partnerships and policies on facility use and physical activity has been recommended in future research (Beets, Webster, Saunders & Huberty, 2013; Kanters et al., 2014b).

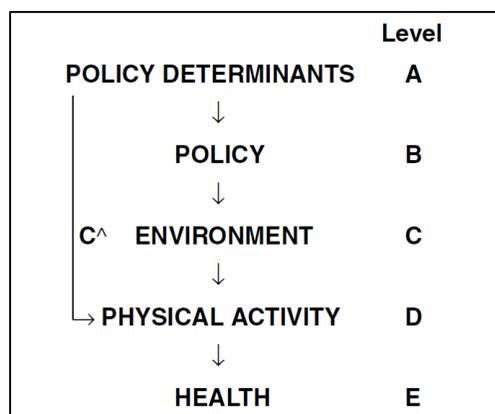


Figure 5: Presumptive model of how policy moves from formulation to implementation and thereby influencing PA directly through the environment (Schmid et al., 2006).

A simple illustration from Figure 5 depicts a model showing policy's direct and indirect effects on PA. The implied causal sequence from the determinants of policy (Level A), policy's direct effects on PA (C^{\wedge}), and its indirect effect on PA through its application on the environment (Level C) (Schmid et al., 2006). The links between environment and PA (Level C-Level D) are established and growing (Heath, Brownson, Kruger, Miles, Powell et al., 2006; Kahn et al., 2010; Schneider, Pestronk, & Jarris, 2013).

PA policies help ensure that PA promotions, programs, and places are resourced and supported (Mowen & Baker, 2009). Sallis et al. (1998) argued the importance of policy in facilitating opportunities for PA but more conceptual models need to be developed in order to fully target policy interventions. For example, funding support and mandates for creating and maintaining public facilities such as schools, recreation centers, and sports fields are functions of public policy. Little evidence is offered regarding policies and practices associated with effective physical activity promotion during after school (Beets, Beighle, Erwin, & Huberty, 2009). In a meta-analysis on school after-school policy, Beets et al. (2009) found that only eight out of 797 articles on programming intervention strategies measured physical activity. More recently, a study sampling 1,241 children within 18 after school programs were evaluated using accelerometers to measure the impact of policy environment characteristics on PA. PA policy curriculum (e.g., presence of a written policy to promote PA, allocating time in the schedule for PA opportunities, staff training to promote PA) were audited, written policy was found to have a very minimal effect on children's PA in after-school programs (Beets et al., 2013a). Thus, despite the many theoretical

underpinnings supporting the change of the policy environment to increase PA, additional work is called for in this area.

Access to PA facilities and the aesthetic qualities of the surroundings are consistently found to be influential in PA levels (Choy et al., 2008; Kanters et al., 2014a; Norman et al., 2006; Oyeyemi, Ishaku, Deforche, et al., 2014; Roemmich et al., 2006). A journal scan identified 19 quantitative studies assessing the relationships with PA behavior and environmental attributes (Humpel et al., 2002). The authors concluded that, although more empirical evidence is needed, accessibility of facilities had significant associations with PA. Lack of access of places to exercise has been previously reported as a leading barrier to physical activity (Brownson et al., 2008; Eyler, 2003; Sallis et al., 1998). Saelens et al. (2003) found evidence of more walking for transportation among adults living in “walkable neighborhoods”. A few studies have used multi-level modeling focused on built environment variables. For instance, the presence of sidewalks is associated with more walking for transport in many studies (Giles-Corti & Donovan, 2002; Owen, 2007; Sallis, 2003). Similarly, changes in national transportation funding to favor public transit may result in more utilitarian physical activity such as walking from the bus stop to work (Schmid et al., 2006).

In response to the National Physical Activity Plan, the CDC and the Arthritis Foundation began an initiative to develop more specific approaches unique to the needs of the arthritis community for improving PA among adults with arthritis (U.S. Department of Health & Human Services, 2004). The priority policy strategies that resulted were (a) the need to invest public resources in convenient settings and (b) the creation of policies that

expand efforts to promote active living environments (Waterman & White, 2014). Changes in local policies, such as a school system's decision to require physical education or to open school grounds to the public have been proposed to have more immediate and direct effects on PA (Brownson et al., 2001; Schmid et al., 2006).

School-based Policies for Physical Activity

Research surrounding policies affecting school-based PA has primarily emphasized physical education (P.E.) and sport offerings (Institute of Medicine, 2013). Existing state and national organization policies for PA in after school programming have set benchmarks for students to achieve appropriate amounts of PA, which can most readily be delivered through P.E. sessions, intramural, and varsity sports. For example, California has a policy that requires an afterschool program provide a minimum of 30 to 60 minutes of moderate-to-vigorous PA, limit sitting to no more than 60 minutes at a time, and limit screen time to 60 minutes per session (Beets et al., 2013b). Beets et al. (2013b) also reported that in other states such as Indiana, Maine, and Michigan, any after school program must offer a chance for 30 minutes of PA for every 3-hour time block. North Carolina programs are required to allot 20% of program time for moderate-to-vigorous PA.

Between 2000 and 2006, the percentage of school districts that adopted a policy stating that schools will follow national, state, or district PA standards rose from 66.5 to 81.4 percent (Lee et al., 2007). However, there is no federal law requiring P.E. to be provided to students in the American education system or any incentives for offering P.E. programs. Instead, states may set general or minimum requirements for PA programs but many choose to delegate responsibility to the local school districts (Story et al., 2014).

Public schools can play an essential role in providing additional opportunities for PA across the school day. Whole school programs to support PA in school are beginning to gain traction in the public school system (Ward, 2011). As seen in Figure 6, this concept not only include policies addressing interscholastic sports and P.E., but also interventions concerning recess, after-school programs, classroom breaks, and SUAs. In a large study in U.S. middle schools that employed such whole school programs, researchers found a 24 percent increase in active participation among girls, and a 12 percent increase among boys (Simon, Wagner, DiVita, et al., 2004). After-school and intramural programs have been cited as contributing to daily MVPA requirements in some empirical studies but research in the school environment continues to be limited (Choy et al., 2008; Lubans & Morgan, 2008; Trost, Rosenkranz & Dzewaltowski, 2008)

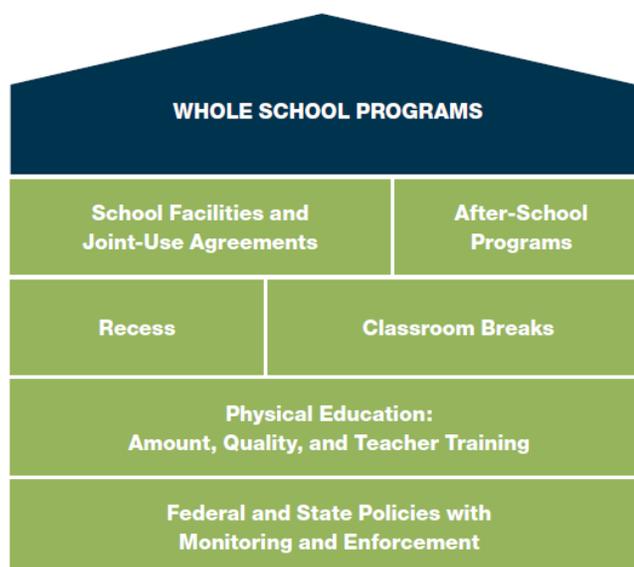


Figure 6: Policy Areas to Support Physical Activity at School (Ward, 2011).

Including intramural sports in the school setting has been called for as an example of a policy change to increase student participation and better promote PA within schools (Bocarro, Kanters, Edwards, Casper & McKenzie, 2014; Edwards et al., 2014; Kanters, et al., 2013). A study of four middle schools in North Carolina measured effect of a policy change of adopting more intramural sports in addition to the interscholastic/varsity sports already in place. The authors estimated that the policy implementation benefitted both economically disadvantaged and not economically disadvantaged students by increasing PA by 4.9% and 1.2% respectively. Moreover, a simulation of all middle schools adopting an intramural sports policy statewide was approximated to increase sports participation by 21.2%, resulting in 43,505 new sports participants (Edwards et al., 2014).

One suburban county in Illinois leveraged a federal policy change initiative by creating convenient and safe places to be active via increasing opportunities for PA. The grant program led to 150 policy changes in 127 schools and 73 communities, citing that active living initiatives yielded the greatest reach and potential impact. By the end of the project, 19 school districts including 115 schools advanced one or more policy changes that increased opportunities for PA before, during, and after school (Bassett et al., 2013).

Local government uses capital spending to make improvements to existing schools.

Consequently, bond referenda are often promoted based on the possibility that there will be civic and community shared use opportunities with the new or improved facility (Filardo et al., 2010). State and local laws exist related to enrollment, school utilization, site selection, design and construction, and school planning. However, there exists few policy blueprints for shared use development (Filardo et al., 2010).

Policies that build or improve access to existing facilities may influence PA at the community level (Eyler, 2003). People who have access to recreational facilities and programs are more active than those without access (Sallis et al., 2001). One of the first studies to examine the availability of school PA facilities for public use and the associated barriers and benefits in making facilities available found that outdoor facilities were available more often than indoor facilities (Evenson & McGinn, 2010). Beets et al. (2009) conducted a meta-analysis and found four out of six after school intervention studies reported positive effects on PA. An recent study on four middle schools was done to examine whether school policy (i.e., intramural or varsity) predicted likelihood that students would engage in after-school MVPA in specific physical activity areas (Bocarro et al., 2012). The authors concluded that shared use of sport facilities during the time periods immediately following the release of school could yield greater and more efficient utilization of facilities. In a broader study on thirty middle schools in North Carolina, the relationship between shared use and school operating costs were measured (Kanters et al., 2014a). Findings showed that schools do not incur significant additional facility operating costs when more programs and children use school facilities after hours. Further, the amount of shared use by schools was associated with an increase in both male and female participation in after school programs. If SUAs can include liability protection and clearly communicate facility operation, maintenance and repair costs between schools and an outside entity, then accessible places for PA could become more available for civic use (Kanters et al., 2014a).

Research suggests that people are more likely to be more physically active when there is easy access to facilities and programs (Cohen et al., 2007; Saelens, Frank, Auffrey,

Whitaker, Burdette & Colabianchi, 2006). But communities with high racial minorities, lower income and in a rural setting are less likely to have access to recreational facilities than higher-income or predominately Caucasian communities (Powell et al., 2006). In a 2009 survey, 69 percent of schools in low-income and primarily Black and Latino communities reported recreational facilities were open to the public outside of school hours (Spengler, Connaughton, & Maddock, 2011). A study in California found income-related disparities concerning access to school facilities. Sixty-eight percent of respondents from higher-income districts reported that some or all of their schools were open for public recreational use outside school hours, compared to only 44 percent of respondents from lower-income districts (Cox et al., 2011).

Through survey of 12 to 18 year olds, adolescents were found to be more likely to be active if given access to existing and renovated school athletic facilities outside school hours (Durant et al., 2009). Another study found the number of children who were physically active outdoors was 84 percent higher in a community that allowed access to schoolyards than in a community that had closed access to the schoolyard (Farley, Meriwether, Baker, Watkins, Johnson & Webber, 2007). An evaluation of six public schools with renovated facilities found a significant increase in the number of children who were physically active outside school hours systematic observation, supporting the concept that enhancement of the built environment can improve PA behavior patterns (Brink et al., 2010). A shared use program in Hawaii between the Department of Parks and Recreation and a local high school found that the program provided people with new opportunities for PA (Choy et al., 2008).

Data from a national survey of public schools from the School Health Policies and Programs Study (SHPPS) found 67 percent of the 921 schools allowed outside, public use of physical activity facilities. However, this percentage did not change between 2000 and 2006 indicating a lack of progress toward increasing the proportion of the nation's public and private schools that provide access to facilities for all persons outside school hours (Evenson et al., 2010b). Furthermore, only 29 percent of the schools surveyed offered all types of shared use for youth sports teams, community sponsored youth activity classes, supervised open gym or free play during the following times: before school, after school, evenings, weekends, or during school vacations (U.S. Department of Health & Human Services, 2008). Similarly, Lee et al. (2007) surveyed 988 elementary, middle and high schools and 60% made their PA facilities available in the evenings, 58% after school hours, 52% on the weekends, 46% during school vacations, and 11% before school hours (Lee et al., 2007).

Policy stakeholders have cited that convenient access, low cost, creating relationships, and location are the most common motivational factors for sharing school facilities with individuals and community organizations (Beighle et al., 2010). Further, there are more public school buildings than any other public facility in the United States; 6.6 billion square feet of space on more than 1 million acres of land (Filardo et al., 2010). Even though not every acre of public school land is devoted to PA, most campuses have an inventory of standard spaces conducive to PA opportunities for serving high volumes of people.

Despite the many advantages of SUAs, many local government systems leave school districts and administration ill-equipped and unprepared to engage in these agreements (Filardo et al., 2010). With the lack of adequate policy guidelines, public school facilities for

non-school use can be challenging and, many times, impossible. One of the challenges in increasing PA is for communities to commit resources to construct environments (e.g., playgrounds, ball fields, parks, trails and other recreational facilities). Cost, liability, poorly designed spaces, inadequate decision-making processes are all additional barriers to shared use (Filardo et al., 2010).

A national survey of principals from lower-income communities provided the most commonly cited reasons that schools did not allow public use of their recreational facilities. The following reasons were identified as extremely important for limited or no access: liability concerns (61%); insurance (61%); costs (60%); staffing (57%); safety concerns (57%); and maintenance costs and responsibilities (55%) (Spengler, 2012). Another survey of California school administrators found the most frequently cited reasons for restricting use to the public during after school hours were lack of staffing (45%); liability concerns (44%); safety concerns (44%); insufficient funding (39%); and risk of vandalism (38%) (Cox et al., 2011). In four communities in the United States, varying in education, race and socioeconomic status. Evenson and McGinn (2010) found that safety, insurance and liability concerns were the main perceived barriers to making recreational facilities available for public use. Similarly, a national survey of school principals reported that 83% of all respondents were “somewhat to very concerned” about liability if someone was injured while participating in recreational activities on school property outside of regular school hours (Spengler et al., 2011). Additionally, 91% of those respondents who reported that their facilities were not open for community use were “somewhat to very concerned” about liability.

Nearly 90% of all school-age children are enrolled in public schools (Filardo et al., 2010). Fewer families today have multiple children or any children at all. From 1960 to 2008, the percent of all households having at least one child under 18 years old dropped by 16 percent (U.S. Census, 2008). This lessens school space demands during public education use hours and reduces demand for school space by students. As a result, school spaces often go under-utilized and could be available for shared use in communities. However, the growth of the U.S. population has contributed to the increase in public school enrollment and is projected to increase by 2 million students by 2015 (U.S. Dept. of Education, 2009). As more students fill up schools, the school grounds and resources are so frequently used by the school and students that gaining access to school facilities is difficult. Athletic and extra-curricular activities can fill up the school after hours and over weekend periods; leaving the school sites with full utilization of their spaces and little room for shared use.

In addition to the lack of research on SUAs in schools, much of the analysis of access to school resources has been predominantly focused in urban schools (Giles-Corti & Donovan, 2002; Edwards et al., 2012). Supportive environments are different in rural areas in that the availability of resources are often more scarce and less accessible to the public than if located in a more urbanized area. Rural schools in poor areas of North Carolina have been shown to be more highly disadvantaged with high racial minority populations and low environmental support (Edwards et al., 2012). Although research suggests that people living in rural neighborhoods lack accessible facilities conducive to PA, few studies have assessed the availability of these resources (Edwards et al., 2011).

Measures

The ways in which access policies and PA have been measured has evolved over the past few decades (Brownson et al., 2001; 2009). Research has moved from focusing on compliance with supervised exercise programs in relation to proximity facilities to studying the impact of the community environment, (e.g., the convenience of facilities) on PA (Brownson et al., 2009). Better measurements of the built and policy environment have been developed and PA surveys have become more comprehensive, allowing assessment of specific behaviors in relation to the environment (Kanters et al., 2014b). Researchers have thus developed and adapted several audit tools in recent years. For example, shared use and policies associated with physical activity has been best measured through interviews or self-administered questionnaires, such as the Structured Physical Activity Survey (SPAS (Evenson & McGinn, 2010; Spengler, 2012)). Combining surveys with objective, systematic observation measures is a trend many researchers are attempting to incorporate into new studies (Farley et al., 2007; Keadle et al., 2014). Reliable observational tools have been applied to school settings to count people in specific settings in addition to contextual information: System for Observing Play and Recreation in Communities (SOPARC) and the Physical Activity Resource Assessment (PARA).

The System for Observing Play and Recreation in Communities (SOPARC) uses momentary time sampling to provide a count of individuals within designated activity zones and classification of observed PA. Additional variables are simultaneously recorded such as gender, age and race/ethnicity. Several studies have adopted systematic observation in the pursuit of measuring and obtaining reliable PA data (Besenyi, Kaczynski, Wilhelm Stanis, &

Vaughan, 2013; Bocarro, Floyd, Moore, Baran, Danninger, Smith & Cosco, 2009; Bocarro et al., 2012; Chung-Do, Davis, Lee, Jokura, Choy & Maddock, 2011; Cohen et al., 2007; 2011; 2013; Cohen, Marsh, Williamson, Golinelli, & McKenzie, 2012b; Floyd et al., 2011; Lafleur et al., 2013; McKenzie, Cohen, Sehgal, & Williamson, 2006; Mckenzie, Crespo, Baquero, & Elder, 2010; Parra, McKenzie, Ribeiro, et al., 2010; Pleson, Nieuwendyk, Lee, Chaddah, Nykiforuk & Schopflocher, 2014; Price, Reed, & Hooker, 2012; Reed, Morrison, & Arant, 2009; Shores & West, 2010; Tester & Baker, 2009).

SOPARC was used in a study on 8 urban public parks in Los Angeles, CA to determine how much PA occurs in minority communities (Cohen et al., 2007; McKenzie et al., 2006). The researchers discovered two thirds of individuals in the 165 target areas were sedentary when observed and target areas were empty 57% of the time of observation (Cohen et al., 2007, McKenzie et al., 2006). Additionally, males were twice as more likely to be vigorously active than females. These findings coincided with a study done in 6 park sites in Honolulu, Hawaii where women and girls were less active than men and boys (Chung-Do et al., 2011). Chung-Do and colleagues summarized their direct observational data by reporting that out of the 6,477 park users observed, 60% were sedentary, 26% moderate, and 14% performed vigorous activities (Chung-Do et al., 2011). Similarly, a summer study in four parks in Kansas City, Missouri used SOPARC to collect over 8,000 observations to help understand the differences in physical activity across park areas in hopes of informing health-related park planning efforts. Adults and seniors showed greater energy expenditure on paved trails and tennis courts while children and teens were most active on playgrounds (Besenyi et al., 2013). Observational data using SOPARC was collected in a two park study

in San Francisco, CA to calculate physical activity levels in low-income neighborhoods that underwent major field renovations. Both intervention parks experienced a significant increase in overall physical activity among male and female visitors (Tester & Baker, 2009). Another pre and post-test study was done using systematic observation to determine whether the installation of new outdoor exercise equipment in 12 public parks impacted physical activity levels (Cohen et al., 2012). Findings indicated that the installation of fitness zones increased the level of moderate to vigorous physical activity at a favorable cost-effect ratio. On the other hand, the difference between the overall park use of the fitness zone parks and the 10 control parks was not statistically significant (Cohen et al., 2012). Cohen and colleagues followed with a national study on the relationship between physical activity and socio-economic status of surrounding neighborhood parks consisted of 24 parks in the metropolitan cities of Albuquerque, NM, Chapel Hill/Durham, NC, Columbus, OH, and Philadelphia, PA (Cohen et al., 2013). Researchers observed almost 36,000 individuals and found that neighborhood poverty level, perception of safety and the presence of incivilities were not associated with the number of park users, however, programmed and supervised activities and the number of facilities were strongly correlated with park use and physical activity (Cohen et al., 2013). Researchers in Recife, Brazil used SOPARC to test the effectiveness of a newly implemented public park programming initiative. People using park sites delivering physical activity programs were seen engaging in more moderate to vigorous physical activity than park sites without such programs (64% vs 49%) (Parra et al., 2010). Environmental characteristics were examined in association with youth park-based physical activity in 20 parks in Durham, NC using SOPARC. Results showed that the majority of

children observed were sedentary (52.6%) in addition to 34.2% and 13.2% as being moderate and vigorously active, respectively (Floyd et al., 2011). Playgrounds were the most popular choice of setting for children (40.3%) while the sports fields (10.8%) and courts (9.4%) were among the target areas that had minimal presence of children. Bocarro et al. (2009) obtained direct observations of 2,145 children in 23 parks in Raleigh/Durham, North Carolina. Three age groupings were established: 0 to 5 years old (Young Children); 6 to 12 (Middle Childhood), and 13 to 18 (Older Children). Results reported 98% inter-observer agreement by age group and gender by physical activity codes (Bocarro et al., 2009).

While the design of SOPARC was originally intended to be used in park settings, a growing number of research studies have applied this as well as the System for Observing Play and Leisure Among Youth (SOPLAY) in schools and playgrounds. The feasibility of SOPLAY was established in a large scale study of 24 diverse schools in southern California to investigate on-campus physical activity levels throughout the school day (McKenzie, Marshall, Sallis, & Conway, 2000). McKenzie and colleagues discovered that only 2-4% of daily attendance were present in facilities before and after school. Although physical settings were available for play and recreation during the school day, little to no structured activities, supervision or equipment was present to encourage student physical activity. Through the results of systematic observation, the authors concluded that many opportunities for physical activity by middle school students are being wasted (McKenzie et al., 2000). Lafleur et al. (2013) wanted to examine how shared use agreements between schools and under-resourced communities in Los Angeles increased use outside of school hours. After completing 172 SOPARC observations in 12 school sites, findings showed that community member use was

16 times higher in schools with shared use agreements in place (Lafleur et al., 2013). In a study in North Carolina, 1,188 SOPLAY observations were completed in two school between the after school period of 2:30 and 4:30 P.M (Bocarro et al., 2014). Intramural sports were found to generate more physical activity than interscholastic sports among boys and the lowest physical activity levels in interscholastic sports were baseball, softball, cheerleading, and football.

The Structured Physical Activity Survey (SPAS) identifies the frequency, duration, and type of structured afterschool physical activity programs offered at a school, how many boys and girls participated in each program, when programs were offered, who sponsored them, and whether or not there was a fee for participating (Powers, Conway, McKenzie, Sallis, & Marshall, 2002). The SPAS was originally designed to assess PA opportunities through public school programming (e.g., intramural, interscholastic, and club programs) (McKenzie et al., 2013). Although new, SPAS has been cited as a viable tool to include in analyzing and developing comprehensive school physical activity models (McKenzie & Lounsbery, 2013). Recently, a summary of P.E. teacher effectiveness research mentioned the utility of SPAS in shedding light on physical activity opportunities that schools can provide before and after school hours (McKenzie & Lounsbery, 2013).

An early study in San Diego County, California used SPAS to assess the type, frequency, and duration of extracurricular physical activities in 24 middle schools (Powers et al., 2002). SPAS were recorded three times over a five month period measuring one week samples of extracurricular activities. Programs from schools were offered an average of 3.1 times per week and lasting approximately 75 minutes (Powers et al., 2002). Results also

showed that 69.6% of activity programs were offered after school but accommodated only 5.5% of the daily school attendance. Powers and colleagues (2002) concluded that PA levels could be improved by increasing program offerings before and after school.

The application of SPAS has also been used in settings other than schools. McKenzie et al. (2013) surveyed 30 community recreation centers in five diverse cities in southern California in an investigation on whether economic disparities were associated with recreation center environmental characteristics. Recreation supervisors completed a modified version of the SPAS documenting opportunities for children 6-10 years old to participate in structured physical activity programs at the center over the past two weeks. Findings from the study posited that the poorer neighborhoods provided fewer options of physical activity programs for children to choose; however, results were not statistically significant (Mckenzie et al., 2013).

One of the latest cases administering the SPAS was an examination of the amount and type of afterschool physical activity programs provided by public middle schools and the additional operating costs as a result of the additional community-sponsored programs (Kanters et al., 2014a). The sample of schools came from one of the largest school districts in the country and data were collected four times over the course of one year to capture seasonality changes in activity. The authors concluded that schools with higher amounts of participants in after school programs did not have significant increases in operating expenses (Kanters et al., 2014a).

The built environment plays an important role in health behaviors, particularly PA (Eyler, 2003; Lyn et al., 2013). Previously, researchers have used audit tools to measure the

actual physical environment as it is directly observed (Brownson et al., 2009). The PARA is a brief, one-page, check-box instrument to systematically document and describe the type, features, amenities, quality and incivilities of a variety of physical activity resources (Lee et al., 2005). The audit tool allows systematic observation of the physical environment, including the presence and qualities of features hypothesized to influence physical activity behavior.

PARA was first developed in 2005 in an effort to study the link between neighborhood factors and physical activity in seventeen neighborhoods in a major metropolitan city (Lee et al., 2005). The overall environment for physical activity resources was different among the neighborhoods while the net number of physical activity resources did not vary. This suggested that merely the presence or absence of facilities may not be a valid way to investigate access to resources (Lee et al., 2005). The authors stated that, understandably, neighborhoods with the presence of litter and a higher proportion of incivilities encourages less desirable behavior and not promoting recreational physical activity.

Heinrich et al. (2007) referenced self-reported PA data of 452 adults to the measured environmental data from PARA. The quality of features used for physical activity and visitor amenities was not significantly related with physical activity; however, more days of walking were reported in neighborhoods with fewer incivilities (Heinrich et al., 2007). Individuals with greater access to more physical activity resources with few incivilities are more likely to be physically active. In a follow up study, Heinrich et al. (2008) used the PARA instrument in 55 physical activity resources in two U.S. cities to examine the relationship between

obesity and environmental factors. The major finding was that more supportive neighborhoods (those with greater accessibility, more amenities, higher-quality physical activity feature ratings and fewer incivilities) correlated with lower obesity prevalence rates among residents (Heinrich et al., 2008).

Twelve housing developments in Houston, TX were included in a cross-sectional study measuring the associations between neighborhood PA resource attributes with body mass index. A total of 105 resources were identified and assessed using PARA measuring accessibility, incivilities, and the quality of features of each physical activity resource. Results found that accessibility of resources predicted higher body fat percentages but inconclusive with feature and amenity quality and more incivilities (McAlexander et al., 2009). Needless to say, the quality of publicly available recreational facilities was a better indicator for PA than the absence or presence of facilities (Frost et al., 2010; Heinrich et al., 2007; Lee et al., 2005; Lee & Cubbin, 2009; McAlexander et al., 2009). This may, perhaps, lead to the concept that similar findings would be expected for school facilities that share with community partners.

CHAPTER THREE: METHODS

The purpose of this study is two-fold: (1) examine the relationship between SUA programs and LTPA behavior, and (2) examine the association of facility quality on LTPA. This study followed a non-experimental research design where a sample of public middle and high schools across North Carolina were selected to participate. A mixed methodology of observations and surveys were used to address the research questions. This chapter describes in detail the methods employed in the study. Study methods were approved by the Institutional Review Board for Human Subjects Research at North Carolina State University (see Appendices D-E).

Sampling

Through the Community Transformation Grant (CTG) Project, the Centers for Disease Control and Prevention (CDC) and Department of Health and Human Services (DHHS) provided support for obtaining and analyzing baseline data through a statewide survey. A baseline survey was e-mailed to all public elementary, middle, and high schools (N=2,359) in North Carolina using Qualtrics. Qualtrics is a web-based survey software tool used to capture survey results from users who are privately given access to a survey. Contact information for principals was compiled from the 2012 North Carolina Department of Public Instruction (DPI) database. The contents of the e-mail included a welcome message, description of the study, a statement of confidentiality and a URL link to the survey. The questionnaire comprised of 22 questions related to the shared use of school facilities. Among other identifiable school characteristics, the analysis was primarily based on whether facilities are shared with outside groups, type of use (e.g., after-school programs, casual use

or other), type of agreement (e.g., informal, formal, or no agreement), and perceived barriers to shared use (e.g., costs, liability concerns, scheduling, etc.). A total of 1,230 usable questionnaires were received for an overall response rate of 52.14%. Findings from this survey were used to identify potential schools to participate in the study. Mainly, the 1,066 public schools whose principals responded ‘yes’ to sharing their facilities with outside groups or individuals during after school hours provided the sampling frame.

Twenty public schools in North Carolina comprising both middle and high schools were selected to participate in the study (Figure 7). The schools were selected using a stratified nonrandom sampling method so that each of the 10 CTG regions were represented and included in the study (Eat Smart Move More North Carolina, 2013). The decision regarding which schools would be included in the study were based on several considerations. First, schools that were within close proximity (approximately less than 25 miles) to the residence of a trained data collector were given highest priority. Since data collection occurred on a weekly and sometimes daily basis, the schools needed to be within a reasonable driving distance from the nearest data collector. Second, schools were valued higher if located in a rural area versus an urban one due to this study’s emphasis on rural environments. Recent research on leisure in rural areas has indicated that determining an accurate and reliable measurement of rural status has been inconsistent across studies (Edwards & Matarrita-Cascante, 2011). Relying on county rural classification such as the North Carolina Rural Economic Development Center can be misleading. For instance, a school could be located in an urban designated county but is actually located 10 miles outside of a major city’s borders; thus being improperly labeled as an urban school. This study

Table 1: Grade Level, Rurality, Socioeconomic Status (SES), and Racial/Ethnic Characteristics of Study Schools

School #	Grade Level	Locale	Title I School	SES¹	% White	% Black	% Hispanic
1	Middle	Suburban	No	40.7	56.5	19.8	17.8
2	High	Suburban	Yes	58.9	43.5	32.9	18.4
3	High	Urban	Yes	77.7	8.6	41.1	46.4
4	High	Rural-Fringe	Yes	68.2	70.9	11.1	12.6
5	High	Rural-Fringe	Yes	42.6	80.0	9.4	3.4
6	High	Rural-Fringe	Yes	54.7	93.8	2.5	2.3
7	High	Urban	Yes	48.9	36.1	53.6	5.7
8	Middle	Rural	Yes	59.8	75.9	5.0	17.2
9	High	Rural	Yes	57.7	83.6	0.3	1.7
10	Middle	Rural	Yes	86.4	13.2	72.1	6.3
11	Middle	Rural-Fringe	Yes	52.2	59.3	26.0	6.5
12	High	Rural-Fringe	No	13.8	80.2	10.7	5.9
13	High	Suburban	Yes	47.8	65.3	7.0	20.0
14	Middle	Rural	Yes	64.1	48.6	23.9	23.9
15	High	Rural	Yes	87.5	7.0	90.8	0.9
16	Middle	Rural-Fringe	Yes	56.6	70.6	22.2	3.8
17	High	Rural-Fringe	Yes	47.6	85.9	0.8	3.8
18	High	Rural	Yes	56.4	51.2	42.6	2.5
19	High	Rural	Yes	53.0	64.2	32.7	1.4
20	Middle	Rural	Yes	72.7	87.4	0.4	6.5

¹Percent of student population receiving free or reduced price lunch

Finally, schools were offered a \$100 VISA[®] gift card given to the athletic department as an incentive to participate in this study. The incentive was awarded only after the completion of all data collection in September 2014. The gift card was to be used toward the purchase of athletic supplies or equipment, based on the needs of the school. The use of the financial incentive varied across the sample of schools and was dependent on the immediate need of the athletic department and in consultation with the school's principal. The purchase of a bucket of baseballs, new basketballs, game day jerseys, and the purchase of pizza for an athletic banquet are common examples of how schools chose to spend their incentive.

Instruments

Structured Physical Activity Survey.

Operationalizing the level or amount of programmed activities at schools with SUAs was done using the Structured Physical Activity Survey (SPAS) instrument. SPAS identifies the frequency, duration, and type of structured afterschool physical activity programs offered by the school and the number of boys and girls participating in each program. The audit is comprised of three parts: Structured Physical Activities Operated by School (Part 1), Structured Physical Activities Operated by Outside Community Groups (Part 2), and Inventory of Physical Activity Facilities (Part 3). Programs offered by the school can include interscholastic sports, intramurals, clubs, and physical activity/sport lessons among others. Structured programs offered by outside groups includes community sport leagues, church sport programs, camps, club programs, or special events. A ratio of the number of shared use participants to the number of school-sponsored participants using PA facilities. Specifically, SPAS allows the number of afterschool PA programs operated by outside organizations on school facilities and the number of non-school participants served per year to be estimated. Categorizing shared use in terms of number of outside programs and participants has been accepted and implemented in a recent study done by Kanters et al. (2014a). SPAS instrument was administered quarterly at every school site. The survey was given to either the principal or athletic director at each school, first in person and then over the phone. To capture the seasonality of school programs, the survey was completed for each school three times: Winter (February), Spring (May) and Summer (August). Due to time and resource constraints, a fall survey was not completed.

System for Observing Play and Recreation in Communities.

The objective measure of PA was the System for Observing Play and Recreation in Communities (SOPARC) method. This method is widely accepted and used in assessing PA in community settings (McKenzie et al., 2006). SOPARC is based on momentary time-sampling techniques in which school facilities are divided into predetermined sections or target areas, where observers perform rapid visual scans at specified times per day. These periodic scans of target areas are made according to an established schedule. During each scan, counts are made of the number of people engaging in each of three different levels of PA: sedentary (lying, sitting, or standing), moderate (e.g., walking), or vigorous (e.g., running, jumping, strenuous activity). Each person is also coded for gender (male or female) and age (child or adult). Lastly, simultaneous coding was conducted for the time of the observation and contextual characteristics such as the accessibility, usability, and the presence of organization, provided equipment, and supervision.

Inter-observer reliability has been found to be high and has been successfully used to assess the correlation between PA and the policy and built environment. Most instruments used to study PA have focused on individual subjects and used self-reported values (McKenzie et al., 2006). SOPARC is unique in that it uses direct observation and focuses on group behavior, not an individual.

Physical Activity Resource Assessment.

The unit of analysis of school facilities was measured using the Physical Activity Resource Assessment (PARA). The PARA is a one-page instrument designed to objectively measure the quality of PA resources (Lee et al., 2005). A modified version of the PARA was

then developed to evaluate the PA resources in twenty public schools known as the School Physical Activity Resource Assessment (S-PARA) The S-PARA provides a brief, reliable and effective strategy to assess built environment factors in schools that may influence physical activity (Frost et al., 2010; Lee et al., 2005).

A trained field assessor conducted an S-PARA evaluation for every PA facility at each school to systematically code various amenities and incivilities for each PA resource. Nine amenities (i.e., bike racks, bathrooms, benches, drinking fountain, landscaping effort, lighting, sheltered picnic tables, non-sheltered picnic tables, and trash cans) were rated on a 0 to 3 scale with “0” being *not present*, “1” as *poor*, “2” as *mediocre* and “3” as *good*. Twelve incivilities (i.e., noise, broken glass, dog refuse, dogs unattended, evidence of alcohol, evidence of drugs, graffiti/tagging, litter, no grass, overgrown grass, sex paraphernalia, and vandalism) were rated on a 0 to 3 scale with “0” being *none*, “1” as *little*, “2” as *some*, and “3” as *a lot*. Nine amenity and twelve incivility categories were given a rating for every facility at each school site. Furthermore, facilities were answered as being present or not present under signage (i.e., hours posted, directional, bilingual, rules for use, prohibitions, English only, and Spanish only) and school access (e.g. sidewalks, crosswalks). The unit of analysis for the S-PARA evaluation was school facilities, not the school as a whole.

Observer training and reliability

Forty observers were hired and trained in SOPARC, beginning in a classroom setting and then by interactive practice in an outside public park. Each observer participated in two, 6-hour days of training. Training occurred over 4 days prior to each data collection period using SOPARC training materials and procedures. Data collectors were also issued an Apple

iPad-mini device and trained in the use of the Apple application called “iSOPARC”.

iSOPARC is a new, interactive application of SOPARC available for download for free in the Apple app store. Figure 8 depicts a screen shot of the main counter tool used by data collectors when observing target areas. The black and white tickers above each button totaled the number of males and females coded, respectively.

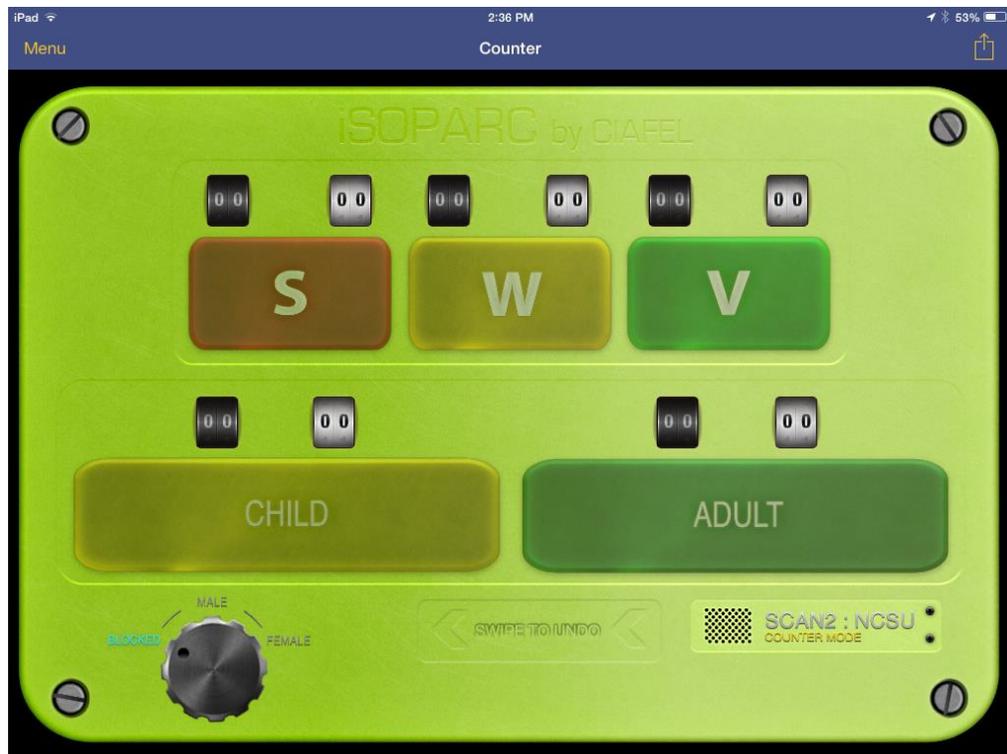


Figure 8: Screen shot of iSOPARC Counter Tool

At the end of the comprehensive training, observers were familiar and consistent with the method of systematic observation and strong inter-observer reliability. The same individual conducted the training for each data collector. Each data collector was reliably

tested for a proportion of the total number of observations to add strength to the data. Reliability observations involve a second trained data collector observing simultaneously, side-by-side with the primary data collector. Inter-observer reliability analysis using the Kappa statistic was performed to determine consistency among raters. Kappa coefficients for physical activity coding ranged from .90 to 1.00 (N=10), well within the acceptable range as values from 0.75 and above are considered excellent (Fleiss, Levin & Paik, 2003).

Data Collection Procedures

Data collection was completed in multiple phases. Data related to physical activity was collected by a survey of school principals and by direct observation. Facility quality was assessed by direct observation audit tool.

Overall facility usage was measured by administering the SPAS survey instrument at every school site. The SPAS was designed to assess a specified two week period of all organized PA programs offered by the school and outside groups/organizations. To capture the seasonality of school sponsored and shared use programs, the survey was administered quarterly at each school: Winter (February), Spring (May) and Summer (August) of 2014. The SPAS determines the number and type of all structured school physical activities, the number and type of participants and whether activities or programs were either school-based (e.g., varsity sports, intramural sports, etc.) or a result of shared/outside use.

The SPAS survey was administered to either the principal or athletic director, first in person and then over the phone. Information gathered from the survey included brief descriptions of the structured physical activity programs, whether the program was competitive or non-competitive, age range of participants, number of sessions offered,

average number of minutes per session, number of boys and girls attending each session, whether school staff or community staff was present, and whether the program/activity required a fee to participate. The final step involved recording an inventory of all potential PA areas at each school. Each facility was separately coded in terms of its location (indoor or outdoor), perceived quality (excellent, moderate, or poor), and which programs occurred at each facility. Due to the time and resource constraints, a fall SPAS survey was not completed.

Data on the PA facilities identified from the first wave of SPAS in February 2014 were used to determine the target areas for the systematic observation phase of data collection. Between the hours of 3:00 pm and 7:00 pm, observers recorded the PA level, gender, and age of individuals in the predetermined target areas that are designated for sport, active play or fitness.

Systematic observational data measuring LTPA among both children and adults were gathered to measure PA within school facilities with SUAs. Before the start of SOPARC, target areas were defined and mapped simultaneously by both the project manager and trained observers by utilizing the iSOPARC GPS capabilities. As shown in Figure 9, a Google Earth “bird’s eye view” allows precise agreement on the boundaries of each target area and offers a visual reference for the observer to follow as he or she is performing a scan.



Figure 9: Examples of Mapped and Subdivided Target Areas in the iSOPARC App

Table 2 illustrates how and when SOPARC data collection occurred during non-school hours with an emphasis on after school and weekends. A combination of weekday and weekend observations were taken in 30 minute intervals between the hours of 3:00 PM and 7:00 PM. Observations using SOPARC were conducted from March through September 2014. Scans were performed 4 times each day for each target area for every school. As shown in Table 2, one round consists of scanning every target area once within a 30 minute time frame before repeating the same cycle on the next 30 minute block.

Table 2: Observation Schedule for Data Collectors Using iSOPARC

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Round 1	3:10	—	3:10	—	3:10	9:10	9:10
Round 2	3:40	—	3:40	—	3:40	9:40	9:40
Round 3	4:10	—	4:10	—	4:10	10:10	10:10
Round 4	4:40	—	4:40	—	4:40	10:40	10:40
Round 1	5:40	—	5:40	—	5:40	1:10	1:10
Round 2	6:10	—	6:10	—	6:10	1:40	1:40
Round 3	6:40	—	6:40	—	6:40	2:10	2:10
Round 4	7:10	—	7:10	—	7:10	2:40	2:40
Round 1	—	—	—	—	—	5:10	5:10
Round 2	—	—	—	—	—	5:40	5:40
Round 3	—	—	—	—	—	6:10	6:10
Round 4	—	—	—	—	—	6:40	6:40

Observers could complete no more than 4 rounds of scans on a single weekday and 8 rounds on a single weekend day to ensure at least 10 days of data collection occurred at each school per season. The schedule was then reset after the academic school year ended and repeated during the summer observation period. Observers performed two scans per target area during each round, one for males and one for females. On average, observers completed each scan within the space in a few minutes. A total of 123 areas were targeted for observation, ranging from 4 to 10 (mean = 6.15) per school. All individuals located within the predefined boundaries of the target area during observations were recorded and coded for PA level (sedentary, moderate, or vigorous), gender (male or female), and age (child or adult). Some target area observations were later collapsed together to represent the facility as a whole, yielding a final count of 115 facilities.

Facility quality was measured by administering the School Physical Activity Resource Assessment (S-PARA) once per facility (n=115). The audit on facility quality was completed by the researcher. Nine amenities and twelve incivilities were individually rated based on an established PARA protocol (Lee et al., 2005).

Analysis

All data were analyzed using the Statistical Package for Social Sciences (SPSS) Version 22.0 software. Descriptive statistics were calculated, including counts and distribution of users for all variables. Simple bivariate correlations were computed to quantify the strength of relationship between PA and shared use. For the bivariate correlations, the school was the unit of analysis. Lastly, multiple linear regression analyses were performed with the facility as the unit of analysis. The purpose of the linear regression models was to identify aspects of the built environment that were independently associated with observed PA across various types of facilities.

Shared use ratio.

The unit of analysis for shared use was schools, hence, a school level shared use ratio was calculated to analyze the relationship between shared use and PA. From the SPAS form, several steps were taken to create the shared use ratio for each school. First, the total minutes of every reported shared use program from Part 2 was calculated by multiplying the number of sessions by the average number of minutes per session. Second, total minutes were multiplied by the reported average number of boys and girls, yielding a ‘Time X Participants’ (TXP) variable. Third, the TXP calculations were totaled for each school. The previous steps were repeated for all reported school-sponsored/interscholastic programs reported in

Part 1. The final shared use ratio was the proportion of Part 1 to Part 2 TXPs. The higher the shared use ratio, the greater the proportion of outside/shared use occurred compared to school-sponsored sports and activities.

Shared use programs.

The amount of organized outside/shared use programming was calculated to analyze the relationship between the number of shared use programs with the amount of PA that was observed in each school. From part 2 of SPAS, informal or general open use policies that indicated no organization affiliation were removed leaving only structured, organized programs for analysis. Next, the average number of minutes per session was divided by 60 then multiplied by the number of reported sessions. The final calculation offered the total number of 60 minute sessions run by outside programs per school over the 3 two week period samples.

Facility quality.

The S-PARA rated a total of 115 facilities at all school sites. These facilities were assigned a number between 1 through 5 based on their respective facility category: 1=Multi-purpose Field, 2=Track, 3=Baseball/Softball Field, 4=Tennis Court, 5=Indoor Gym. Facility quality was divided into two categories: amenities and incivilities. Following similar methodology used by DeBate et al. (2011), the ratings for the 9 amenities and 12 incivilities were averaged giving the mean amenity and incivility rating for each facility. All “0” or *not present* amenities were excluded from the calculation of means for a couple of reasons. First, the “0”s skewed the data heavily to the left, showcasing an inaccurate picture of overall quality. For example, since most facilities did not have bike racks at the site, a “0” would

pull the overall amenity rating to the poor range for that particular facility. Second, I was interested in the quality of the amenities that were already present and not necessarily the absence of amenities. In other words, the “0” for amenities held no meaning in the context of this evaluation. On the other hand, “0” had a significant meaning for the incivility rating. The absence of incivilities such as vandalism or broken glass is the ideal scenario for maintaining inviting environments, attributing positively to the rating. For this reason, incivilities were recoded from a 0 to 3 scale to a 1 to 4 scale to adjust for the inclusion of all *not present* ratings.

PA dependent variables of interest.

Three dependent variables for the study were: (a) number of participants, (b) METs, and (c) average METs. The number of males and females for each observation were summed to calculate the total number of participants per observation. Next, standard metabolic equivalents (METs) were calculated by multiplying each observed participants’ PA level with an assigned energy expenditure value: 1.5 for every *sedentary* person, 3.0 for every *moderate* person and 6.0 for every *vigorous* person. These values have been accepted and widely used in estimating the amount and level of PA (Ainsworth et al., 2011; Cohen et al., 2013; Edwards et al., 2014). Average METs were calculated for each observation by dividing the total number of METs by the total number of participants. The purpose of calculating the average METs was to give a more accurate picture on the level of energy expended by giving the average MET value per person. Subsequently the average MET per observation ranged from 0 to 6.

Bivariate correlations.

Six separate bivariate correlations were calculated using SPSS to measure the strength of relationship between shared use and PA. The two shared use variables previously mentioned (shared use ratio and shared use programs) were each tested against the three PA dependent variables (METs, number of participants, and average METs). Spearman's rho was chosen as the correlation coefficient due to the small sample size of schools (N=20). It was important to use a non-parametric statistic like Spearman's rho in order to minimize the effects of any extreme values. Scatter plots were created for significant findings to help better visualize the linear relationship.

Multiple linear regression.

Final analysis used multiple linear regression modeling to test the statistical significance of facility quality variables as factors contributing to PA. The purpose of linear regression is to deliver a forecasting model that can be used to predict dependent variable outcomes based on the values of one or more independent variables. In the case of this study, the outcome variable is PA and the predictor variable is facility quality. Three models were run for each of the dependent variables. The average amenity and incivility scores for each facility served as the independent variables. Additional models were built to investigate how much significance varied with respect to (1) facility type, (2) amenities and (3) incivilities. Cases were split by the five facility types (indoor gym, baseball/softball field, tennis court, outdoor track, and multipurpose field). Unstandardized beta coefficients were reported to predict PA across various facilities.

CHAPTER FOUR: RESULTS

As stated earlier, my study examined the effect of SUAs on outside/community PA as well as the influence of facility quality on PA. This chapter is organized in terms of the three research questions presented in Chapter 1. Total PA during non-school hours is described first. Second, results from bivariate correlations showing the relationship between shared use ratios for each school with PA variables and results from bivariate correlations between the number of shared use programs with PA variables are presented. Third, findings from linear regression models on whether facility quality can predict the number of participants and level of PA observed at shared use facilities is presented.

Descriptive Statistics

SOPARC.

The exported SOPARC data yielded 9,610 observations from all 20 school sites. Total observations were then grouped for each school facility reducing total observations to 9,140. Within these observations, a total of 11,897 people were recorded and coded. Reliability checks were completed for every data collector (n=20). A total of 40 reliability rounds (1,882 observations) were completed and generally spread out evenly across schools. One data collector was reliability checked only once. The rest successfully registered two or more rounds with a reliability partner. The Kappa coefficients showed high inter-observer agreement for all age, gender and physical activity level codes, ranging from 0.90 to 1.00. Table 3 shows the breakdown of Kappa values for each of the ten coding variables from SOPARC. According to Fleiss et al. (2003), Kappa values above 0.81 can be interpreted as almost perfect agreement.

Table 3: Cohen's Kappa Coefficients by Gender, Age, and Physical Activity Level

Variable	Kappa Coefficient
Male, Sedentary	0.95
Female, Sedentary	0.96
Male, Walking	0.93
Female, Walking	0.96
Male, Vigorous	0.92
Female, Vigorous	0.96
Male, Child	0.90
Female, Child	0.97
Male, Adult	0.99
Female, Adult	1.00

Males were observed using facilities more frequently than females. Out of the 11,897 participants coded from SOPARC, nearly 60% were males. Additionally, 17 out of the 20 schools had more males than females. No participants were recorded at one school. The overall gender distribution by school can be found in Table 4.

Table 4: Distribution of Facility Users by Gender

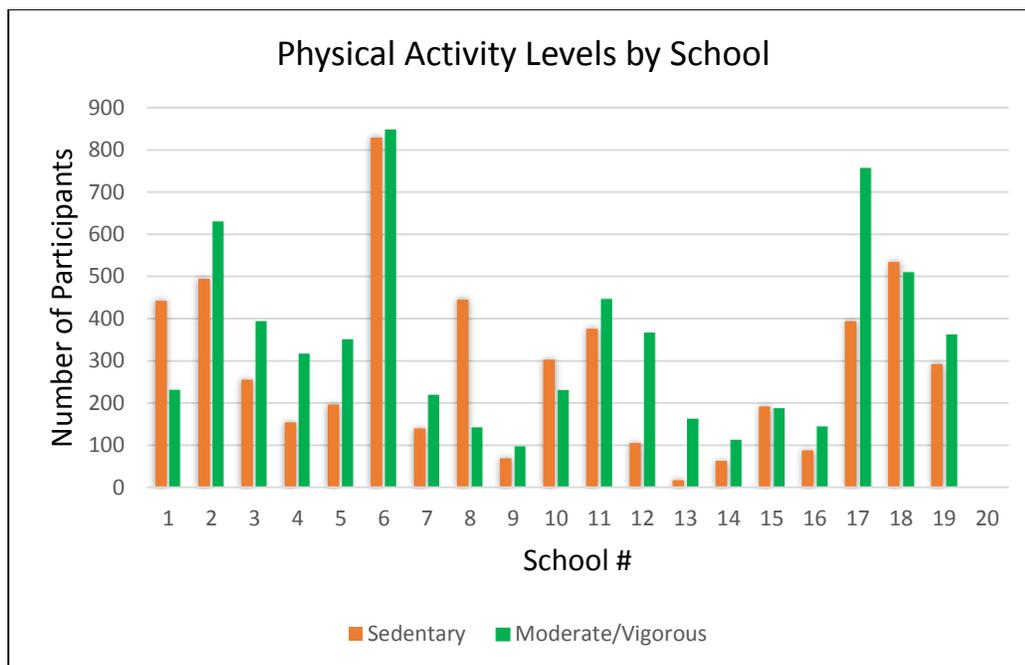
School #	Gender (%)		Participants
	Male	Female	
1	496 (73.6)	178 (26.4)	674
2	595 (52.9)	529 (47.1)	1124
3	329 (50.8)	319 (49.2)	648
4	296 (62.8)	175 (37.2)	471
5	367 (67.1)	180 (32.9)	547
6	882 (52.6)	794 (47.4)	1676
7	209 (58.1)	151 (41.9)	360
8	343 (58.4)	244 (41.6)	587
9	92 (55.1)	75 (44.9)	167
10	193 (36.2)	340 (36.2)	533
11	307 (37.3)	516 (64.3)	823
12	268 (56.8)	204 (43.2)	472
13	122 (67.8)	58 (32.2)	180
14	90 (51.1)	86 (48.9)	176
15	254 (67.0)	125 (33.0)	379
16	152 (65.5)	80 (34.5)	232
17	935 (81.3)	215 (18.7)	1150
18	672 (64.4)	372 (35.6)	1044
19	507 (77.5)	147 (22.5)	654
20	0 (0.0)	0 (0.0)	0
Total	7109 (59.8)	4788 (40.2)	11897 (100.0)

The overall distribution of participants was almost even (children 51% vs. adults 49%) but fluctuated from school to school. For instance, over 75% of participants in seven of the schools were children and in four schools, the same proportion was found for adults. School #13 had the lowest number of children registered (0) while school number 6 had the highest (948). School #14 had the lowest number of adults (10) while school number 2 had the highest (1,106). Again, no user information was available from school #20. A summary depicted in Table 5 presents the breakdown of age by specific school site.

Table 5: Distribution of Facility Users by Age

School #	Age (%)	
	Child	Adult
1	504 (79.9)	127 (20.1)
2	18 (1.6)	1106 (98.4)
3	530 (82.0)	116 (18.0)
4	112 (26.5)	310 (73.5)
5	42 (7.7)	505 (92.3)
6	948 (56.7)	725 (43.3)
7	296 (78.4)	64 (21.6)
8	267 (45.5)	320 (54.5)
9	56 (33.4)	111 (66.6)
10	428 (80.3)	105 (19.7)
11	666 (80.9)	157 (19.1)
12	371 (78.6)	101 (21.4)
13	0 (0.0)	180 (100.0)
14	152 (93.8)	10 (6.2)
15	265 (71.0)	108 (29.0)
16	132 (57.1)	99 (42.9)
17	806 (70.1)	344 (29.9)
18	413 (39.9)	621 (60.1)
19	26 (4.0)	627 (96.0)
20	0 (0.0)	0 (0.0)
Total	6001 (51.1)	5733 (48.9)

More people were found to be sedentary than any other PA level. Of the participants observed, 45.3% were coded as sedentary, 35.3% and 19.4% were coded as being moderate and vigorously active, respectively. The distribution of the PA levels of users by school can be viewed in Figure 10.



*Note. School #20 had no participants observed

Figure 10: Observed Physical Activity Levels of Facility Users by School

In terms of the number of people observed, the most used facilities were overwhelmingly baseball and softball fields with 45% of the users observed in this facility category. This was not a surprising finding given that data collection occurred primarily during the spring and summer season, the time of year most associated with the sports of baseball and softball. Multipurpose fields had the next highest number of users (25%) followed by indoor gyms (14%), tracks (13%), and tennis courts (3%) having the lowest number of users. The proportion of sedentary people was largest in baseball/softball fields (57.6%). On that same note, the Baseball/Softball category had the lowest proportion of vigorous participants (10.5%). On average, outdoor tracks and tennis courts were seen to have the highest proportion of people engaged in moderate and vigorous PA. A complete distribution of participant counts across facility categories is summarized in Table 6.

Table 6: Participant Physical Activity Levels by Facility Category

Facility Category (n)	Physical Activity Level (% within facility category)			Total Participants
	Sedentary (%)	Moderate (%)	Vigorous (%)	
Multi-purpose Field (35)	1087 (36.8)	999 (33.9)	864 (29.3)	2950 (24.8)
Track (14)	409 (25.6)	814 (51.0)	373 (23.4)	1596 (13.4)
Tennis Court (8)	98 (27.5)	165 (46.2)	94 (26.3)	357 (3.0)
Baseball/Softball Field (35)	3084 (57.6)	1709 (31.9)	565 (10.5)	5358 (45.0)
Indoor Gym (23)	710 (43.4)	519 (31.7)	407 (24.9)	1636 (13.8)
Total (115)	5388 (45.3)	4206 (35.4)	2303 (19.3)	11897 (100.0)

Despite having observed 11,897 participants, a vast majority of observations recorded no people in the target areas. As seen in Table 7, out of the 9,140 total observations, 87.7% were found to be completely empty spaces with no PA to observe. Outdoor tracks had the lowest proportion of empty observations with one out of every four instances having registered at least one participant. The only facility type that is indoors (gyms) had the highest proportion of empty observations (92.4%). Multi-purpose, baseball, and softball fields accounted for over half (62.1%) of the empty observations.

Table 7: Frequency of Empty Observations by Facility Category

Facility Category (n)	Empty Observations (%)
Multi-purpose Field (35)	2459 (91.0)
Track (14)	831 (74.9)
Tennis Court (8)	542 (86.3)
Baseball/Softball Field (35)	2517 (86.9)
Indoor Gym (23)	1666 (92.4)
Total (115)	8015 (87.7)

The average number of people per observation was 1.3 across all observations. Baseball/Softball fields had the highest average persons (1.85) followed by tracks, multi-purpose fields, indoor gyms, and tennis courts having the lowest with an average of less than one person per observation. Calculations for average METs were done by dividing the total METs by the number of participants per observation. Outdoor tracks yielded an exponentially higher average METs over all other facilities (0.86), nearly doubling the next highest tennis courts (0.48). The lowest average METs came from baseball/softball fields (0.19). The complete summary can be viewed in Table 8 below.

Table 8: Average Persons and METs Per Observation by Facility Category

Facility Category (n)	Average Persons	Average METs
Multi-purpose Field (35)	1.09	0.29
Track (14)	1.44	0.86
Tennis Court (8)	0.57	0.48
Baseball/Softball Field (35)	1.85	0.19
Indoor Gym (23)	0.91	0.29
Total (115)	1.30	0.38

S-PARA.

Reliability audits were conducted at 11 of the 20 school sites in 64 of the 115 facilities. Inter-rater agreement for facility quality was moderate. Across all amenity and incivility categories, the Kappa coefficient was 0.55. According to Fleiss et al. (2003), this Kappa value is interpreted as a moderate level of agreement by most researchers. Moderate level agreement within ordinal data was expected since there was little variability of the raters and so few available ratings in each category as noted by Saelens et al. (2006).

Amenities were found to be in good condition overall. A summary of the S-PARA data gathered for facility quality can be found in Table 9. As previously stated, the scale for amenities was from 1 (poor) to 3 (good) and incivilities was 1 (none) to 4 (a lot). The mean amenity quality rating was between 2 and 3 for each facility type. This was expected given a report from the National Center for Education Statistics stating that 70% of all public school athletic facilities nationwide are said to be in good to excellent condition (Alexander &

Lewis, 2014). Public schools are typically required to provide basic and appropriate amenities in facilities on a regular basis for school-based activities. On average, overall amenity quality was greater for indoor gyms and tennis courts than it was for multi-purpose fields, tracks, and baseball/softball fields. Indoor gyms and tennis courts were most frequently rated as “good” with mean scores for amenities being 2.70 and 2.74, respectively. The other three facility types were closer to the “mediocre” rating. However, overall, the results show more high than low quality amenities.

The mean incivility quality rating was just over 1 for each facility type. All hard surface facilities (tracks, tennis courts, and indoor gyms) were rated as having little to no incivilities to report on average. Multi-purpose, baseball and softball fields were, more or less, normally distributed for average incivility ratings.

Table 9: Descriptive Statistics for Overall School Facility Quality Scores

Amenity Quality						
(# of Observations)	<i>Mean</i>	<i>SD</i>	<i>Skewness</i>		<i>Kurtosis</i>	
			<i>Stat</i>	<i>Std. Error</i>	<i>Stat</i>	<i>Std. Error</i>
Multi-purpose Field (2653)	2.31	0.66	-.61	.048	-.83	.095
Track (1069)	2.54	0.60	0.60	.075	1.10	.149
Tennis Court (532)	2.70	0.38	-1.20	.106	0.34	.211
Baseball/Softball Field (2724)	2.35	0.57	-.90	.047	0.14	.094
Indoor Gym (1804)	2.74	0.34	-1.34	.058	1.08	.115
Incivility Quality						
Multi-purpose Field (2653)	1.15	0.13	0.35	.047	-1.0	.094
Track (1069)	1.05	0.08	1.23	.073	0.29	.147
Tennis Court (532)	1.14	0.18	1.09	.098	-.15	.195
Baseball/Softball Field (2724)	1.19	0.15	0.44	.045	-.54	.091
Indoor Gym (1804)	1.05	0.74	1.29	.058	0.69	.115

Bivariate Correlations

Results for the bivariate correlation analysis for each school (n=20) are presented in Table 10. As stated previously, SPAS was administered three times during the year at every school site: winter, spring, and summer. From the SPAS form, 3 out of the 20 schools reported more shared use than school-sponsored activities (a ratio greater than 1). School #1

had the highest shared use ratio of 13.26. The reason behind such a high ratio in school #1 was due to the context of the shared use programs being implemented. The local YMCA ran a youth summer camp all day for five days a week during the summer months, resulting in a large number of shared use programming sessions at this site. School #1 was the only school that had a full-time outside program using PA facilities on this large of a scale. Schools #10 and #14 did not report any organized shared use programs through SPAS but school #10 did have an open use policy for community members to use the track which is why the shared use ratio is 0.08 and not 0.00. Again, no participants were recorded in School #20 through SOPARC so no METs could be calculated.

Table 10: Descriptive Statistics for Calculated Shared Use Ratio, Shared Use/Non-school Programs, and Dependent Variables by School

School #	Shared Use Ratio	Shared Use Programs	Participants	Total METs	Average METs
1	13.26	110	674	1455	2.16
2	0.01	12	1124	3129	2.78
3	0.20	22	648	1861	2.87
4	0.22	14	471	1548	3.29
5	0.13	16	547	1758	3.21
6	0.69	102	1676	4999	2.98
7	0.22	73	360	1194	3.32
8	0.07	15	587	1108	1.89
9	1.01	47	167	598.5	3.58
10	0.08	0	533	1273	2.39
11	0.86	65	823	2295	2.79
12	0.95	38	472	1627	3.45
13	0.24	22	180	742	4.13
14	0.00	0	176	535	3.04
15	0.19	22	379	948	2.50
16	0.54	50	232	687	2.96
17	0.23	32	1150	4350	3.78
18	1.55	94	1044	2649	2.54
19	0.06	11	654	1758	2.69
20	0.82	28	0	0	0
Mean (Std Dev)	1.07 (2.9)	38.6 (33.5)	598 (413)	1726 (1258)	2.82 (0.86)

Results from the bivariate correlations between the school's shared use ratio and total METs, number of participants, and average METs are summarized in Table 11. There was no significant relationship found between the shared use ratio and PA outcome variables.

Table 11: Correlation Coefficients between Shared Use Ratio and Dependent Variables

Outcome Variable	Spearman's rho correlation coefficient (r_s)	P-value
METs	0.032	0.892
Participants	0.015	0.950
Average METs	0.110	0.645

The bivariate correlations between the number of 60 minute shared use programming sessions and total METs, number of participants, and average METs are summarized in Table 12. Again, there was no statistically significant relationship between programming sessions and PA outcome variables. However, the Spearman's rho correlation coefficient for both METs (0.19) and Participants (0.21) indicates a positive linear correlation with the amount of organized shared use programs reported by the school. Although a weak relationship, 19% and 21% of PA levels and total number of people present in PA spaces is explained by the amount of outside programming offered by organizations other than interscholastic programs offered by the school itself. There was no significant correlation found between average METs and shared use programs.

Table 12: Correlation Coefficients between Shared Use Programming Sessions and Dependent Variables

Outcome Variable	Spearman's rho correlation coefficient (r_s)	P-value
METs	0.188	0.428
Participants	0.206	0.384
Average METs	0.094	0.693

Figures 11 and 12 show the scatter plots for the most relevant relationships found through the bivariate correlation analysis.

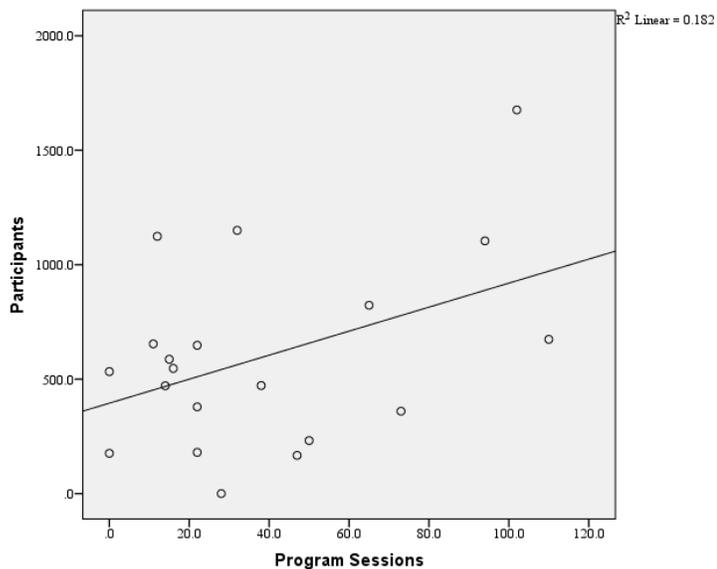


Figure 11: Bivariate Linear Correlation between Shared Use Programming Sessions and Participants

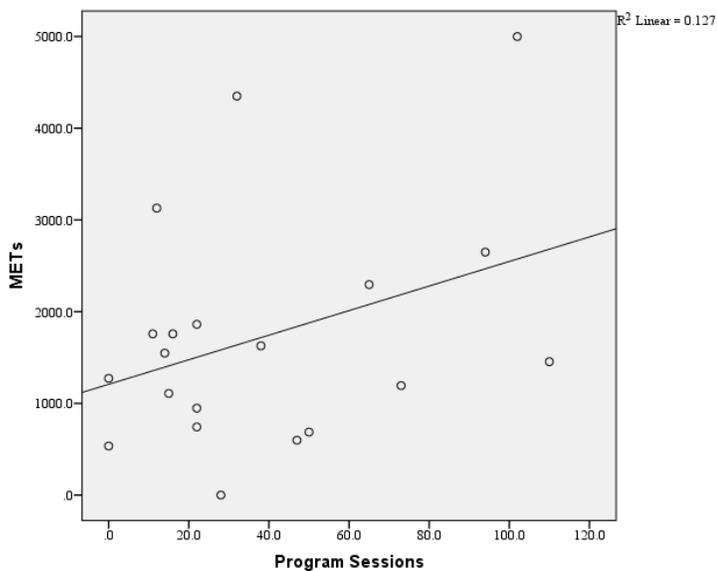


Figure 12: Bivariate Linear Correlation between Shared Use Programming Sessions and METs

Linear regression

Separate multiple regression analyses were used to predict the value of METs, participants, and METs based on the average amenity and incivility values for each facility. I first present the results from the overall models shown in Table 13. Next, the results split by facility type shown in Table 14 are discussed.

Table 13 summarizes the overall results for all observations for three different linear regression models. From Model 1, we can see that the average facility quality scores were not major predictors of METs ($F=1.92$). In contrast, the quality of amenities and incivilities served as positive and significant predictors of the number of participants ($F=4.04$) in a PA space shown in Model 2. As the amenity and incivility scores increase, so did the number of people per observation. From Model 2, we can predict that with each categorical increase in amenity and incivility quality, the number of participants will also increase (unstandardized B coefficients= 0.34 and 1.37) per observation. Thus, better quality facilities resulted in more participants observed using the space. For Model 3, overall facility quality was also a significant predictor for average METs ($F=17.74$), however, incivilities were found to be insignificant in the overall model. More METs on average could be predicted in spaces with higher amenity quality values ($B=0.09$) for each observation. In summary, the quality of amenities and incivilities were good predictors for total participants (Model 2) and average METs (Model 3) but not for total number of METs (Model 1). While controlling for amenities, the quality of incivilities did not have a profound influence on the usage of public school facilities during non-school hours.

In order to see the differences between various types of facilities, a second set of multiple regression analyses were done by splitting the results by facility type for all three previous models (Table 14). The quality of indoor gyms, baseball/softball fields, tennis courts, and multipurpose fields had a strong relationship with all three PA dependent variables. Outdoor tracks were the only facility type where overall facility quality was not a significant predictor of METs and participants. Taking into account both amenities and incivility ratings, we could reliably predict the average METs produced in each of the five facility categories.

Indoor gyms had strong unstandardized beta coefficients for METs ($B=2.47$) and participants ($B=1.09$) under amenities, indicating that for every category increase in amenities (e.g., moving from *mediocre* to *good*), we could expect to see an average of 2.5 more METs and 1 more person per observation. Incivilities were only significant for predicting average METs ($B=-1.67$) for indoor gyms. As incivilities increased by one category (e.g., moving from *a little* to *a lot*), we can predict that there would be an average of 1.7 less METs in each indoor gym observation.

Amenities in baseball/softball fields were significant predictors of METs ($B=2.28$), participants ($B=0.81$), and average METs ($B=0.14$). For every one quality category increase for amenities, an average increase of 2.3 METs, 1 participant, and 0.14 average METs could be predicted for each observation in baseball or softball fields. The average incivility ratings for baseball/softball fields had no noteworthy effect on PA.

Tennis courts had significant unstandardized beta coefficients for incivilities. As the incivilities increased, more METs ($B=17.16$), more people ($B=5.89$), and more METs on

average ($B=2.49$) could be expected per observation. The quality of amenities only effected the average METs variable for tennis courts ($B=0.36$), estimating a jump of average METs per observation for every categorical increase in the quality rating of amenities.

Outdoor track use was least affected by overall facility quality. In fact, the level of incivilities present in track facilities were not associated with any of the PA variables of interest. Amenities were significant predictors for participants ($B=-0.53$) and average METs ($B=0.16$). However, the beta coefficient for participants was a negative value, which was counter intuitive to what we expected to find. As amenity values for tracks increased, less people were observed in the target areas.

In multipurpose fields, amenities were significant predictors of participants ($B=0.37$) and average METs ($B=0.10$). As amenity quality increases, we can predict a jump in the number of participants and average METs for every observation. Next to tennis courts, multipurpose fields were the only facility type that had a significant relationship with the quality of incivilities. In other words, METs ($B=8.70$), participants ($B=2.70$), and average METs ($B=0.63$) could all be predicted to increase as the quality of incivilities increased. The results for multipurpose fields indicate that lower quality spaces in terms of incivilities received more METs, participants and average METs than those with higher incivility values within the respective facility category.

Table 13: Summary of Regression Analysis for Facility Quality Variables Predicting Physical Activity

Variable	Model 1 (Total METs)			Model 2 (Participants)			Model 3 (Avg METs)		
	B	SE B	β	B	SE B	β	B	SE B	β
Amenities	0.687	0.376	0.024	0.344	0.130	0.035*	0.091	0.025	0.048*
Incivilities	2.701	1.648	0.021	1.372	0.572	0.031*	-0.189	0.110	-0.023
R ²		0.000			0.001			0.004	
F change in R ²		1.920			4.041*			17.741*	

*Note. Significant at p -value = <0.05

Table 14: Summary of Regression Analysis for Facility Quality Variables by Facility Type

Variable	Model 1 (Total METs)			Model 2 (Participants)			Model 3 (Avg METs)		
	B	SE B	β	B	SE B	β	B	SE B	β
Indoor Gym									
Amenities	2.470	1.234	0.060*	1.089	0.403	0.080*	-0.071	0.085	-0.025
Incivilities	-6.631	5.711	-0.035	-0.994	1.863	-0.016	-1.668	0.395	-0.125*
R ²		0.007			0.008			0.012	
F change in R ²		6.603*			7.536*			11.397*	
Baseball/Softball Field									
Amenities	2.278	0.731	0.076*	0.805	0.308	0.064*	0.142	0.041	0.085*
Incivilities	-0.646	2.732	-0.006	-0.222	1.150	-0.005	-0.175	0.152	-0.028
R ²		0.006			0.004			0.011	
F change in R ²		8.683*			6.098*			15.076*	
Tennis Court									
Amenities	0.997	0.867	0.051	0.397	0.259	0.068	0.363	0.165	0.099*
Incivilities	17.155	3.403	0.225*	5.859	1.017	0.255*	2.498	0.647	0.174*
R ²		0.046			0.056			0.029	
F change in R ²		12.799*			16.618*			8.033*	
Track									
Amenities	-1.043	0.963	-0.033	-0.532	0.268	-0.061*	0.164	0.083	0.061*
Incivilities	5.166	7.003	0.023	1.797	1.948	0.028	-0.799	0.603	-0.041
R ²		0.002			0.003			0.006	
F change in R ²		0.978			2.679			3.229*	
Multipurpose Field									
Amenities	0.504	0.665	0.018	0.368	0.203	0.043*	0.098	0.036	0.066*
Incivilities	8.698	3.381	0.062*	2.700	1.034	0.063*	0.627	0.181	0.083*
R ²		0.003			0.002			0.005	
F change in R ²		3.748*			3.466*			6.373*	

*Note. Significant at p -value = <0.05

CHAPTER FIVE: DISCUSSION

Physical activity (PA) is an essential component for positive health outcomes and can significantly add to a person's quality of life. Access to safe and convenient places for people to recreate and be physically active has been positively associated with higher levels of individual and community-wide physical activity (Durant et al., 2009; Spengler, 2010; 2012). Governmental organizations have recommended shared use agreements (SUAs) as a potential combatant to the increasing physical inactivity epidemic in the U.S. For instance, one of the goals stated in the Healthy People 2020 report is to increase the percent of public schools that provide access to PA facilities outside of normal school hours by 10 percent (U.S. Department of Health & Human Services, 2008). Increasingly, communities have called on the creation of SUAs between local organizations and schools to more efficiently use financial and facility resources (CDC, 2014; ChangeLab Solutions, 2010; Institute of Medicine, 2013; Spengler et al., 2011).

One of the purposes of this research is to better inform practitioners and school administrators on the impact of SUA programming as they consider exploring these partnerships as viable options for the future. Although the sharing of public school facilities can provide opportunities for more PA, limited information exists on how active people are when given access to these facilities as well as the contribution that facility quality plays in facility use and PA behavior. Under the Social Ecological Model (SEM), multiple factors including the policy and built environment, play a key role in facilitating active living behaviors (McLeroy et al., 1988; Sallis et al., 2006). This study used the SEM as the guiding

conceptual framework for research on the role of SUAs, facility quality and their relationship to PA.

As previously mentioned, the purpose of this study was to investigate the relationship between shared use agreements (SUAs) and leisure-time physical activity (LTPA) in public school PA facilities. Moreover, the study provided context into how these spaces are being used during after school hours and weekend days, specifically in terms of who uses them and the amount of shared use programming that occurs. This research focused on rural communities spread out across a diverse state. Finally, it examined the influence that facility quality may have on the use of PA facilities and the impact of various amenities and incivilities.

In this chapter, I will discuss and interpret the findings of this study within the framework of previously stated research questions. Furthermore, I will discuss and relate my results to what previous literature in this area of research has reported. I will end by presenting the strengths and limitations of the study, some concluding thoughts, and recommendations for future research.

Underutilization

My first research question asked how much LTPA occurs at school facilities as a result of outside/shared use programs. Previous research that included a survey of all North Carolina public school principals found 89% of schools reported the sharing of their athletic and PA facilities (e.g., playgrounds) with outside groups or individuals (Kanters et al., 2014b). However, although 89% of school facilities were reported as ‘open’ and available to the public (Kanters et al., 2014b), findings from the same sample schools that stated they

shared facilities showed very little after school utilization (87.7% empty). The lack of use was common with nearly nine out of every ten observations resulting in no one using the facility. Findings were similar to those reported by Bocarro et al. (2012) who found that 68% of PA areas observed during their study were vacant. Alternatively, this differed from Lafleur et al. (2013), McKenzie et al. (2010) and McKenzie et al. (2006) who observed 35%, 52%, and 57% empty spaces, respectively. Nevertheless, 87.7% empty observations was a startling discovery and sheds light on the significant amount of underutilization of these PA resources after school hours.

Results showing an average of just over one person per observation was the most telling indication of the overall lack of usage across the sample. The underutilization of school facilities is not a new phenomenon (Bocarro et al., 2012; Cohen et al., 2013) but was unexpected for two reasons. First, many of the schools had general after school open use policies for outdoor facilities, especially during the weekends and over the summer. Second, it was expected that more use by community members would occur during the summer months when school was not in session and the weather was relatively favorable. Facilities are typically not occupied by school sponsored activities and sports in the summer, giving outside groups the greatest access on available, ready to use resources. While previous studies indicate that school facilities go largely unused during the summer (Zimmerman et al., 2013), results of this magnitude were not anticipated. Unlike urban areas, public school resources located in rural settings are often the only convenient option for people looking to access PA conducive facilities. The perception that public schools are ‘off limits’ to the public other than for school-related activities could be a valid reason as to why outside

individuals or organizations are not using these spaces like that of public parks. This leads to other practical questions as to how to better enhance utilization through shared use partnerships during the summer months when the demand for school interscholastic and intramural sports is at its lowest.

More males than females were observed in facilities which coincides with other study findings (Bocarro et al., 2012; Chung-Do et al., 2011; McKenzie et al., 2010). A lower proportion of sedentary behavior was found (45%) sample wide as compared to others (Chung-Do et al., 2011; Cohen et al., 2007). Outdoor tracks were the most consistently used with the lowest proportion of empty observations (75%) and highest average METs (0.86) per observation. Although not much attention has been devoted to the use of school tracks, this supports previous research regarding the importance of accessible trails, tracks, and walking routes within parks (Cohen, Ashwood, Scott, et al., 2006; Sharpe et al., 2004). Knowledge of accessible areas for jogging and walking has been associated with increased odds of meeting PA recommendations (Sharpe et al., 2004). Higher levels of non-school METs have also been associated with walking paths and running tracks for adolescents. The level of PA has doubled if running tracks were within a half-mile of subjects' homes (Cohen et al., 2006).

It can be inferred from this study that outdoor tracks were the most commonly used facility as consistent with other studies. Perhaps the reason being is in the very nature of the facility. Tracks were observed to be rarely locked up and open to the public on most occasions. Additionally, one of the most commonly cited and popular forms of physical fitness is walking/jogging (Weikert, Dlugonski, Balantrapu, & Motl, 2011). An argument

can be made that the most optimal facility for individuals to satisfy personal physical fitness goals at any fitness or age level are outdoor tracks because of the inherent structure they provide for leisurely walking and running (Temple et al., 2011). Lastly, tracks are not conducive to sedentary behavior; the design of the facility encourages moderate to vigorous activity. Hence, the sample of outdoor tracks did not have the most participants across facility types but they did, in fact, have the lowest proportion of sedentary people (25.6). As Brownson et al. (2001) noted, the presence of walking and jogging trails have resulted in increases in PA, similar to the results found in the current research.

Even though baseball/softball fields had almost half of the total participants observed (45%), these facilities had the lowest average METs (0.19) and highest proportion of sedentary people (57.6%). Although people were observed using baseball and softball fields, most were not found to be engaging in optimal MVPA levels, similar to what Bocarro et al. (2012) found measuring METs in various facilities. The findings in baseball/softball facilities almost mirrors that of McKenzie et al.'s results stating that while baseball and softball fields attracted the most users, people in them were frequently sedentary (2010). Prior research has found additional evidence that activities such as baseball and softball facilities are generally associated with lower energy expenditure of participants compared to other athletic/sports fields (Floyd et al., 2011).

Indoor gyms had the highest proportion of empty observations (92%) and one of the lowest in average people observed per observation (0.91). Since gyms were the only indoor facility, this supports previous findings that gyms are harder for people to access during after school hours due to security reasons and liability concerns (McKenzie et al., 2006). Again,

the disparity between baseball/softball field and indoor gym use was consistent with Sallis and colleagues' recent finding (Sallis et al., 2012) along with Bocarro et al. (2012).

Nevertheless, opportunities for formal partnerships with shared use/outside entities exist for indoor facilities. As the data suggests, indoor gyms were the least used and had the highest average facility quality rating.

The findings indicate that regardless of shared use, very little LTPA occurs in schools during non-school hours. A possible explanation for this would be that a ratio of shared use programs to school-based programs may not be a valid measure of how much sharing occurs. No direct conclusions can be drawn here because PA within school-sponsored programs and outside/shared use programs could not be distinguished. However, a possible reason behind such a lack of use that deserves attention is the commonly held belief that public schools are off limits to outside individuals or groups during all hours of the day, not just when school is in session. People's perceptions of schools may be very different from those of public parks in that parks elicit direct and indirect messages of openness and accessibility to everyone. Since the primary purpose of parks is to be available and activity-friendly for all users to participate in LTPA (Spangler & Caldwell, 2007), community members assume that LTPA activities are only allowed in areas designated as public parks. To put it simply, people expect school policy to be prohibitive to non-school affiliated open use of facilities. In rural settings, public school grounds could be significantly closer than the nearest public park and may be the only option to engage in LTPA, but use of these facilities are passed over for fear of trespassing or not knowing that open use of resources is, in fact, permitted.

The Role of Organized Programming

My second research question asked about the relationship between LTPA and shared use. The proportion of shared use programs to school-based programs had no impact on the amount of use observed in schools. However, more profound discussion could be drawn from the relationship of shared use programs to objectively measured PA. Arguably the most meaningful finding from this study was the impact of organized programming as a result of SUAs. The total number of 60 minute shared use program sessions offered at each school had a positive relationship with the number of people recorded and average per person metabolic energy expenditure.

The importance of incorporating programs to improve PA coincides with previous research. Identical to what Kanters et al. (2013) found in 30 middle schools, the amount of afterschool programs was positively correlated with more physical activity. Cohen et al. (2011; 2013) reiterated that the strongest factor associated with the number of METs expended was the number of organized and supervised activities. When activities are organized and formal in nature, more PA can be expected in most recreation facilities (Bocarro et al., 2012; Floyd et al., 2011).

The more shared use programs run by each school facilitated higher numbers of participants and a greater amount of energy expenditure. The emphasis of incorporating programs into SUAs to increase PA has been highlighted in recent studies. As noted earlier, Lafleur et al. (2013) showed that PA as a result of SUAs was higher in school districts where organized sports were offered. When activity in 20 parks in Durham, NC was organized and formal, more PA was observed among children and adolescents (Floyd et al., 2011). More

notably, instituting more organization and structure into existing regularly scheduled youth sport practices has been objectively shown to accommodate more people and at higher PA levels (Kanters et al., 2015).

Program interventions have been found to be effective in prior research, both in parks and schools. With additional program offerings, parks have increased both adult and youth visitors (Sallis, 2012). Programs of low/no-cost have also been recommended for parks near and around low socio-economic status neighborhoods (Mowen & Baker, 2009).

Furthermore, after school PA programs have been shown to increase PA levels while others have not (Pate et al., 2009). Nevertheless, organized programs do play a significant role in engaging people in more PA during afterschool hours, especially for young children and adolescents (Beets et al., 2009, 2013a; Gortmaker et al., 2012). After-school programs are gaining traction in efforts to increase LTPA among youth (Mowen & Baker, 2009).

The current study aligns well with intervention research stating that during program implementation, children experience increases in both PA intensity and participation levels (Gortmaker et al., 2012; Kahn et al., 2010). Programming has been shown to support PA particularly among under-represented groups such as women and girls. In other research in the utilization of recreation facilities, females have been associated with significantly lower levels of PA than boys (Floyd et al., 2011). However, it has been previously established that offering sport programming has increased PA levels among female adolescents (Bocarro et al. 2012). Gender-specific motivational factors exist, especially for youth-aged participants. Boys have been cited as being more attracted to competition and girls are more motivated by the social benefits (Sirard et al., 2006). Organized programming can play a key role in

facilitating both boys and girls PA interests by facilitating competitive elements which are most attractive to boys, and social opportunities which are most attractive to girls. Program offerings is even more critical in rural populations when proximity to recreation facilities is sometimes a major barrier. Parents may need a substantial reason (e.g., a structured after school sports program) to find value in driving their children to and from public school PA facilities.

This study's findings highlights the potential value that additional structured programming has on impacting more people and generating higher levels of PA, regardless of being informal or formally shared. The parks and recreation field has already demonstrated heavy focus on engaging in partnerships and programs and serves as a flagship example of how incorporating outside programming can be sustained. Through synergistic efforts, collaborations that comprise of multi-sector linkages has proved to be mutually beneficial. For example, the National Recreation and Parks Association has actively promoted partnerships between public health and parks and recreation practitioners to promote PA (Spangler & Caldwell, 2007). In a similar way, collaboration could result in expanding the value of public schools as a channel for public-private partnerships to support more PA.

Along with other studies, the current research support recommendations to increase organized activity to increase PA (McKenzie et al., 2006). However, as we know, not all schools and communities are the same. When attempting to provide more accessible facilities through shared use programs, the effectiveness of SUAs are certainly dependent

upon many factors such as the characteristics of the space, location of the school, and the context and needs of the community as a whole.

Facility Quality

My third research question asked about the relationship between LTPA and facility quality and whether or not it differs by the type of facility, quality of amenities, and quality of incivilities. Higher quality facilities were anticipated to receive more usage than lower quality facilities. It can be deduced from the results that overall, this expectation was supported. Without controlling for either variable, overall facility quality was positively associated with METs, participants, and average METs. However, outdoor tracks were the only facility type where METs and participants could not be significantly predicted based on these measures of facility quality. This indicates that the quality of outdoor tracks was inconsequential in determining how many and how active people are in using public school tracks during non-school hours. The quality of amenities was significantly associated with PA across all facility types with the exception of tennis courts.

Generally speaking, outdoor facility use in multipurpose fields, tracks and tennis courts did not differ in regards to incivility levels. In fact, regression results show that as more incivilities were found in an area, the more use it received. This was a counterintuitive finding and one that went against the conventional thinking of poor facilities attract few people and programs previously noted (Lee et al., 2005). For instance, low quality facilities are often characterized as being unattractive, unsafe, and with unusable playing surfaces; all of which are not conducive to large-scale PA programming (Everett-Jones et al., 2003). Though minimal, the number of negative incivilities has increased the likelihood of people

using facilities in parks (McKenzie et al., 2013), which goes against the findings of this study.

Contrary to what has previously been observed in parks, schools are dissimilar in that higher incivilities may actually promote more use. Since the public perception of parks are different than that of schools, the meaning that incivilities have on how a space is used may be different as well. A possible explanation for this phenomenon is that parks are widely known to be free and accessible to the public whereas schools are perceived as having more restrictions to outside users. Therefore, higher incivilities may be a good indicator that public school facilities are being used more often than we think. For example, a field with no grass could mean that lots of people are using the facility and the turf just does not have enough time to recover. One can also infer that the presence of litter is clear evidence that participants were recently in the facility engaged in some form of PA. Higher incivilities in schools may suggest that LTPA *is allowed* and thus encourages more use. But to my knowledge, no empirical research exists that supports this speculation. In sum, the presence of high levels of incivilities had a minimal impact on PA behavior while controlling for amenity quality.

While the presence and quality of incivilities played a mixed role for PA outcomes, the quality of amenities were significant factors in influencing observed number of people and average METs across all facility types with the exception of tennis courts. To review, the nine amenities rated were bike racks, bathrooms, benches, drinking fountain, landscaping effort, lighting, sheltered picnic tables, non-sheltered picnic tables and trash cans. An interpretation of this finding could be that the presence and higher quality of any of these

amenities would attract more outside programs to use the target areas. In terms of large scale shared use programming, the need for many of these amenities such as bathrooms, benches, and trash cans would be necessary and, often times, essential.

It was not surprising to find that facilities with higher quality amenities and fewer incivilities had higher PA rates. In the past, the *quality* of amenities has not had strong correlations with the usage of recreational facilities but the *number* of amenities has been a strong predictor of facility use (Lee et al., 2005; McKenzie et al., 2013). As some researchers have explained, people are naturally drawn to spaces that are aesthetically pleasing and offer high quality amenities to be physically active (Heinrich et al., 2008; Lee et al., 2005). The findings support the notion that, for the most part, well maintained and safe facilities absent of such incivilities like litter and vandalism were important factors in determining people's use of recreational resources (Temple et al., 2011). Multifaceted approaches that couple facility quality improvements and shared use programming are likely needed to ensure that facility use is optimized.

Study Strengths and Limitations

There are several limitations to this research that should be acknowledged. Primarily, this study did not differentiate school-based (interscholastic) PA from outside/shared use programming PA during SOPARC data collection. Other researchers were able to conclude that during times where no programming was underway, all sites were empty (Lafleur et al., 2013). This was possible due to data collectors notating whether an organized activity or program was taking place while simultaneously coding individuals' PA levels. This step was not included in the current study and, to some degree, weakens the link between shared use

and PA. The value and power of the findings from direct observation could have been elevated if participants could have been directly connected back to either a school-sponsored or outside/shared use program.

Second, the small sample size of school sites was a significant limitation. Having only 20 schools participate in the study restricted the strength of the bivariate correlation analysis. Since larger sample sizes yield higher statistical power, having a higher volume of school sites, programs and participants would lower the p-value enough to make more concrete conclusions on shared use ratios. The argument for creating and sustaining SUAs would have been more strongly supported if more school sites were included and additional shared use programming was documented.

Third, this study focused on only a fraction of the built environmental factors that can influence LTPA. As the Social Ecological Model suggests, there are infinitely more influences to behavior that span across the intrapersonal, social, organizational, and physical environment. In the conceptual model proposed by Bedimo-Rung and colleagues (2005), physical activity can be influenced by six built environment factors (features, condition, aesthetics, safety, access, and policies). The present study focused just on the conditions of the target areas. More specifically, this study did not account for the walkability of the surrounding neighborhoods, which has been a point of emphasis for previous research on this topic (Robertson-Wilson et al., 2008; Sallis et al., 2012). For example, street types, sidewalk connectivity, cross walks, and transportation options are all built environmental factors commonly associated with physical activity behavior but not included in this research.

Fourth, this study did not conduct an in-depth analysis of the specific types of amenities and incivilities associated with levels of physical activity. For practicality purposes, knowing which amenities mattered most would have been useful for schools looking to upgrade their facilities to maximize community utilization. Did the presence of lighting have more effect on physical activity than the quality of drinking fountains or bathrooms? Along the same line of thinking, having knowledge as to which incivilities to focus more preventative measures toward would be helpful for anyone involved in maintaining these resources.

Fifth, weekday observations were only conducted on Mondays, Wednesdays, and Fridays. Thus, programming that is regularly scheduled for Tuesdays and Thursdays were not included in the observation schedule. Including these additional days in the sample of observations could have had an impact on findings. Lastly, facility quality was not normally distributed relatively speaking. However, schools have an obligation to keep facilities at optimal levels to serve their student population so we would expect to see higher amenity scores and incivility scores across public schools.

Although similar limitations have been found in previous studies, the current study has several strengths. For one, examining schools located in designated rural areas is the biggest strength of this study and serves as one of the main contributions to the school environment active living research arena. Characteristics associated with rural locations are very different from urban centers. For example, populations located in rural settings experience increased constraints to accessible recreational resources and leisure benefits (Edwards & Matarrita-Cascante, 2011). In addition, public recreation programs and public

leisure spaces are less available in rural areas as compared to urban areas. While a few authors have investigated public school access for LTPA, most all have included schools situated in dense metropolitan areas. This study adds valuable context and insight into the usage of spaces in rural corners of North Carolina not previously explored.

Secondly, observations had very high inter-rater reliability among data collectors. This can be attributed to the investment of time, both in the interviewing and hiring of qualified personnel and intensive training. The sample of school sites was also spread across a diverse state, covering virtually all corners of North Carolina. Not being concentrated in one specific region, county, or school district offers stronger implications for researchers and stakeholders. While previous empirical research has investigated access policies, facility quality and LTPA independently, no studies have examined the relationships among all three together within the same sample of public schools.

As Cohen et al. (2011) stated, as few as 4 observations per day for 3 days is sufficient to accurately estimate PA for the entire week. This study well surpassed this benchmark and offers a robust sample of observations (9,140) in a large sample of schools (20) that can reliably predict facility PA usage. Finally, to my knowledge, this study was the first to pilot test and use the iSOPARC iPad application in the United States. Utilizing available technology such as this reduced the amount of data retrieval and data entry exponentially. iSOPARC was the first generation of systematic observation tools offered that allowed for simultaneous data collection of PA, environmental contexts, and GPS mapping.

Conclusion and Recommendations

Overall, the results of this study suggested that the number of structured shared use programs and facility quality are highly influential factors on PA outcomes. Specifically, the addition of organized programming to existing SUAs coupled with improvements made to amenities could have a profound impact on PA behavior in communities. As SUAs become increasingly more popular (Zimmerman et al., 2013), schools can provide a safe and inexpensive option for people to engage in PA during their leisure time. Some non-school groups feel that public schools have a civic responsibility to allow the sharing of resources to better serve the physical activity opportunity needs of the community (CDC, 2011; Everett-Jones & Wendel, 2015). While SUAs may seem like a quick fix for under-resourced communities (Lafleur et al., 2013; Suminski et al., 2011), there are other factors that may need to be addressed in addition to fostering sustainable shared use partnerships (Stein et al., 2015). Barriers exist not just on the policy level but also within the organizational and physical environment. Based on the results from this study and observations during the process of collecting and analyzing data, several concluding thoughts, follow-up questions, and recommendations for future research can be made.

To reiterate a central question of this thesis, is shared use really enough to get people more active? Results from this study suggest that there is much more needed than just creating a SUA; particularly SUAs that are ‘open’ in nature. Open use policies requiring no formal contractual agreement can be valuable for communities, especially in nonurban areas (Spengler et al., 2011b; Stein et al., 2015). But in some cases, general open use policies during non-school hours may not be sufficient for increasing PA, especially for young

children and adolescents. Along with this research, organized programming has been found to be a major factor in promoting moderate to vigorous physical activity (Cohen et al., 2009; Lafleur et al., 2013). In short, the answer to the question is no, SUAs may not be enough to effectively influence PA behavior just on their own. However, findings suggests that if accompanied by organized and structured programs with the appropriate amount and quality of amenities, SUAs have an increased potential for being highly effective active living strategies.

The facility quality during observations was a key determinant of how many people were in a target area and how much PA ensued. More specifically, the quality of amenities were more significant predictors than incivilities. Again, the general lack of incivilities was not a surprise since public schools have a daily responsibility to maintain safe and adequate facilities for normal student use. However, caution should be taken when attempting to conclude that better amenities and fewer incivilities result in more PA. This is certainly not always the case. For example, does high quality public school facilities (a) attract active people to a place in which they would otherwise not use or (b) increase previous sedentary peoples' PA level? While neither option is mutually exclusive, assuming one to be true over the other based on the results of this study would be pure speculation.

Researchers have found that making improvements to facilities alone will not always guarantee increased use (Brink et al., 2010; Cohen et al., 2009). Still, repurposing old facilities to encourage more PA may be a viable strategy for public schools to consider. Renovating or adding new amenities to recreation and sport facilities can increase use and activity intensity as prior colleagues have suggested (Floyd et al., 2011; Tester & Baker,

2009). As Young et al. (2013) recently pointed out, there are several state policies that incentivize school districts for renovating school facilities for the purposes of shared use concepts. Previous parks studies have even indicated that renovations from new fencing, lighting and turf replacement increases facility use and the number of visitors (Brink et al., 2010; Sallis et al., 2012).

The number of sport and PA facilities constructed or renovated in the United States has increased dramatically during the past 10 to 15 years (Stotlar & Cooper, 2014). In fact, 39% of public schools in the U.S. have plans to perform major repairs, renovations, or modernizations within the next two years (Alexander & Lewis, 2014). The results of this study also leads to questions and issues regarding school siting plans. Opportunities exist for innovative ideas as to how school facilities can be built or renovated to foster more use while also addressing school liability concerns. For example, redesigning indoor gyms where community organizations can gain access to the facility through a secondary entrance while the rest of the school buildings can remain locked and closed. Creating additional access points for the purposes of shared use, especially during the summer months when indoor facilities are barely utilized, can be a viable strategy for communities to consider. During the renovation process, partnerships can help usher in a more modern school design where all members of rural communities can have the opportunity to take advantage of PA facilities.

This study should be replicated with a larger sample of schools and, perhaps, using a pre and posttest research design. An intervention study where SUAs are systematically implemented across a subset of schools would provide added clarity into the utility of partnerships aimed at increasing more usage of facilities. Comparing PA data and types of

programs between control schools and intervention schools before and after shared use would be a valuable contribution to the evaluation of SUAs (Young et al., 2013). Environmental and policy intervention research is not new (Kahn et al., 2010), but an intervention study on this large of a scale would have a tremendous and practical impact in the active living research arena. Moreover, this study recommends additional evidence on the utility of informal open use policies as a form of ‘shared use’ along with others (Hodge, 2015).

Also, data collected on the socio-economic status of the surrounding neighborhood as well as GIS mapping techniques could help shed more light on the usage patterns of these public school facilities. Using GIS-based measures has been described as the most feasible way to objectively measure individuals and neighborhoods dispersed across large areas (Brownson et al., 2009). Future research should attempt to integrate mapping techniques to better understand other environmental variables such as vehicular traffic patterns, crime, side-walk coverage, land-use mix, and population density.

The primary goal of this research is to contribute new knowledge on the impact and context of SUAs and the role of facility quality. The current study can offer guidance on priority areas in terms of what is important when establishing a SUA. While there is value in informal “open use” policies (Hodge, 2015; Stein et al., 2015) findings from this study point to the need for added emphasis for organized programming if the top priority is more efficient utilization of resources and to serve as many people as possible. That is not to say that informal and formal SUAs cannot coexist at the same school, but integrating more program sessions for both options would yield greater impact. Even parks and recreation research has emphasized the value of organized programming through partnerships by stating

that increasing opportunities for people to have lifelong access to resources to pursue a physically active lifestyle would be “insufficient without a deliberate emphasis on programming” (Spangler & Caldwell, 2007). Community stakeholders could follow the blueprint of the parks and recreation field and its successful implementation of outside programs when attempting to engage in SUAs within public schools.

An added benefit to operating a SUA with organized programs is the presence of supervision. Qualified people facilitating and supervising activities run through SUAs can lighten the burden placed on school administration and help ensure both the safety of participants and efficiency in maintaining moderate-to-vigorous PA levels. Furthermore, since outdoor track use is least affected by its level of quality, showed high levels of community use, and is somewhat immune to large-scale deterioration, starting a SUA for tracks may be a smart first step in building a foundation for successful partnerships in the future.

For community stakeholders, especially those leading recreation/sport based organizations, this study provides key insight into the availability of PA resources. The two most commonly cited barriers to schools’ involvement in SUAs have been liability and cost (Spengler et al., 2011b) but more recently principals and athletic administrators overwhelmingly cited the “lack of knowing where to start” as the leading factor into not engaging in SUAs (Kanters et al., 2014b). Therefore, given the abundance of empty facilities observed during after school hours in this study, there is ample opportunity for mutually beneficial partnerships to exist. The biggest opportunity gathered from this study for shared

use programming to be enhanced is in indoor gyms since these were the most underutilized spaces with the highest quality amenities.

The low levels of use for these particular facilities could be in part due to liability concerns of allowing non-school groups access inside schools. However, during summer months, observers consistently recorded comments that indoor gyms were either (a) locked (inaccessible) or (b) being resurfaced/renovated in preparation for the next school year. For organizations running summer recreation or sports camps needing indoor space for PA programming implementation, indoor gyms in public schools can offer a solution while aligning well with the school's academic calendar. Organizations looking to approach public school administration for shared use of indoor gyms should be prepared to enter into a formal SUA and be flexible when schools' attempt to make improvements/repairs to the facility while school is not in session.

Could it be that recent legislation protecting schools from liability concerns (Zimmerman et al., 2013) and the potential revenue generation that SUAs can bring (Filardo et al., 2010) have offset some of the preexisting fears regarding liability and cost? It is recommended that community groups in need of space to facilitate structured programs should more intensely explore avenues of sharing facilities with public schools. SUAs that include terms on the maintenance, upkeep and even addition of new amenities would be even more beneficial to both parties since the quality of amenities was a strong predictor of outside/shared use.

Existing research has only begun to evaluate SUAs and their value to communities (Howard et al., 2013; Young et al., 2013). Increasing the demand for and use of existing

space should be high on the priority list for promoting PA. School facilities have been identified as an important environment to facilitate active people but are only valuable when being used. Opportunities exist to maximize current resources and to “use what we already have”. This study’s findings call for further research into the environmental and policy determinants of PA. SUAs have the potential for fostering more usage designed to increase PA but there are other factors that need to supplement these partnerships (e.g., organized programs and higher quality facilities) if success is to be sustained.

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APPENDICES

Appendix A: Initial Contact Email

November 6, 2013

[Principal's Name],

Earlier this year you or a representative at your school participated in an NC State University and NC Department of Health and Human Services survey of school facility shared use. Based on the results of the survey, your school has been selected to participate in a follow-up study to examine the impact of school facility shared use on physical activity. Participation in this phase of the study will include compensation for you or your school.

This research is part of a statewide initiative sponsored by the NC Department of Health and Human Services and the CDC to positively transform communities by improving access and opportunities for community based physical activity. Your school's participation in this study is vital to this initiative and will provide important information about the relationship between school facility use and physical activity participation.

All data collection will occur after school and will not disrupt any school activities. Procedures will include a brief survey to collect specific information about any structured after school physical activity programs (e.g., sports) and observations of after school programs by trained NC State University staff.

If you agree, we would like to schedule a time to meet with you to provide more specific information about data collection procedures and tour your school's facilities. Within the next two weeks, Troy Carlton, the study's project coordinator, will contact you to answer any questions and to schedule a time to visit your school.

For more information on the N.C. Community Transformation Grant, please visit the website http://www.ncdhhs.gov/pressrel/2011/2011-09-27_NC_awarded.htm. If you have any questions, please contact me or Troy Carlton at tacarlto@ncsu.edu. Thank you and we look forward to working with you to help positively transform North Carolina communities.

Sincerely,
Michael Kanters, Ph.D.
Professor
Parks, Recreation & Tourism Management
NC State University
mkanters@ncsu.edu



Appendix B: School Physical Activity Resource Assessment Tool

SCHOOL - PHYSICAL ACTIVITY RESOURCES AUDIT TOOL (S-PARA)											
1) School/Location											
2) Zone ID						5)Date of audit					
3)Data collector						6)Start Time					
4)School Name						7)End Time					
Feature		Rating ¹				Amenity		Rating			
	Baseball field	0	1	2	3		Bike racks	0	1	2	3
	Basketball courts	0	1	2	3		Bathrooms	0	1	2	3
	Soccer field	0	1	2	3		Benches	0	1	2	3
	Multi-purpose field	0	1	2	3		Drinking fountain	0	1	2	3
	Playground	0	1	2	3		Landscaping effort	0	1	2	3
	Play equipment	0	1	2	3		Lighting	0	1	2	3
	Tennis Court	0	1	2	3		Picnic tables (shelter)	0	1	2	3
	Track	0	1	2	3		Picnic tables (no s)	0	1	2	3
	Indoor Gym	0	1	2	3		Trash cans	0	1	2	3
		0	1	2	3			0	1	2	3
Incivilities											
	Noise	0	1	2	3		Graffiti/tagging	0	1	2	3
	Broken glass	0	1	2	3		Litter	0	1	2	3
	Dog refuse	0	1	2	3		No grass	0	1	2	3
	Dogs unattended	0	1	2	3		Overgrown grass	0	1	2	3
	Evidence of alcohol	0	1	2	3		Sex paraphernalia	0	1	2	3
	Evidence of drugs	0	1	2	3		Vandalism	0	1	2	3
Signage											
	Hours posted	YES	NO				Rules for use	YES	NO		
	Directional	YES	NO				Prohibitions	YES	NO		
	Bilingual	YES	NO				English Only	YES	NO		
							Spanish Only	YES	NO		
School Level Access											
	Sidewalks	YES	NO				Street Type	2lane	4lane	Etc.	
	Cross-walk	YES	NO								
Comments:											

0=not present; 1=poor, 2=fair (mediocre), 3=good (Lee, Booth, Reese-Smith, Regan, & Howard, 2005)

Appendix C: Structured Physical Activity Survey

Structured Physical Activity Survey (SPAS)

Part 1: Structured Physical Activities Operated by School

Name of respondent: _____ Position: _____

Tel: _____ Email: _____

Dates programs surveyed: ___/___/___ to ___/___/___

For office use only: School Name: _____ DC Initials: _____
 Form Code: SPAS-01 Form version: A Evaluation Date: ___/___/___
 QC Initials: _____ Date: ___/___/___ Data Manager: _____ Date: ___/___/___
 Coded by: _____ Date: ___/___/___ Enter by: _____ Date: ___/___/___

Physical Activity Program	Competitive (C ₁) Non-Competitive (NC ₂)	Grade Range	# of Sessions Offered (during 2-wk period)	Start Time	End Time	Avg. # of Minutes <i>per</i> Session	Boys Only (B ₁) Girls Only (G ₂) Co-Ed (CE ₃)	Avg. # of Girls Who Attended <i>per</i> Session (approx)	Avg. # of Boys Who Attended <i>per</i> Session (approx)	School Staff (SS ₁)/Non-Staff (NSS ₂)	Fee-based (FB ₁) Free (FR ₂)
Ex. Basketball	C ₁ NC ₂	7-9	2	12:00 AM PM	1:00 AM PM	60	B ₁ G ₂ CE ₃	9	12	SS ₁ NSS ₂	FB ₁ FR ₂
1.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
2.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
3.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
4.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
5.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
6.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
7.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
8.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
9.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
10.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂

Physical Activity Program	Competitive (C ₁) Non-Competitive (NC ₂)	Grade Range	# of Sessions Offered (during 2-wk period)	Start Time	End Time	Avg. # of Minutes <i>per</i> Session	Boys Only (B ₁) Girls Only (G ₂) Co-Ed (CE ₃)	Avg. # of Girls Who Attended <i>per</i> Session (approx)	Avg. # of Boys Who Attended <i>per</i> Session (approx)	School Staff (SS ₁)/Non-Staff (NSS ₂)	Fee-based (FB ₁) Free (FR ₂)
11.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
12.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
13.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
14.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
15.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
16.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
17.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
18.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
19.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂
20.	C ₁ NC ₂						B ₁ G ₂ CE ₃			SS ₁ NSS ₂	FB ₁ FR ₂

Structured Physical Activity Survey (SPAS)

Part 2: Structured Physical Activities Operated by Outside Community Agency/Group

Name of respondent: _____ Position: _____ Tel: _____ Email: _____

Dates programs surveyed: ___/___/___ to ___/___/___

Physical Activity Program & Administering Agency/Group	Competitive (C ₁) Non-Competitive (NC ₂)	Age Range	# of Sessions Offered (during 2-wk period)	Start Time	End Time	Avg. # of Minutes <i>per</i> Session	Boys Only (B ₁) Girls Only (G ₂) Co-Ed (CE ₃)	Avg. # of Girls Who Attended <i>per</i> Session (approx)	Avg. # of Boys Who Attended <i>per</i> Session (approx)	Community Staff (CS ₁)/School Staff (SS ₂)/Other (O ₃)	Fee-based (FB ₁) Free (FR ₂)
Ex. Basketball - YMCA	C ₁ NC ₂	9-10	2	12:00 AM PM	1:00 AM PM	60	B ₁ G ₂ CE ₃	9	12	CS ₁ SS ₂ O ₃	FB ₁ FR ₂
1.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
2.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
3.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
4.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
5.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
6.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
7.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
8.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
9.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
10.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	

Physical Activity Program & Administering Agency/Group	Competitive (C ₁) Non-Competitive (NC ₂)	Age Range	# of Sessions Offered (during 2-wk period)	Start Time	End Time	Avg. # of Minutes <i>per</i> Session	Boys Only (B ₁) Girls Only (G ₂) Co-Ed (CE ₃)	Avg. # of Girls Who Attended <i>per</i> Session (approx)	Avg. # of Boys Who Attended <i>per</i> Session (approx)	Community Staff (CS ₁)/School Staff (SS ₂)/Other (O ₃)	Fee-based (FB ₁) Free (FR ₂)
											FB ₁ FR ₂
11.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
12.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
13.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
14.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
15.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
16.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
17.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
18.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
19.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂
20.	C ₁ NC ₂						B ₁ G ₂ CE ₃			CS ₁ SS ₂ O ₃	FB ₁ FR ₂

Part 3: Inventory of Physical Activity Facilities

What spaces in the school can be used for physical activity?

Facility	Location: Indoor (I) or Outdoor (O)	Facility Quality: Excellent (E); Moderate (M); Poor (P)	Programs from Part 1 that occur at facility (use Row # as program code)	Notes
Example: Gymnasium	I1 O2	E1 M2 P3	1, 3, 6	Includes bleachers & bathrooms with option for outside access only.
1.	I1 O2	E1 M2 P3		
2.	I1 O2	E1 M2 P3		
3.	I1 O2	E1 M2 P3		
4.	I1 O2	E1 M2 P3		
5.	I1 O2	E1 M2 P3		
6.	I1 O2	E1 M2 P3		
7.	I1 O2	E1 M2 P3		
8.	I1 O2	E1 M2 P3		
9.	I1 O2	E1 M2 P3		
10.	I1 O2	E1 M2 P3		
11.	I1 O2	E1 M2 P3		

Appendix D: Informed Consent Form for Research

North Carolina State University
INFORMED CONSENT FORM for RESEARCH

Title of Study: Community Transformation Grant: Joint Use Agreements of Public Schools

Principal Investigators: Michael Kanters

Thank you for agreeing to participate in this research study and spending the time to complete this survey. The purpose of this study is to understand the effectiveness of sharing school facilities in providing physical activity opportunities.

INFORMATION

If you agree to participate in this study, you will be asked to sign this consent form and complete a written survey.

RISKS

There are no foreseeable risks or discomforts, associated with the procedures to be used in the study.

BENEFITS

There are no predetermined direct benefits to be gained by participating in this study. The indirect benefit is that you are contributing to the knowledge which could benefit managers and future users of this and other artificial adventure recreation facilities.

CONFIDENTIALITY

The information in the study records will be kept strictly confidential. Data from completed paper surveys will be entered by the researcher and the original survey will be stored in a locked room. Upon completion of the study they will be destroyed. All personal and identifying information will be kept confidential. No individual data will be reported and no reference will be made in oral or written reports which could link you to the study.

COMPENSATION

\$100 *VISA* gift card

CONTACT

If you have questions at any time about the study or the procedures, you may contact the researchers, Dr. Michael Kanters, at mkanters@ncsu.edu, or 919-513-0279 or Dr. Jason Bocarro at jnbocarro@ncsu.edu, or 919-513-8025. This research study has been reviewed and approved by the Institutional Review Board for the Use of Human Subjects in Research. For research-related problems or questions regarding subjects' rights, the Institutional Review Board may be contacted through Deb Paxton, Regulatory Compliance Administrator, Box 7514, NCSU Campus (919/515-4514) or Mr. Matthew Ronning, Assistant Vice Chancellor, Research Administration, Box 7514, NCSU Campus (919/513-2148)

PARTICIPATION

You must be 18 years of age or older to participate in this study. Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be destroyed.

CONSENT

"I have read and understand the above information. I have received a copy of this form. I agree to participate in this study with the understanding that I may withdraw at any time."

Subject's signature _____ Date _____

Investigator's signature _____ Date _____

Appendix E: IRB Informed Consent Form

North Carolina State University is a land-grant university and a constituent institution of The University of North Carolina

**Office of Research
and Graduate Studies
Division of Research Administration**

NC STATE UNIVERSITY

Sponsored Programs and
Regulatory Compliance
Campus Box 7514
2701 Sullivan Drive
Raleigh, NC 27695-7514

919.515.2444
919.515.7721 (fax)

From: Debra Paxton, IRB Administrator
North Carolina State University
Institutional Review Board

Date: December 16, 2013

Project Title: Physical Activity and Shared Use of School Facilities Project

IRB#: 3672

Dear Michael Kanters,

The project listed above has been reviewed by the NC State Institutional Review Board for the Use of Human Subjects in Research, and is approved for one year. **This protocol will expire on 12/11/2014 and will need continuing review before that date.**

NOTE:

1. You must use the attached consent forms which have the approval and expiration dates of your study.
2. This board complies with requirements found in Title 45 part 46 of The Code of Federal Regulations. For NCSU the Assurance Number is: FWA00003429.
3. Any changes to the protocol and supporting documents must be submitted and approved by the IRB prior to implementation.
4. If any unanticipated problems occur, they must be reported to the IRB office within 5 business days by completing and submitting the unanticipated problem form on the IRB website.
5. Your approval for this study lasts for one year from the review date. If your study extends beyond that time, including data analysis, you must obtain continuing review from the IRB.

Sincerely,



Debra Paxton
NC State IRB