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Urban Park Systems:
A Conceptual Model of How Low Accessibility to Parks Can Create Obesity

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An abstract of
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Abstract

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The characteristics of urban parks function as influential factors in physical activity behavior by place (neighborhoods) and by person (park user). Examining the relationship of the neighborhood and park user is instrumental to identifying barriers to increased physical activity. A conceptual model is proposed using two key dimensions of access that are important to understanding parks in the neighborhood environment: availability and proximity. Both dimensions are shown to be associated with increased park use and physical activity levels. The prevalence of people participating in some kind of outdoor recreation in the U.S. continues to be high. Unfortunately, an overwhelming portion of park users exhibit sedentary behaviors when in parks. Disparities in health related resources, such as parks, among urban populations are documented and show spatial clustering of resources by race and ethnicity. Accessibility of parks and park services predict park visitation, the first requirement of increased park-based physical activity. Building on the evolution of park design, structural park characteristics within parks are integral to increasing physical activity levels among park users.

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Chapter 1

Health and Physical Activity

Obesity in America

The issue of obesity dominates discussions of improving health in the United States. Studies on national media not only explore the increase in number of stories on obesity, but also the manner in which the media frames exposure and risk of obesity to the individual. Kim and Willis (2007) analyzed newspaper articles and television news reports from 1995 to 2004 to chart the considerable rise in obesity coverage by national and regional news outlets. Although the increased coverage had significant implications for integrating obesity into the national dialogue, the authors concluded that the presentation of these reports might have had a more important impact. The juxtaposition of root causes of obesity and targeted solutions was clear: larger, societal forces underscore the cause of obesity, but responsibility for solving obesity falls to the individual (Kim and Willis 2007). For example, the food industry was cited in 15% of reports on obesity as a cause, yet only 6% of reports highlighted food regulations as possible policy solutions (Kim and Willis 2007). Judging by the news media, solutions to conquering obesity emphasized an individual's responsibility twice as much as compared to societal roles (Kim and Willis 2007). Before further examining the issue of obesity in America, it is important to first define obesity, and then illustrate the explosion in the number of overweight and obese Americans that has occurred in the past two decades.

What does it mean to be overweight or obese? In the simplest sense, weight gain is the input and output of energy that results in an excess of retained energy (Church, Thomas et al. 2011). Excessive weight gain ultimately classifies the individual as

overweight or obese. According to the Centers for Disease Control and Prevention, overweight and obese are two classifications of health status that indicate a range of excessive weight, measured by body fat, for given heights (CDC 2010). The Body Mass Index (BMI), calculated by the weight (in kilograms) divided by height (meters squared) of an adult (20 years or older), generally correlates with the amount of body fat for an individual.[1] Current classifications for adults stipulate a BMI between 25.0 and 29.9 classifies as overweight, and 30 and above classifies as obese (1998). Following those guidelines, obesity can be further categorized into three ranges of BMI: 30 to <35 (grade 1), 35 to <40 (grade 2), and >40 (grade 3). For example, an adult measuring 5'9'' (69 in.) would have a BMI of 35 if he weighed 236 lbs (NHLBI 2012).For children (aged 2 to 19 years) the calculation is more complicated, but ultimately assesses the BMI of the child along with a BMI-for-age percentile based on the CDC BMI growth chart (CDC 2010). According to the CDC growth chart (CDC 2011), children can be classified by one of four weight status categories: Underweight (< 5^{th} percentile), Healthy Weight (5^{th} to less than 85^{th} percentile), Overweight (85^{th} to less than 95^{th} percentile), and Obese (equal to or greater than the 95^{th} percentile). The complexity of the processes that produce weight gain extends beyond the classification of weight and introduces the broader problem of obesity in America.

In recent decades, the prevalence of obesity has skyrocketed to historic levels for families, communities, and the health care system. The alarming rise in prevalence of

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[1] The accuracy of using BMI to measure body fat is not universally accepted, but is not a topic for discussion here.

obesity in the United States has been thoroughly documented using national health surveys for several decades now (Flegal, Carroll et al. 1998). Studies utilize the National Health and Nutrition Examination Survey (NHANES) and the Behavioral Risk Factor Surveillance System (BRFSS) to investigate population-level trends in obesity (Flegal, Carroll et al. 1998; Flegal, Carroll et al. 2010; Pan, Freedman et al. 2011). The NHANES and BRFSS both are CDC surveillance systems. Begun in 1960, the NHANES is a cross-sectional nationally representative survey administered by the National Center for Health Statistics (NCHS). The BRFSS, the world's largest on-going telephone survey, has collected monthly data on health conditions and risk factors in all 50 U.S. states, the District of Colombia, and U.S. territories since 1984. The longitudinal data from these national surveys facilitates a deeper understanding of the trends in obesity: the growth in prevalence, socio-demographic dimensions, and the current status of obesity in America.

Recent history illustrates major changes in the prevalence of obesity, but prevalence was relatively stable for many years. Obesity levels showed very little change between 1960 and the 1976-1980 NHANES survey, which reported an 8% increase in prevalence (Kuczmarski, Flegal et al. 1994). Prevalence continued to increase in subsequent years, and has more than doubled since then (Flegal, Carroll et al. 1998). From 1976-1980 to 1988-1994 obesity prevalence increased by 7.9% (men) and 8.9% (women); from 1988-1994 to 1999-2000 obesity prevalence again increased 7.1% (men) and 8.1% (women) (Flegal, Carroll et al. 2010). Beginning in 2000, smaller increases in prevalence occurred, although researchers claim this does not indicate a leveling off (Flegal, Carroll et al. 2012). Obesity prevalence may not be climbing at the previous

speed, but the problem remains in the large percentage of the population currently classified as overweight or obese.

In 2010, more than 78 million American adults (35.7%) and nearly 12.5 million children and teenagers (17%) were obese (Flegal, Carroll et al. 2012). Although recent incidence and prevalence changes may not be significant at a population-level, subsets of the population are dramatically affected. BRFSS data demonstrate a wide variation in the distribution of the overweight and obese population. For example, the adult obesity prevalence of 36% (95% CI, 36.4 – 37.4) in Mississippi represents a stark contrast with Colorado's level of 19.7% (95% CI, 18.7 – 20.7) during 2009 (Median (across 50 states) 28%; 95% CI, 19.7 – 36.0) (Li, Balluz et al. 2011).

The variation in prevalence is not exclusive to geography. There are significant sociodemographic differences as well. As mentioned, trends between men and woman were very similar up until the year 2000. From 2000 to 2008, slight increases in prevalence occurred among men, but no significant changes occurred among women (Flegal, Carroll et al. 2010). Recent figures (from 2009-2010) report age-adjusted prevalence of obesity and age-adjusted mean BMI for men as 35.5% (95% CI, 31.9% - 39.2%), and 28.7 (95% CI, 28.3 – 29.1), respectively. The age-adjusted prevalence of obesity was 35.8% for women (95% CI, 34.0% - 37.7%), with age-adjusted mean BMI of 28.7 for women (95% CI, 28.4 – 29.0) (Flegal, Carroll et al. 2012). Although obesity prevalence is similar among men and women overall, gender break outs across racial and ethnic subpopulations are varied.

Men tend to show less variation in obesity prevalence by race than do women. The most recent reports show overall age-adjusted obesity prevalence for non-Hispanic White men was 36.2% (95% CI, 31.8% - 40.8%) as compared with 38.8% (95% CI, 33.9% - 43.9%) for non-Hispanic Black men (Flegal, Carroll et al. 2012). The contrast is more pronounced among women, however, with age-adjusted obesity prevalence for non-Hispanic Whites at 32.2% (95% CI, 29.2% - 35.3%), and 58.5% (95% CI, 52.4% - 64.3%) for non-Hispanic Blacks (Flegal, Carroll et al. 2012). Clearly, the obesity epidemic affects demographic groups differently. Noting that certain populations are disproportionately affected by obesity does not address causation. Investigating differences in behavior across populations sheds further light on the complexity of obesity and its differential effects on the American population.

It seems axiomatic that increases in BMI would indicate an increase in obesity prevalence. If containing BMI is a measure for preventing obesity, the issue then focuses on influences on BMI levels. In 2009, the overall crude incidence of adult obesity was 4%, but the variation of incidence was profound across socio-demographic groups after controlling for baseline BMI (Pan, Freedman et al. 2011). Pan and colleagues (2011) analyzed data from the 2009 BRFSS to examine the incidence of obesity and its association with selected socio-demographic characteristics. For example, incidence of obesity was significantly highest (6.4%) among younger adults (18-29) even though their prevalence was very low (Pan, Freedman et al. 2011). Furthermore, women, non-Hispanic Blacks, and Hispanics all reported higher incidences of obesity. Most importantly, however, factors such as

education and geography revealed critical implications for obesity. Incidence of obesity among those with less than a high school education level (5.1%) was nearly twice that compared to those with a college degree (2.9%) (Pan, Freedman et al. 2011). Living in the South was significantly associated with an increased incidence of obesity (4.3%) versus living in the West (3.8%) (Pan, Freedman et al. 2011). These results underscore the variation of obesity in America.

Although these results highlight disparities in the population, physical activity is a consistent factor in decreased obesity prevalence. Adults reporting participation in any leisure-time physical activity represented a 30% decrease in incidence of obesity (Pan, Freedman et al. 2011). Additionally, there is greater percentage of normal weight adults engaged in physical activity compared with obese adults (CDC 2008). If participation in leisure-time physical activity has such a demonstrable association with reduced obesity, why is the population increasingly sedentary?

What is Physical Activity?

The seemingly congruous terminology of physical activity and exercise is understandable, but worthy of differentiation. How can an individual properly strive to meet recommended levels of physical activity if he or she is unaware of

what defines active? How is a person capable of modifying daily behavior to incorporate more exercise in their life if the potential improvements are minor? These questions support the distinction of terms. Physical activity is generally thought to describe the body movement that increases energy expenditure ultimately improving health (Brownson, Boehmer et al. 2005). However, exercise also aims to increase energy expenditure. The difference resides in that exercise, a category of physical activity, is a planned movement executed for the purposes of maintaining or improving the components of physical fitness. The organized and repetitive movement performed in exercise enhances the components of physical fitness, which improve one's competency to perform physical activity (Caspersen, Powell et al. 1985; HHS 2008).

While the general descriptions of physical activity and exercise seem relatively open-ended concepts, operationalizing physical activity for an individual is more refined. Recommendations by HHS suggest at least 60 minutes per day engaged in either moderate- or vigorous-intensity physical activity for children, and 150 (moderate) to 75 minutes per week for adults (HHS 2008). These recommendations include aerobic physical activity as the majority of the time, but also bone and muscle strengthening each for 3 days a week. Running, swimming, and bicycling are some examples of aerobic activity. Bone and muscle strengthening are more targeted behaviors that exert greater force on the bone and muscle beyond usual daily activities. The total weekly amount of aerobic physical activity can be classified into four categories (Inactive, Low, Medium, High), in which a Medium

level indicates meeting the recommended level of moderate-intensity physical activity (HHS 2008). Measuring the intensity of activities is done by calculating metabolic equivalents (METs), which represents the ratio of energy expended during an activity when compared with energy expended at rest. Moderate-intensity activities can be quantified as 3.0 to 5.9 METs. This metric has no practical utility for most individuals measuring physical activity. As an everyday guideline, moderate-intensity activity can be thought of as 5 or 6 times (scale of 0-10) the capacity of the individual when at rest (HHS 2008). How a person expends this energy often not only depends on the desire of the individual, but the space for physical activity.

Increased Sedentary Lifestyles

With physical activity level an influential factor on obesity incidence, the trends in physical activity levels are an important first step in examining the increasingly sedentary lifestyle of Americans. Physical inactivity is one component of a sedentary lifestyle. The increases in physical inactivity are best characterized by changes in daily behavior that do not exert energy to optimize health. Where physical activity is the bodily movement expending energy for health benefits, sedentary lifestyle is the opposite. The rise in physical inactivity is a result of a myriad of cultural changes, such as recreational and occupational physical activity.

For example, recent history presents a noteworthy change in the professional landscape that includes more sedentary behavior (Church, Thomas et al. 2011). Occupation-related physical activities shifted with the change in the labor force. In addition, the built environment represents a host of social factors that contribute to an increased sedentary lifestyle. Urban sprawl is one element in the changing design of physical space that has contributed to modified daily physical activity (Ewing, Schmid et al. 2003). The general trends in physical activity show an increasingly sedentary population, characterized by higher rates of physical inactivity across socio-demographic groups.

Trends in physical activity rates suggest that the U.S. is increasingly becoming a sedentary population. Although prevalence of obesity is low for younger adults, the significantly high incidence for this group indicates a critical window of opportunity for intervention. In 2001, 24.2% of male and 37.9% of female high school students were categorized as inactive (Brownson, Boehmer et al. 2005). Inactivity levels rise with grade level, but the general trend in inactivity seems to be relatively stable over time. These trends suggest that the onset of inactivity during high school foreshadows the spike in obesity incidence that occurs among young adults. Similarly, research shows that physical activity among children and adolescents decreases with age, indicating an increasingly sedentary lifestyle fostered in adolescence (Belcher, Berrigan et al. 2010; Gortmaker, Lee et al. 2011). In one study on children, time spent in Moderate to Vigorous Physical Activity (MVPA) decreases from 88 minutes per day (among 6- to 11-year olds) to

26 minutes per day (16- to 19-year olds) (Belcher, Berrigan et al. 2010). Another study found that MVPA among children aged 9 to 15 decreased on weekdays and weekends by 37 minutes per year and 39 minutes per year, respectively (Nader, Bradley et al. 2008). The decreases in weekday and weekend time spent physically active represents the effect of no increased time in physical education (PE) classes and more—of their free—time watching television (Lowry, Lee et al. 2009).

Decreases in physical activity are evident across the board, but the changes among gender and race present a case for disparities in physical activity. There is a significant gender gap when measuring MVPA, as males report spending more minutes per day engaged in MVPA than females (Brownson, Boehmer et al. 2005; Belcher, Berrigan et al. 2010; Gortmaker, Lee et al. 2011). More alarmingly is the potential origin of racial disparities in physical activity levels during adolescence. In a report on children ages 6 to 11, only non-Hispanic White children significantly increased the reported minutes per day engaged in MVPA over a three year period, while the physical activity of all other races decreased (Gortmaker, Lee et al. 2011). If these decreases in physical activity begin during childhood and adolescence it is very clear that insufficient physical activity levels persist into adulthood.

Since 2000 there have been only modest gains in physical activity level among U.S. adults, and almost half of adults continue to report not reaching the recommended physical activity level set by the CDC. The number of adults meeting the recommended physical activity levels increased from 45.3% in 2001 to 48.8% in

2007 (CDC 2010). More specifically, from 2001 to 2005 the prevalence of physical activity among males and females increased by 3.5% and 8.6%, respectively (CDC 2007). Although these results from the BRFSS suggest a moderate increase in adults engaging in physical activity, data from another national survey contradicts the trend. Measuring the same time period (2000-2005), the National Health Interview Survey found that leisure-time physical activity actually decreased among males and did not change among women (CDC 2007). Regardless of the contradiction, the evidence clearly supports the fact that the number of adults meeting the recommended physical activity level is insufficient.

Physical activity trends among adults introduce a more targeted problem in the U.S. The slight increases when examined by race suggest an unequal gain among non-Hispanic Whites. In 2007, the prevalence of physically active adults was higher among non-Hispanic Whites (67.5%) than non-Hispanic Blacks (56.5%) (CDC 2008). Similar to previously mentioned trends in obesity, prevalence of physical activity has strong associations with education level and geography. As for education levels, BRFSS data from 2007 show that the prevalence of physical activity among adults with a college degree (70.3%) is far higher than those without a high school diploma (52.2%) (CDC 2008). Using the same data, adults in the South represented the lowest prevalence (62.3%) of physical activity, while those in the West had the highest prevalence (67.8%) (CDC 2008).

It should not go without saying that the prevalence of physical activity and obesity are connected. An individual engaging in physical activity will increase the number of calories expended, and decreasing the excess calories will support maintaining a healthy weight. Regular physical activity, and a healthy weight, are factors associated with decreased risk for obesity (CDC 2011). Fewer adults classified as obese engage in physical activity (57.1%) than normal weight adults (68.8%) (CDC 2008). But the increased sedentary lifestyle extends beyond decreased physical activity prevalence and is also a result in the changing work place that occupies a large majority of the day for most adults.

The shift in daily physical activity behavior among adults is highly reflective of the evolving professional landscape. In the past decades, the U.S. labor force has shifted from a goods producing economy to more of a service-based economy. Between 1960 and 2008, the percentage of the private sector work force in manufacturing shrank from over 30% to roughly 12% (Church, Thomas et al. 2011). Transitioning from a goods producing economy meant changes to the physical activity levels required of occupations. In the past fifty years, occupations classified as sedentary or light intensity increased, while moderate intensity occupations decreased. Whereas the prevalence of moderate intensity occupations was 48% in 1960, that number dwindled to barely 20% by 2008 (Church, Thomas et al. 2011). What effect did the slow reduction in moderate intensity occupations have on the physical activity of the average worker?

Changes in occupation-related physical activity meant new daily demands on the worker. Daily occupational habits manifested into a decrease in energy expenditure by the average adult. By some estimates, the increasingly sedentary occupations resulted in a loss of over 100 calories from occupation related daily energy expenditure for men and women (Church, Thomas et al. 2011). The loss in daily energy expenditure resulted from sedentary occupations that involved, among other things, more sitting and less lifting. In 2005, 39.9% of adults spent the majority of their day sitting, and 29.5% reported no lifting (Barnes 2010). The technological advances that revolutionized the labor force not only made occupations less labor intensive, they also reduced labor demands in our personal lives.

Reducing high activity occupations has had an accumulated effect on daily expenditure of calories. However, these effects also extended beyond the work place. Urban sprawl, as this phenomenon is commonly known, characterizes changes in the urban form as it shapes the built environment. Studies on urban sprawl posit that changes in the built environment have health implications because elements no longer require many of the previous physical activity behaviors. One example of changes in physical activity due to urban sprawl is the behavior of walking. Built environment analysis illustrates how urban sprawl reduces minutes walked by an individual. Increased urban sprawl at the metropolitan and county level predicts a decrease in the number of minutes walked by an individual (Ewing, Schmid et al. 2003). Decreasing time spent walking further supports the increasing

trends in sedentary lifestyle. Adults are increasingly utilizing automobiles to cover the distances resulting from urban sprawl. In fact, daily vehicle miles traveled (VMT) increased by 0.4 miles per year, amounting to a 200% change between 1960 and 2000 (Brownson, Boehmer et al. 2005). This means increased time spent in an automobile, with adults filling an average of 55 minutes per day in a car that previously represented time potentially spent physically active (Brownson, Boehmer et al. 2005). The urban sprawl effect is definitely a factor in decreasing physical activity levels, which results a more sedentary lifestyle. But, what are the ultimate costs of the increasingly sedentary lifestyle?

Costs of Disease

Obesity has a significant effect on diseases. Obesity dramatically increases the risk for many health conditions, such as cardiovascular disease, diabetes, and mental health issues (CDC 2011). Risk factors, such as obesity, for cardiovascular disease that begin in childhood are predictive of future health complications, and even premature death (Berenson 2012). Cardiovascular disease, which includes heart disease and strokes, is the leading cause of death in the United States (Berenson 2012). The CDC (2010) estimates that 1 in 3 U.S. adults live with at least one type of cardiovascular disease, and 935,000 heart attacks and 795,000 strokes occur annually. Furthermore, mental health problems are associated with obesity. A nationally representative study found overweight youth (12 to 17 years old) were more likely to report anxiety, feelings of inferiority, and bullying compared with

their nonoverweight peers (BeLue, Francis et al. 2009). Low physical activity, which is associated with increased risk for obesity-related disease, such as diabetes (Telford 2007), also has an adverse impact on mental health (Penedo and Dahn 2005).

The increasingly sedentary lifestyle, and rise in obesity prevalence have increased health care spending in America. Estimations show that obesity-related spending accounted for 10% of all medical spending in 2008, totaling nearly $150 billion (Finkelstein, Trogdon et al. 2009). Medical spending on obesity could be curtailed if improvements in physical activity levels are realized. In an analysis of California, researchers conclude that a 5% improvement in physical activity levels would amount to $6 billion in savings over a five year period, while a 10% improvement would equal $13 billion in savings over the same five years (Chenoweth 2005).

Chapter 2

Healthy Places, Healthy People

For much of the past 50 years, public health research has typically focused on the individual, and attempted to explain health outcomes as a result of purely individual-level factors (Macintyre, Ellaway et al. 2002). Focusing exclusively on individualized explanations has the potential to marginalize environmental factors that can have substantial influence on the individual. Recent research has concentrated "upstream" to investigate origins of health inequalities (Macintyre, Ellaway et al. 2002). Obesity research can benefit from this focus on causes of poor health. Although overall obesity levels have increased in recent years, there is wide variation in obesity prevalence by geographic and socio-demographic variables (Flegal, Carroll et al. 1998; Flegal, Carroll et al. 2010; Li, Balluz et al. 2011; Flegal, Carroll et al. 2012). An individual-level analysis of obesity would suggest that a person gains weight exclusively because of a series of choices. In fact, environmental influences are significantly associated with obesity and physical activity levels (Giles-Corti and Donovan 2002; Ewing, Brownson et al. 2006; Zick, Smith et al. 2009; Feng, Glass et al. 2010). Limiting the understanding to individual determinants of obesity places an unjust weight on the individual.

Increased physical activity levels are proven to be associated with lower BMIs and reduced risk for obesity across demographic variables (Pan, Freedman et al. 2011). This would suggest that increasing physical activity is one strategy to

combat obesity. Increasing physical activity levels at a purely national scale, however, overlooks the nuances of neighborhood and community health. Unfortunately, defining what constitutes a neighborhood is much more complicated than a five-digit zip code or a point on the map. Once defined, the characteristics of a neighborhood are helpful for exploring the health of residents beyond their individual-level attributes (Caughy, O'Campo et al. 2001). Additionally, the neighborhood environment includes physical and social influences on behavior that can have an effect on physical activity levels and obesity (Giles-Corti and Donovan 2002; Giles-Corti, Macintyre et al. 2003). Defining neighborhood characteristics creates an understanding of urban form, and built environment that are associated with physical activity and obesity (Ewing, Brownson et al. 2006; Zick, Smith et al. 2009; Feng, Glass et al. 2010). The focus of this chapter is to address the conceptualization of neighborhoods, the influence of neighborhoods on obesity, and how the built environment impacts physical activity levels.

Neighborhoods and Health

Understanding what defines a "neighborhood" lies at the heart of understanding neighborhood health effects. The relationship between neighborhoods and health describes how the environment shapes health outcomes, such as obesity. Investigations of health effects primarily favor environmental

interpretations because determinants of disease and social inequalities elude individual-level explanations (Diez Roux, Evenson et al. 2007). Individual determinants of health are criticized because they fail to incorporate environmental influences that are vital to the person-place interaction (Giles-Corti and Donovan 2002). Environmental, or place, effects on individual and community health are generally examined by neighborhoods (Caughy, O'Campo et al. 2001). The historical relationship between health and neighborhoods is traced by trends in urbanization, and the emergence of a social contextual framework for analyzing society.

Awareness of a connection between the environment and health dates back hundreds of years, but the increasing urbanization during Industrialization aptly illustrates neighborhoods as they relate to the study of health (Macintyre and Ellaway 2003). Industrialization in Britain and America was accompanied by an intensifying public health focus in growing cities that was largely a response to social and health problems of urbanization (Fee and Porter 1992). Public health practitioners at the time pioneered analyses of aggregate-level data to investigate patterns of mortality among the increasingly urban population. Linking items such as birth and death registrations with census data, researchers began to parse through the crude mortality numbers and ascertain social discrepancies in disease (Macintyre and Ellaway 2003). The critical revelation in this work was the larger social inequalities in the distribution of disease that significantly affected the lower income population. Edwin Chadwick famously published a study that detailed how

neighborhoods associated with lower income families had shorter life spans (Macintyre and Ellaway 2003).

Differences in disease patterns are well documented, and the connection between social inequalities has long been an important element of public health. As health professionals advanced elegant methods for mapping disease, the contextual role of disease gained prominence (Macintyre and Ellaway 2003). Origins of disease fell to a social question of whether the environment produces disease (Contextual), or if disease is a result of the type of person in the environment (Compositional) (Macintyre, Ellaway et al. 2002; Macintyre and Ellaway 2003). This idea postulates that contextual variations in health represent differences between places, whereas compositional variations are those differences of people within a place. Between the 1950s and 1990s, the dominant social construction of the individual in society dichotomized causes of disease: chronic disease was attributed to individual lifestyle decisions, while environmental explanations were used for infectious disease transmission (Macintyre and Ellaway 2003). Relegating disease origin to lifestyle choices, a purely compositional explanation, neglects the environmental influence on behavior. However, the contextual role eventually superseded this individualism to become an important perspective on health and the environment (Diehr, Koepsell et al. 1993; Diez Roux 2001).

The conceptualization of a neighborhood identifies social and physical features of the local environment that have the potential to impact health outcomes.

Although neighborhoods are considered an appropriate proxy for characterizing an area, demand still exists for improved theoretical and methodological connections between neighborhoods and health outcomes (Caughy, O'Campo et al. 2001; Diez Roux 2001; Macintyre, Ellaway et al. 2002; Macintyre and Ellaway 2003). Creating a multilevel framework positions an individual within the place, and subsequently examines the ascribed social and physical world. Macintyre, Ellaway, and Cummins (2002) describe their contextual conceptualization of a neighborhood by five features that cover the social and physical environment: Physical features shared by all residents in a locality; Availability of healthy environments at home, work and play; Services provided, publicly or privately to support people in their daily lives; Socio-cultural features of a neighborhood; and The reputation of an area.

Contextual Influences on Obesity

Although the majority of previous research on obesity has focused on the individual-level, growth in contextual analysis broadened the understanding of environmental effects on obesity (Giles-Corti and Donovan 2002; Ewing, Brownson et al. 2006). Since increased risk for obesity is associated with decreased physical activity levels (Pan, Freedman et al. 2011), physical activity is one method for reducing obesity. The social and physical environment included in the

conceptualization of a neighborhood applies to the study of contextual influences on obesity as well.

Access to physical activity resources, like parks and recreational services, is a widely recognized influence of the contextual environment on obesity (Giles-Corti and Donovan 2002; Li, Fisher et al. 2005; Gordon-Larsen, Nelson et al. 2006). Generally, accessibility is a measure of the distribution of resources in a spatial area that includes proximity, and means of transport (Giles-Corti and Donovan 2002). Physical environmental factors, such as proximity, can have an effect on obesity. The closer people live to physical activity resources like parks and recreational facilities, the more likely they are to utilize the resources and engage in higher levels of physical activity (Cohen, Ashwood et al. 2006; Kaczynski, Potwarka et al. 2009).

Changes in the built environment can have an effect on physical activity (Catlin, Simoes et al. 2003; Ewing, Schmid et al. 2003; Giles-Corti, Macintyre et al. 2003; Saelens, Sallis et al. 2003). Walkability is an example of how the built environment can impact physical activity on a daily level. Residents of neighborhoods where urban form facilitates increased walking are associated with decreased BMI levels and resultantly lower obesity risk (Zick, Smith et al. 2009). For a conceptual purpose, the built environment is composed of three elements: urban design, land use, and transportation systems (Handy, Boarnet et al. 2002). To disassemble the definition, "urban design" represents the layout and components of a neighborhood. Public spaces, within this concept of urban design, represent the

arrangement of physical elements, such as parks or buildings, and the appearance of these elements. Urban design must also incorporate the utility of a public space and the elements contained to describe the function of the space. Secondly, "land use" describes the activities occurring across space and includes the characteristics of the activities, such as position and density. Land use could be thought of to describe the use of space for residential, commercial, or any other kind of activity. Third, "transportation system" represents the movement and means of movement within public spaces. This could include the infrastructure that allows commuting, or the type of commuting performed.

Formulaically, obesity and excess weight is the result of greater energy intake over energy expenditure, with neighborhood environments influencing both predictors of obesity (Zick, Smith et al. 2009). Zick et al. (2009) report that availability of at least one healthy food store is significantly associated with lower BMI and risk for obesity among low-income residents of Salt Lake County, Utah, (Zick, Smith et al. 2009). Built environment analysis shows how modifiable characteristics of the neighborhood environment can identify opportunities to combat obesity trends.

Urban parks are widely considered a positive feature of neighborhood environments that encourage health benefits, such as physical activity (Bedimo-Rung, Mowen et al. 2005; Floyd, Bocarro et al. 2011). The role of urban parks in the built environment is critical to understanding how neighborhood factors can reduce

population obesity levels. The neighborhood contextual role of parks identifies environmental factors that predict park visitation. Second, parks that are utilized more frequently for physical activity are categorized by structure and characteristics. This analysis of urban parks provides steps to maximizing place-based opportunities physical activity that reduces individual risk for obesity. Before examining parks today, it is worthwhile to review the history of urban parks.

Chapter 3

Urban Parks

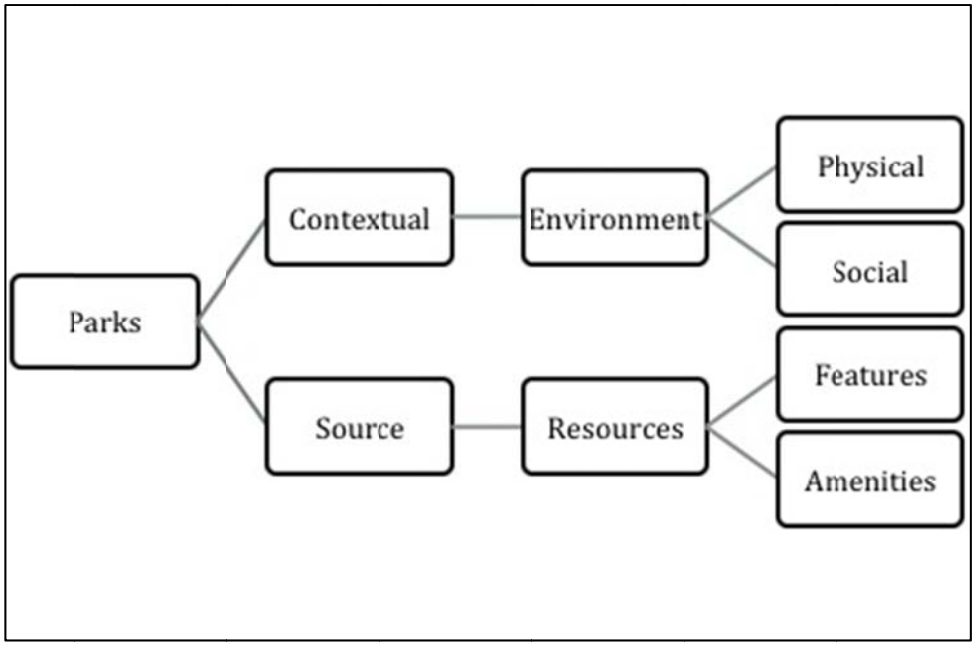
Currently there are around 20,000 urban parks, covering over 1.5 million acres, and serving 100 cities in the United States (TPL 2011).[2] Like the neighborhoods and persons that inhabit these cities, the characteristics of urban parks in the United States are diverse, offering a broad picture of what constitutes a park. Urban parks evoke visualizations of natural space, playgrounds, athletic facilities, or even dog parks. No one feature qualifies a space as a park. But, the many features that can be assembled to collectively embody a park demonstrate the multiple effects of place on a person. It is clear urban parks cohere into one example of the multifaceted impact of the built environment on health. Indeed, parks are associated with aspects of healthy living. Parks can also anchor populations, and create a sense of neighborhood identity; neighborhood residents gather in parks for baseball games, family picnics, and daily exercises. Like the nuances of a neighborhood and its residents, though, characteristics of parks can expand the discussion into how health demands, like physical activity, are facilitated—or limited—by the structural role of urban parks.

Urban parks have a dynamic two-fold role in shaping neighborhood health (Figure 1). First, they are a prominent aspect of the neighborhood environment. In a contextual role, parks are one of the many features that shape the environment, or place, effectively creating health benefits. The presence of a park influencing the health of the

[2] "Cities" are defined as municipalities, and "parks" are only those publicly owned and operated

neighborhood environment can be divided into the physical and social environment. The physical and social environments are both important to health. For the physical environment, parks provide natural elements critical to the health of the individual and place. Trees and vegetation in urban parks help modify air pollution and

Figure 1 The dual effect of parks on neighborhood characteristics that influence health outcomes.



temperatures, which are partly responsible for respiratory problems and heat-related illness (Blum, Bresolin et al. 1998; Cummins and Jackson 2001). These same natural elements of parks that create physical health benefits also shape the neighborhood landscape to affect the social environment. Contextual effects of parks on the social environment are more nuanced, but equally important for health benefits. For example, individuals living in areas depicted as "greener", with more vegetation and trees, report lower levels of fear and fewer incivilities (Kuo and Sullivan 2001). Kuo and Sullivan (2001) demonstrate the effect of natural elements on crime rates surrounding a public

housing development in Chicago. Vegetation proved to be a significant predictor of crime, as buildings in the development with high levels of vegetation had 52% fewer total crimes and 56% fewer violent crimes than buildings with low levels of vegetation (Kuo and Sullivan 2001). Crime, while imposing a direct health threat, also shows how the social environment affects health in a neighborhood. Neighborhood crime rates that influence an individual's perception of safety can ultimately decrease physical activity levels (Harrison, Gemmell et al. 2007). The positive impact of greenery on the social environment supports the proposed health benefits of the contextual role of parks in neighborhoods.

Second, urban parks are a vital source for many physical activity behaviors that lead to improved health. As a source within the neighborhood, parks contain features that are conducive to health-promoting behaviors, such as physical activity. Park characteristics demonstrate the importance of specific resources that are connected with park-based physical activity. Utilization of parks for physical activity is more likely with a greater supply of resources (Kaczynski and Henderson 2007; McCormack, Rock et al. 2010). Amenities, like organized programs and exercise facilities, can adversely affect physical activity levels if not properly maintained (Coen and Ross 2006). Additionally, specific park features, such as trails, are associated with varying levels of physical activity (McCormack, Rock et al. 2010). The following chapter contains a more detailed discussion of park features and physical activity. Before examining parks as a source for physical activity behavior in neighborhoods, it is worthwhile to review how parks evolved in our cities. In addition, the historical understanding of urban park design

permits a more social analysis on how parks can be used to promote increased physical activity in cities.

A Brief History of Urban Parks

The historical evolution of urban parks in the United States illustrates the social complexities of society, and our changing class landscape throughout the modern age. Galen Cranz (1982) argues that urban park history can be viewed through four stages: The Pleasure Ground (1850-1900), The Reform Park (1900-1930), The Recreational Facility (1930-1965), and The Open Space System (1965-present) (Cranz 1982). A historical review of urban parks highlights the integral role these entities play in shaping both the physical and social spaces influencing society. Parks influence the health and behavior of the population over time, and the historical trends of design and function elegantly serve as a snapshot of larger societal demands over periods.

Pleasure Ground Era (1850 – 1900)

Beginning in the nineteenth century, urban space design sought to plant a naturalist element in the city. Burgeoning philosophies believed that the role of parks was to contrast with the urban world, instilling elements of the wilderness to balance the

living environment. Designers sought this balance as the industrial revolution dramatically reshaped the social and physical world of cities. Parks during the Pleasure Ground Era (1850-1900) linked the urban and rural world. Lying primarily on the periphery of cities, these parks were created for what the famous landscape designer, Frederick Law Olmsted, called, “a class of opposite conditions” (Cranz 1997). The visual contrast of the pastoral world and the city sought to allow for both contemplative moments and active exercise. The city shape, marked by an increasingly grid-like street pattern and monotonous housing style, evoked the world of an assembly line, championed by the industrial revolution. Industrialization, while changing personal habits, also altered working conditions. In response, park designers sought to create passive venues for workers who were spending more time laboring inside loud, dirty factories. Parks during this period facilitated a disassociation with the primarily artificial work environment and the changing demands of labor. Industrialization not only refashioned working conditions, but the machines that were driving the historic phenomenon also impacted previous levels of exercise. The effects of industrialization marked an important transition towards sedentary occupations. Parks attempted to reclaim lost physical activity by offering unstructured pieces of the diminishing pastoral world in order to stimulate exercise. Pleasure Ground park design consisted of walls of vegetation, curved circulation routes, and separated transportation systems. The walls of vegetation on the perimeter of parks disconnected the natural landscape within the parks from the neighboring buildings and streets. Curved paths and trails contrasted the grid-like nearby streets, and encouraged strolling along the expansive meadows. Separating the transportation system, parks shielded visitors from vehicle traffic that would disrupt

the organic ambiance. The most prominent example of Pleasure Ground design is New York's Central Park, designed by Frederick Law Olmstead in 1858. If the bucolic world was to be a perk of these parks, it also provided an early glimpse into how social inequality could result from design.

The transcendental design, injecting elements of nature into the increasingly artificial urban world, was the goal of the Pleasure Ground. However, the extent to which designers would go in order to maintain this transcendentalism foreshadowed a marginalization of the working class. Selecting the location for a park proved contentious and politically charged as these grounds utilized expansive plots of land that were slowly consumed by the urbanization of the time. Securing sizeable plots often situated parks further away from the increasingly dense areas of cities. Improved means of transportation justified developing parks away from low-income areas; more efficient transportation modes, such as streetcars, trumped the emphasis on location. Accessibility of parks was hindered for lower income individuals without the disposable income and free time necessary for travel. While the peripheral location diminished accessibility for lower income populations, there were more nuanced features that marginalized the working class as well. Park designers sacrificed functional features of parks, such as lighting, in order to preserve the natural qualities, which had social ramifications. Working class individuals, laboring inside for long hours during the day, found the majority of their free time to be at night. However, these individuals were disincentivized to visit parks at night due to a lack of lighting. The gas lamps needed to illuminate parks would have detrimental effects on the trees, and artificial light was

anathema to park philosophy. The marginalization prompted a democratic reconsideration of park accessibility. The Pleasure Ground Era, although not without some flaws, embodied a period of design aligning itself with the changing demands of the social and physical world to ultimately provide for all citizens. While general park design philosophy was greatly shaped by the Pleasure Ground Era, current ideas of neighborhood parks originated in the Reform Era.

Reform Park Era (1900 – 1930)

The transformation of spaces into what we now know as neighborhood parks largely came from a reformist movement at the close of the nineteenth century. The Reform Era (1900-1930) grew from the inspiration of Olmsted and others to maintain a picturesque space that provided for health and well-being. Additionally, the Reform Era furthered the democratic ideals of unadulterated spatial access, and city planners injected social activism into park design. The progressive city planners hoped to use new park design as a way of reforming the social world. Their goal was to use parks to better serve the growing population of cities that resulted from industrialization. Arguing to better serve the population, park designers framed their cause as promoting better health and well-being for children.

Industrialization of society resulted in dramatic changes to the daily life of many Americans. Most notable were the changes in occupation and labor. Longer working

hours and artificial environments prompted designers in the Pleasure Ground Era to harness the inspiration of nature to balance the daily lives of city laborers. But changes in the early 20th century provided a new challenge: leisure time. School children playing in the busy city streets prompted officials to find ways to remove the children from danger, as well as to reduce the ire of the increasing number of people attempting to navigate those streets. Building and improving playgrounds for children was one remedy. The increasing leisure time demanded more than just passive spaces for contemplation and relaxation. These spaces required more organization and provisions to serve the population. Factoring in the desire for social equality, park reformers began to provide more population-directed resources. Recognizing the importance of serving vulnerable populations, reformers aimed to use parks to shape the social world and improve lives.

With the expanding and somewhat unpredictable population growth in cities, reformers began to focus on ways to shift the role of these spaces to more practical parks that could serve the various needs of an enlarging society. But what determined a real "need" of society? Reformers identified organized activity as a means to control the effects of increased leisure time among the working class. Focusing on the utility of space, reformers pushed the ideology of parks away from ornamental spaces and into functional spaces for urban communities. Organized recreational activities were an attempt to manage leisure time. Unaccounted for leisure time among a diversifying population was perceived by reformers as somewhat of a threat to general society; leisure time exposed a moral issue of how individuals would occupy their newfound time if left

to their own devices. Unaccounted for, time "could be as easily spent in the saloon, the dance hall, and the picture show as in the church, the YMCA, and the library, unless reform advocates competed to channel time their way" (Cranz 1982). Promoting organized activities was an attempt at social control, as planned recreational activities aimed to instill themes of leadership, ethics, and even hygiene. For example, swimming pools were expanded during this time as a means to encourage bathing by the working class, with pools in some cities running night and day to accommodate everyone.

The success of population-targeted design in functional resources, like swimming pools, during the Reform Era persuaded park designers to shift from expansive spatial designs to more functional layouts. The prominence of functionality is evident in the spatial layout of parks. Reform Era parks were symmetrically divided into outdoor and indoor spaces. The outdoor spaces emphasized utility, as contemplative activities were replaced by active spaces, such as playgrounds, running tracks, and swimming pools. The indoor spaces reflected the social control of the period, providing assembly halls, locker rooms, and gyms. Enlarging park provisions meant maximizing the available space. This pushed reformers to adapt grand designs to smaller-scale, neighborhood spaces in order to serve local populations. Especially for marginalized populations, the growing population of cities, creating greater density, made selecting space even more difficult. Park designers began neighborhood-based projects that situated playgrounds in condensed, unused areas.

Recreational Facility Era (1930 – 1965)

As parks took on more of a utility-based role, design became more important in the ever more limited city space. Park designers and planners were rightly challenged to construct and shape spaces so that their maximum functionality could be achieved. The goal of the Reform Era was to provide organized services for the population; the subsequent Recreational Facility Era (1930-1965) is characterized by the massive expansion of those services. The ideology palpable in the Reform Era, to exert social reform through park development, faded in the 1930s. Park development did not need to be staunchly defended as a social good during the Recreational Facility Era. At this point in time, parks and park services were viewed as a social service inherent in the government's duties to the citizenry. Such an assumption meant an expansion of services; designers focused on the quantity of services and facilities, and the number of citizens reached without a special emphasis on the social good of those services.

Robert Moses (1888-1981), the powerful New York City Parks Commissioner, is one of the signature examples of Recreational Facility Era thinkers. Beginning in 1934, Moses used his sweeping influence over city planning and public works projects during his 26 years as park commissioner for an unprecedented expansion in parks that included construction of 658 playgrounds (Goldberger 1981; Larrivee 2011). Considered a conservative man, Moses championed standardized, mass-produced equipment, and would regularly reject proposed park designs that conflicted with his personal taste (Goldberger 1981). Criticism of Moses and his method foreshadowed the transition to a

more holistic park philosophy that incorporated new ideas of health, safety, and recreation. While history has judged him unimaginative, Moses is credited with massive growth in New York City park space and features.

Like Moses, designers focused on versatility of facilities and buildings within parks to maximize utility. Economic conditions that constrained development resulted in greater use of industrial materials, such as concrete, which had previously been taboo in park construction. Considered "modernist" at the time, these parks marked a significant transition from traditional park design philosophy, and heralded a new era of artificiality. Benches, fences, and signs multiplied, due to their ease of production and cost effectiveness. These elements contrasted the natural layout of park space, and highlighted the economic effect on park design. This era was dramatically shaped by two significant historical events: the Great Depression, and World War II. The Depression dealt a crippling blow to the national economy and caused historic unemployment. As demands for park services continued to rise, one response was to provide employment. The Works Progress Administration (WPA), as an example, supplied park construction and maintenance jobs. The WPA also funded public art projects, such as murals and sculptures, that produced features for parks, but artists were ineligible to receive WPA funding for construction of park design, like playgrounds (Larrivee 2011). Excluding non-professional planners from working on park design proved to be a mistake when subsequent era integrated artists. Additionally, wartime re-framed many services offered by parks departments. Physical fitness activities resonated with the public as greater discipline and fitness represented a perceived strength of the nation. Although the two

major events created a pause in park development, construction dramatically increased in the 1950s.

Sharp increases in demand for services mainly explain the serious growth in quantity of parks and services beginning in the 1950s. While the quantity grew, park design continued the Reform Era tendency to maximize smaller plots of unused space. This era also highlighted an emerging trend of suburbanization. A philosophical theme began when families moved out to suburbs: the idea of reward became more central in utilization of park services. As leisure time in the previous era represented unemployment, leisure time in the Recreational Era symbolized a reward for working hard. People began to demand wider variation in services provided by parks departments as a product of this thinking.

Open Space System Era (1965 – Present)

Following the emphasis on expansion during the Recreational Facility Era, the Open Space System Era (1965-present) transcended the role of recreation in daily life. Already invested heavily in urban park development, park designers identified an issue with the growing disparity in demand between urban and suburban residents. The migrating population represented a discord in the debate over necessary funding. Increased funding for parks that were not directly beneficial to a group of people garnered diminishing support. This reactionary take on park investment epitomizes the

stark individualist period that was politically popular at the beginning of the era (Macintyre and Ellaway 2003). The response to a cultural shift was, in a simple way, to make parks part of the existing environment instead of changing the environment for the parks. This final—and arguably present—era theorizes the potential for unlimited elements of daily life to represent a form of recreation. Recognizing a potential value for recreation to be anywhere, this era promoted a participatory role for citizens. Parks were inserted into the city landscape, utilizing vacant lots and street nooks.

The transformation of park design philosophy illustrates the influence of previous eras on the most recent period. Equally important, witnessing the evolution of park design is evident in current design. Work by Isamu Noguchi (1904-1988) is a prime example of how park design arrived at the current Open Space Era. A world-renowned sculptor, Noguchi explored ways to shape urban landscape with his art. Initially, the 1930s Recreational Facility era proved unreceptive to Noguchi's style. Approaching Robert Moses in the New York City Parks Department, Noguchi aimed to use his progressive style to transform public playgrounds. Moses characteristically rejected Noguchi's model, *Play Mountain,* repeatedly (Larrivee 2011). The design proposed a playground that utilized natural earth to shape typical playground equipment; slides would be built into the side of the earth, a pyramid rising from piled dirt, and a pool. As a Japanese-American, the Recreational Facility Era proved difficult for Noguchi to secure public projects, and he concentrated on private commissions for most of his life. By 1976, the growing art influence in Open Space Era design led to Noguchi's first playground in the United States (Larrivee 2011). Nestled in Piedmont Park in Atlanta,

Georgia, *Playscapes* balances traditional playground equipment (with a uniquely Noguchi style) emphasized during the Recreational Facility era, and natural elements that evoke Pleasure Ground intentions.

The role of a park during the Open System Era is exhibitionist. Spaces are allotted so that individuals can further shape potential uses of space. Partly the constrained city budgets, partly the diminishing available space, park design exemplifies a measure of efficiency in society. Improved tools for rapid construction, flexible design theory, and an emphasis on agency, all assist the Open Space Era in revolutionizing urban parks into personal and malleable spaces. To caricaturize the transformation, "if the pleasure ground had been a pious patriarch, the reform park a social worker, and the recreation facility a waitress or car mechanic, the new park was something of a performance artist" (Cranz 1982). Critical to that notion is the ownership, or the role of the individual, embodied in driving park and service innovation to the present day.

Urban Parks Today

The storied evolution of urban parks in the United States is not only a chronicle of parks—space and activities—through time, but also a reflection on the integral role of society in parks. A larger point may be that the history of urban parks reflects the cyclical question of influence between person and place. Through time, the demands of citizens and the capabilities of park designers have changed. The philosophical roots of

urban park design persisted over the years and parks continue to be a connection with the benefits of nature while providing the resources to nurture healthy living.

Between 2000 and 2011, the U.S. population grew by 9.7%, and estimated above 311 million people (U.S. Census 2012). The population growth continues at high rates in urban areas, which now account for the overwhelming majority of U.S. residents. Over 80% of the American population live in metropolitan areas (classified by core urban populations of at least 50,000), charting a 10.3% increase over the past decade (Mackun and Wilson 2011). Along with the staggering growth in the 366 metropolitan areas, other urban areas not meeting metropolitan criteria have also grown. Termed "micropolitan" areas, these 576 urban cores represent a population of at least 10,000, (but less than 50,000) and add an additional 10% to the urban population (Mackun and Wilson 2011). There is an estimated 1.5 million acres of parks for the nearly 62.5 million Americans living in one of the 100 most populous cities (TPL 2011).[3] With the growing populations dominating space in cities, it is worthwhile to examine the land per individual. Across the 100 most populous cities, parks represent 8.1% (median) of land area, totaling 12.4 acres of park per 1,000 residents (TPL 2011). As a historical trend, city budgets often determine the future of park development. Total spending on parks and recreation, which includes capital and operating costs[4], totaled $6.1 billion (FY 2009) amounting to $84 per resident (median) across the 100 most populous cities. Illustrated by work during the Depression, parks and recreation services became a source of employment for many

[3] The "most populous cities" is based on 2000 U.S. Census figures

[4] This excludes spending on zoos, stadiums, aquariums, museums, and cemeteries

cities. Today, across the 100 most populous cities, regular (non-seasonal) workers in the city park agencies total over 40,000 jobs or 5.4 employees per 10,000 residents (TPL 2011). The debated role over parks in cities can come and go but, to use Boston as an example, the Boston Common Park constructed in 1634 sees 2.2 million annual visitors (TPL 2011). While not tantamount to the number of annual visitors in the renowned Central Park, the argument is that parks continue to remain an important venue for many people.

The history of park and recreation services demonstrates a critical role of service when many Americans desperately needed help. But, the changing demands of the park user illustrate the complication of delivering a service across such a diverse population. Parks offered a bright refuge from the darkness of early industrialization, morale-boosting services during times of doubt, and spaces for creativity during the modern time. While historical review can often retrospectively narrate societal change, current needs of parks are to capitalize on the social services offered to improve the prospective health of neighborhoods, cities, and, ultimately, the nation. Considering the role of parks in promoting physical activity is an emerging trend in public health. Understanding the relationship between park design and park users is essential to improving physical activity levels. The behavior of individuals in utilizing parks for physical activity is largely a result of the design of the park itself. The characteristics of urban parks function as an influential factor in physical activity behavior by place (neighborhoods) and by person (park user). Examining the relationship of the two is instrumental in identifying barriers to improved physical activity.

Chapter 4

Urban Parks and Physical Activity

The evolution of urban parks demonstrates a longitudinal effort to shape public spaces in order to serve the demands of neighborhood residents. As history has shown an increasing trend in sedentary lifestyles, the demands of the population may not appropriately address the needs of the population. Resources are consistently supplied to make lives easier, not harder. Although this fact would seem like a good thing, there are indirect consequences that are not necessarily immediately recognized. Sedentary activities are having a negative effect on health, and high obesity rates are taking an unfortunate toll on the health of millions of Americans. Alternative to expensive gym memberships, parks are a relatively low-cost resource for physical activity and the millions of urban dwellers aiming to improve their health.

Regrettably, there is no specific park design that automatically facilitates physical activity in a neighborhood. Rather, park characteristics are associated with physical activity levels and overall health. This returns to the principle that urban parks serve a two-fold role on neighborhood health: contextual and source. In a contextual role, existence of a park in a neighborhood has an environmental effect on the neighborhood population. In the source role, certain park characteristics, or resources, are associated with increased park use. Increases in park use are instrumental to physical activity levels. Taken together, availability of parks is associated with increases in leisure time physical activity, and specific park characteristics are related to increases in physical activity

levels. Understanding the two dimensions of urban parks in neighborhoods will illustrate how park characteristics ultimately create health disparities by race.

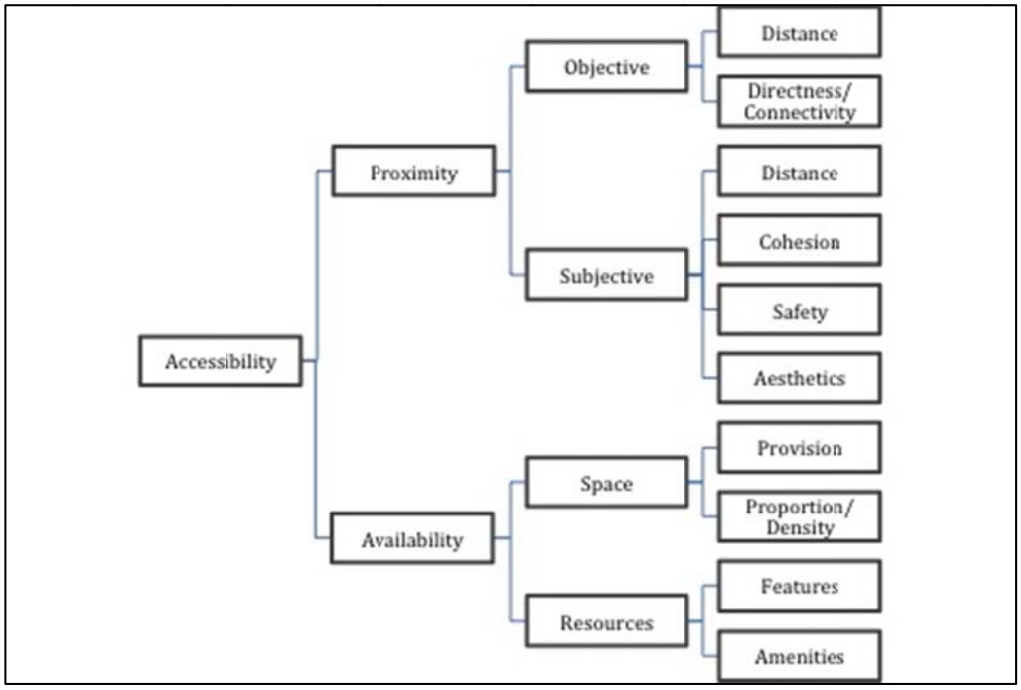
Parks and Active Living

National surveys indicate that 9 in 10 Americans will partake in an outdoor activity at least once a year (Cordell, Betz et al. 2004). The number of people who use parks and playgrounds is very high, and recent trends show a growth in popularity of activities in urban parks (Walls 2009). Not only is park popularity very high across the nation, urban parks record millions of visitors annually (Godbey, Graefe et al. 1992; Cordell, Betz et al. 2004; Crosby and Rose 2008). While a high number of Americans may be visiting the parks annually, the frequency of those visits is of principle interest to future research on the benefits of parks. The overwhelming majority of park users primarily engage in only occasional park use (Godbey, Graefe et al. 1992; Crosby and Rose 2008). Broadly speaking, research supports the notion that parks encourage outdoor activities and represent an outlet for physical activities (Bedimo-Rung, Mowen et al. 2005; Floyd, Bocarro et al. 2011). To strengthen the effect of parks on active living, the frequency of use should be a factor in developing not only park structure, but also park services.

Accessibility

Understanding how parks and recreational services can benefit active living in a neighborhood introduces the complexity of accessibility. Defining accessibility is critical to examining how environmental factors influence the ease of utilizing a service, such as a park. Comprehending the influences on utilization of parks is predicated on a conceptualization of accessibility. Accessibility is a multidimensional concept that describes the ease of which individuals are able to reach a service (Penchansky and Thomas 1981; Apparicio, Abdelmajid et al. 2008). A conceptual model is proposed to describe park accessibility that uses two key dimensions of access important to understanding parks in the neighborhood environment: availability and proximity.

Figure 2 A Conceptual Model of Urban Park Accessibility: The facilitators and barriers to park use that ultimately influence park-based physical activity



First, park availability includes space and resources. A pivotal factor in determining the expected use and value of a park for an individual depends on park availability in a neighborhood. Park space fulfills a principal step to analyzing park use: determining the number of parks in an area, and the size/density of park space relative to the neighborhood population. Park resources, which include features and amenities, are important to understanding what kind of physical activity is supported within a park. Second is the proximity of the user to the park. Part of the built environment analysis suggests that the proximity of an individual to a park will predict not only usage, but also the mode of travel to the destination. Proximity is comprised of objective and subjective proximity of a park. For examining the effect of parks on neighborhood health and active living, it is critical to look at both the resources within parks, and the existence of parks.

A discussion of parks and active living must begin with the existence of a park in the neighborhood. As park design evolved from the Pleasure Ground Era to the Open Space Era, the function of a park transitioned from a purely contemplative realm to a space for both active and passive activities. Regardless of the intended behavior within a park, the existence of one has positive effects on neighborhood physical activity. It is well understood that the greater number of parks and park areas within a community is correlated with increased levels of physical activity among adults and youth (Li, Fisher et

al. 2005; Rosenberger, Sneh et al. 2005; Cohen, Ashwood et al. 2006; Gordon-Larsen, Nelson et al. 2006; Norman, Nutter et al. 2006). The availability of parks in neighborhoods, as a measure of accessibility, is divided between space and resources. Space provision includes, for example, the existence of a park and dimensions of park space. Conceptualizing park space captures the total area of a park, and density of the park and park resources. Park density is a measurement of the amount of resources within the park compared to the physical park dimensions. The resources contained within parks are its features or amenities, such as trails and water fountains. This proposed conceptual model alludes to the various park design philosophies. As the Pleasure Ground aimed to expand the total amount of space, the Recreational Facility—and somewhat the Open Space—Era concentrated on functionality of the park, emphasizing utility of park resources.

The basic supply, or availability, of park area in a neighborhood, therefore, is instrumental in increasing physical activity levels. In fact, percentage of neighborhood surface area occupied by parks is positively correlated with reported physical activity levels among adolescents (Roemmich, Epstein et al. 2006). Among adults in a Canadian city, each additional park increased neighborhood residents' participation in physical activity by 17% (Kaczynski, Potwarka et al. 2009). The existence of park space and higher levels of physical activity may be correlated, but which elements of the park-related environment influence physical activity? Since parks do not have a defining feature, the most basic characteristic is open space. The value of public open space to physical activity recalls the original intention of the Pleasure Ground Era. A study on

public open space in Australia found that neighborhood residents identified natural features of parks (i.e. trees, bird life, and water) as “restorative” features that influenced physical activity (Giles-Corti, Broomhall et al. 2005). The attributes of public open space also influenced the type of behavior. Natural elements of open space and parks create a perceived restorative experience as compared to the street environment. Runners and walkers who use urban parks for physical activity perceive a more restorative experience, which may predict greater use or more sustained activity than those who walk or run in a street environment (Hartig, Mang et al. 1991). The exposure to open space and natural elements encouraging more walking evokes the design of the Pleasure Ground Era. The environmental presence of park features influences the peripheral behavior, such as walking or bicycling in the area surrounding the park boundaries. While the presence of these resources promotes an active living lifestyle, benefiting from park attributes also depends on the accessibility of these resources.

The ultimate goal of travel to a destination is, in large part, a result of the resources at the ultimate destination. Park resources, like recreational facilities and park amenities, are associated with park utilization (Kaczynski, Potwarka et al. 2008; McCormack, Rock et al. 2010). Classification of park features such as pools, fields, and benches is inconsistent across current research (Kaczynski, Potwarka et al. 2008; McCormack, Rock et al. 2010). A comprehensive classification of park elements recognized for strong inter-rater reliability is the Environmental Assessment for Public Recreation Spaces (EAPRS) instrument (Saelens, Frank et al. 2006). The instrument categorizes park features by trail/path; designated and specific use area; water area;

amenities and facilities; playground equipment and fields and courts. Park features, for simplicity of this study, include the natural elements of park space, such as trails and specific use area, while amenities include facilities (pools) and recreational services. Regardless of the classification, urban parks have long aimed to provide resources for cities. The Pleasure Ground Era parks conserved trees, water features, and wildlife as resources within urban parks to reconnect with the therapeutic qualities of nature. The Reform Era provided organized activities to engage the neighborhood population in leisure time activities within parks. Park design evolved to focus more on the resources demanded by the neighborhood residents. Each successive period illustrates how the features of a park ultimately drove park design. The Recreational Facility Era used the activity-based programming to increase the equipment: to construct ball fields, swimming pools, and exercise areas. Park resources are not limited to features, or physical elements. Amenities, such as organized activities represent an influence on park use.

Park resources and physical activity are important for the new age of park design. Parks offering a greater supply of features are more likely to be utilized for physical activity (Kaczynski and Henderson 2007; McCormack, Rock et al. 2010). The Open Space Era characterizes an effort to maximize smaller spaces in neighborhoods and accommodate resources to best serve local needs. Determining those needs, features are just as critical to park use as is proximity. Children may even prefer to travel further in order to reach desired features (McCormack, Rock et al. 2010). Not only are features like open space a predictor for physical activity in parks, but certain elements in parks can increase physical activity. For example, physical activity among park users is seven

times more likely in parks with trails (paved and unpaved) than those without (Kaczynski, Potwarka et al. 2008). Strong association between a trail and physical activity levels is thoroughly documented (Troped, Saunders et al. 2001; Troped, Saunders et al. 2003). Although the association between park elements and physical activity levels are reported at population levels, scarce research has investigated the association within urban parks. The implication is that the park elements can be classified according to levels of physical activity. While the physical resources, or features, are often thought of as a reason for visiting a park, amenities like supervised activities are associated with increased park use as well (Cohen, McKenzie et al. 2007). Decreases in amenities can have significant effects on park utilization. Reducing organized programs in parks resulted in a 39% decline in park users reported in one study on parks in low-income neighborhoods (Cohen, Golinelli et al. 2009). However, supervised activities primarily increase park use and physical activity within a specific sub-area of a park. This activity is isolated, in one study, to a mere 9% of all observed activity within the park (Cohen, McKenzie et al. 2007). Using the documented physical activity level association with park resources, park design can best utilize the balance of features and social resources to maximize physical activity levels. Simply inserting features into a park does not automatically boost physical activity levels. Further complicating the design challenge, the conditions, or quality, of the park features can influence park use and physical activity.

The general conditions, or quality, of park resources expound the motivation, or lack thereof, for park use. Indirectly, the conditions linking increased park use can also

explain health disparities. One study in Montreal examined the quality of playground equipment in neighborhoods categorized by different levels of health. The authors reported that the areas of poorer health had lower quality park equipment, and subsequently concluded that this was a material disadvantage that may have impacted the quality of health of the residents (Coen and Ross 2006). Poor conditions also include aesthetics of a park. Parks that are poorly kept (overgrown vegetation and defective facilities) and showing signs of danger (vandalized signs and graffiti) are generally associated with decreased park use (Miles 2008). Furthermore, the subjective quality of a park influences an individual's park use. Testing perceived park quality confirms that an increase in just one point on the Perceived Park Quality Scale doubles the odds of an individual using a park (Ries, Voorhees et al. 2009). It is therefore evident that the—objective and perceived—quality of the park resources are critical to assessing the conditions of a park because they greatly influence an individual's desire to use the park.

Proximity to a resource, such as a park, is one main determinant of an individual's likelihood of utilization (Brownson, Baker et al. 2001; Cohen, McKenzie et al. 2007; Kaczynski and Henderson 2007). Park proximity is critical to both the goal of physical activity and the type of travel involved. Compared to others, people who live within a half-mile of a park show considerably higher physical exercise frequencies (Cohen, McKenzie et al. 2007). For example, youth are more likely to engage in physical activity when proximity to a park is higher (Cohen, Ashwood et al. 2006; Frank, Kerr et al.

2007). One study of 1,500 middle school girls from six different U.S. cities found that each park within a half mile radius of the home accounted for an additional 2.8% of moderate to vigorous physical activity outside of school hours (Cohen, Ashwood et al. 2006). Objective proximity to a park can be broken down to describe the distance between an individual, the directness for travel, and the type of travel.

Built environment features such as distance and connectivity are crucial to understanding utilization behavior. Physical distance, as a measure of proximity, is a predictor of park visits and physical activity levels. Among a sample of eight parks in Los Angeles, people living within 1 mile of a park were four times more likely to visit the park, and reported 38% more exercise sessions within the park than those respondents living greater than 1 mile from the park (Cohen, McKenzie et al. 2007). A study on Canadian adults reported that each additional hectare of park within 1 km increased physical activity levels by 2%, and each additional park within 1 km increased physical activity levels for women by 19% (Kaczynski, Potwarka et al. 2009). In addition, park proximity encourages active travel behavior such as walking, jogging, or bicycling. Active travel can be examined by utilitarian travel (for commuting purposes) or for leisure travel (i.e. going to a park). Research is beginning to accumulate regarding the focus of proximity to predicting type of travel. More specifically, walking to parks increases in likelihood as measured distance decreases (Giles-Corti, Broomhall et al. 2005; Ries, Voorhees et al. 2009).

If proximity is partly defined by physical distance, then it is important to consider the directness of traveling that distance. Directness of a route is one way to examine the ease of traveling to a destination in the built environment (Saelens, Sallis et al. 2003). Pleasure Ground park designers understood the importance of travel behavior when they designed meandering paths to contrast the gridded city routes; directness is an important place-based influence on the individual. Connectivity is one influence on proximity, which can result in eventual utilization of parks or recreational services. Operationalizing street connectivity includes, among others, assessing the number of routes available, size of street blocks, intersection density, and intersection types (Dill 2003; Steiner 2004; Oakes, Forsyth et al. 2007). More importantly, looking at street connectivity introduces a behavioral component that reflects resident decision-making in the built environment. Whether a person walks or jogs will be decided by that person based on built environment features. Hills and less street density (less connected streets), for example, are more commonly associated with leisure walking (Lee and Moudon 2006; Oakes, Forsyth et al. 2007). While physical distance and directness are objective measures for proximity, an individual will also be influenced by perceived characteristics of travel within the built environment.

The concept of proximity to a park for an individual goes beyond the crude measure of physical space. Subjective proximity to parks can include both the perception of distance from the individual, as well as social perceptions, like safety of the route. Subjective proximity is important to factor into a conceptualization of accessibility of parks because these perceptions have the potential to impact utilization. A meta-analysis

of qualitative studies on urban parks describes the growing evidence that subjective proximity is critical to further understanding park use (McCormack, Rock et al. 2010). In one study, urban women generally overestimated distances to nearby physical activity resources, but had a higher correlation (between perceived and objective distances) for specific features, like trails (Jilcott, Evenson et al. 2007). These findings suggest that specific park features would have higher utilization because of consistent subjective proximity. Subjective proximity includes perceptions of users and non-users, which is important for determining the reasons behind utilization, and the barriers to use by those currently inactive. Perceptions are critical when analyzing physical characteristics of a park and the park's role in the built environment. While the objective proximity would suggest that a park is physically near, perceived proximity highlights elements of the built environment that may deter park visitation; objective and subjective proximity represent variations on exploring the accessibility of a park. A qualitative study of African American women in Chicago, IL, describes features of the built environment that influence subjective proximity (Wilbur, Chandler et al. 2002). The study of 48 women, predominantly single (85%) and of low income, describe safety concerns to depict how the social and physical environment can explain low accessibility to parks and services, which decreases the likelihood of utilization. The perceived danger of the park reduces their likelihood of utilizing the space and services, indicating low accessibility for the population. Proximity is a large influence on an individual's decision to use—or not use—a park. If influences such as proximity and availability are managed in order to facilitate reaching a park, the focus shifts to a profile of the park user.

Characteristics of Park Users

Identifying current park users parks, and who can benefit from parks and services will advance the understanding of the role of parks in the built environment. The prevalence of people participating in some kind of outdoor recreation in the U.S. continues to be high (Cordell, Betz et al. 2004; Bedimo-Rung, Mowen et al. 2005). Unfortunately, an overwhelming portion of park users exhibits sedentary behaviors when in parks. In one study on eight parks in Los Angeles, 66% (range by park 49%-77%) of all park users observed were sedentary, with sitting or picnicking reported the most common activity (22%), and a mere 16% (range 11%-23%) engaged in vigorous activity (Cohen, McKenzie et al. 2007). Park activity areas can be one explanation for the high sedentary behavior. Areas targeted for physical activity were largely empty 57% of the observed time (Cohen, McKenzie et al. 2007). The high concentration of sedentary behavior illustrates how park design may be facilitating sedentary activities. However, as noted earlier, the low frequency of physical activity among adults and children is a primary concern for public health practitioners (Cordell, Betz et al. 2004). It appears that a small percentage of park users account for the majority of participation days. One study shows that 7% to 21% of participants accounted for as much as 89% of total participant days (Cordell, Betz et al. 2004). Described as “leisure enthusiasts”, this population demonstrates a positive correlation with park use and physical activity levels. Leisure activity, however, includes both exercising and sedentary behaviors. The

increase in sedentary lifestyle is one explanation for the changing role of physical activity in daily life. An emphasis on leisure time activity predominantly focuses on increasing physical activity among adults and children during these periods.

For parks, however, rates of participation are influenced by many characteristics of the user. Demographic features, such as gender and race, prominently predict likelihood of park utilization for leisure time activity. In general, it appears that men are more likely to engage in vigorous physical activity within parks compared to women (Cohen, McKenzie et al. 2007; Ries, Voorhees et al. 2009). This gender disparity is evident in adolescence as well. Adolescent girls are less likely to use parks for physical activity, and the reduced utilization translated into 77 fewer minutes (per week) of MVPA compared with adolescent boys in a Baltimore study (Ries, Voorhees et al. 2009). Additionally, physical activity levels among females drops with age (Butt, Weinberg et al. 2011). Across race, studies show a lower rate of leisure time inactivity among non-Hispanic White men when compared to others (Marshall, Jones et al. 2007). More troubling, however, may be that African-American adolescents are documented to be more active than adolescents from other racial groups, but are 68% less likely to engage in physical activity within a park (Ries, Voorhees et al. 2009). The adolescent period is critical for public health interventions because this represents a time when disproportionate gains begin among non-Hispanic Whites, and decreases are seen among racial minorities in physical activity levels (Gortmaker, Lee et al. 2011). Insufficient access to physical activity resources such as parks illuminates racial health disparities.

Disparities in Park Access by Race and Income

If public health officials are to advocate for use of parks in order to increase frequency and type of physical activity, then access should be the principal focus. Advancing the components of accessibility of parks by demographic is integral to understanding variations in physical activity levels. Disparities in health-related resources among urban populations are documented and show spatial clustering of resources by race/ethnicity, with more Blacks and Hispanics living in neighborhoods with low resource density (Smiley, Diez Roux et al. 2010). Lower income neighborhoods similarly have limited accessibility to parks, which decreases physical activity levels (Abercrombie, Sallis et al. 2008; Moore, Diez Roux et al. 2008). The role of park access, by availability and proximity, across race and income identifies neighborhood barriers to physical activity, which advances an understanding of health disparities.

A critical health resource, parks and recreational facilities are inequitably distributed, and there is a significant disparity in access by race and income (Moore, Diez Roux et al. 2008; Maroko, Maantay et al. 2009; Dai 2011). Park availability, which includes amenities like recreational services, is predictive of park use for physical activity and can have a greater effect on minority populations (Diez Roux, Evenson et al. 2007). The availability of a park amenity is important for physical activity because it is a low-cost resource. Reduced availability of parks and recreational services has effects on neighborhood health. In lower income neighborhoods, access to an open health service

like a park is important for public health because alternative sources of physical activity may be scarce. One study in Maryland covered nearly 500 public parks and spanned 833 Census blocks to find that availability (the number and size of parks) was a significant predictor for low accessibility in low income and high minority neighborhoods (Abercrombie, Sallis et al. 2008). Decreased accessibility to limited park space is a barrier to physical activity. Reducing access to park resources can result in the greater usage of streets for physical activity. In a telephone survey based on a modified version of the BRFSS, 66% of respondents indicated that they primarily engaged in physical activity along neighborhood streets (Brownson, Baker et al. 2001). Oddly enough, park design during the Reform Era was inspired to create safe places for the growing number of children who were playing in the streets.

Closer proximity to parks is associated with greater integration of physical activity and is significantly associated with race and income (Kaczynski, Potwarka et al. 2008; Ries, Voorhees et al. 2009). Lower access to parks is more common in residential areas that are primarily African-American and Hispanic populations (Powell, Slater et al. 2004; Gordon-Larsen, Nelson et al. 2006). A nationally representative study illustrates the inequitable distribution of park space as high minority neighborhoods are half as likely to have at least one physical activity resource than low minority neighborhoods (Gordon-Larsen, Nelson et al. 2006). The limited supply of available park space signifies that one would be required to travel further to visit a park. Proximity is shown to influence park use across race, but distance affects non-Caucasians disproportionately as they are less likely to visit a park (Giles-Corti, Broomhall et al. 2005). Moreover, when

there is available park space that is physically near, the concept of accessibility also incorporates other factors in benefiting from utilization of a park.

Accessibility factors, such as distance, showcase how physical distance is one barrier to park use. Perceived distance also influences an individual or group decision to visit a park. Perceived proximity may even be more of more of influence in low income, high minority neighborhoods (Brownson, Baker et al. 2001; McCormack, Rock et al. 2010). Perceived proximity depends on the physical environment between an individual and the park. Characteristics of the spatial distance, such as quality of the pavement and social factors, influence the decision to visit a park. Higher income women, for example, report more places to exercise and enjoyable scenery than low income women (Brownson, Baker et al. 2001). The enjoyable scenery and finer sidewalks would seemingly not deter an individual from walking or traveling to a park. Social factors of a travel route are persuasive, but still debated. On one hand, a quantitative study on park use and urban youth (69% African-American) in Baltimore, Maryland, reported that neighborhood crime was not associated with overall park use (Ries, Voorhees et al. 2009). One speculation is that the study did not operationalize safety in a localized manner, as the authors note crime rates for the Baltimore area are among the highest in the nation. The contextual role of safety for the sample of urban youth could have been misaligned with their experienced perception of safety. On the other hand, reviews of qualitative data suggest that social factors, such as crime, are indeed influential on park use (Wilbur, Chandler et al. 2002; McCormack, Rock et al. 2010). The more profound anecdotes of factors influencing park use capture the social environment within a park.

Parks that are perceived to be safe are positively associated with increased use and physical activity (Babey, Hastert et al. 2008; McCormack, Rock et al. 2010).

The perceived safety of parks represents another element of accessibility. Safety, like other perceptions, is somewhat varied in terms of park use. For example, perceptions of safety can vary by income. A study of high-minority neighborhoods in Los Angeles found that 98% of respondents living near two parks with the lowest percentage of houses in poverty (within the sample) perceived the parks to be safe; only 50%-74% of respondents perceived parks to be safe near neighborhood households over 40% in poverty (Cohen, McKenzie et al. 2007). The perceived safety of a park captures both the social and physical environment. Crime within, or near, a park may alter the social environment and subsequently influence the decision to visit the park. Additionally, the social environment, such as gangs or drug users, can affect the physical environment of a park. The presence of such figures cautions park users, and the mark on the physical world, such as graffiti and syringes, can further discourage park visits (McCormack, Rock et al. 2010). The balance between the physical and social environments is vital to reducing barriers to park use, and further encouraging physical activity within parks.

Disparities in park access are certainly adversely affecting racial minorities. A successful intervention would begin with addressing the accessibility barriers for neighborhoods in need. If accessibility is properly accounted for, the focus then shifts to the behaviors of racial minorities within the parks. Presently there is little evidence documenting the behaviors of park users by race or income, which presents a need for

further research on sub-group behavior (Kaczynski and Henderson 2007; Floyd, Spengler et al. 2008). Acknowledging the disparity of parks among African-Americans and Hispanics, Floyd and colleagues (2008) conducted an observational study in Tampa and Chicago to explore park-based physical activity in ethnically diverse neighborhoods that accounted for high and low income residents. Their findings were very similar with other physical activity studies within parks. Very few park users were engaged in some form of vigorous physical activity (11%), and the majority of observed park users were sedentary (65%; 70% in Tampa and 51% in Chicago) (Floyd, Spengler et al. 2008). High-income groups outperformed in energy expenditure: high income Hispanics (Tampa), and high income African-Americans (Chicago). The authors suggest that physical activity levels were actually a result of park design. Understanding the physical activity behavior by demographic within a park emphasizes the importance of park design to improving physical activity levels. Proper arrangements of park features can improve physical activity levels and, ultimately, energy expenditure. Parks design is a modifiable mechanism that can subsequently improve physical activity within a neighborhood. Accessibility of parks and park services predicts park visitation, the first requirement of increased park-based physical activity. Building on the evolution of park design, resources within parks are instrumental to further increasing physical activity levels among park users.

Conclusion

Increases in obesity prevalence and incidence are a critical public health issue. Data on obesity show that trends are relatively similar by gender, but age and race are two significant sources of variation. The incidence of obesity among adolescents and youth are of important concern. This is a demographic where obesity prevalence is low, but incidence rates are the highest of any group. The sharp jump in adolescent obesity incidence parallels a time of increased sedentary behavior. The adolescent years mark a reversal in physical activity levels of childhood; physical activity levels gradually decline with grade level. These changing behaviors rooted in childhood create lasting negative effects on health status throughout adulthood.

Although a national problem, obesity trends indicate a racial and ethnic disparity in health. The variation in obesity prevalence by race is most pronounced among women. Like adolescents, an underlying factor is the contrasting physical activity levels. Specifically related to physical activity, women and racial minorities report less MVPA. Physical inactivity, a characteristic of sedentary lifestyle, is therefore one element that can contribute to reducing obesity levels. The reductions in physical activity occurring through adolescence have a disproportionate effect on racial minorities. However, the concentrated effect to subsets of the population should not validate individual-level analysis of disease.

The inequitable distribution of health resources is one example for why research should incorporate more contextual analysis. Physical activity resources, like parks, are inequitably distributed in neighborhoods by race and income. Therefore, connecting marginalized populations to health resources like urban parks is critical to facilitating physical activity and reducing obesity.

Urban parks will continue to be a significant neighborhood resource for physical activity due to wide acceptability and affordability. Park history shows the evolution of design to be user-oriented. Focusing park construction and modification to reflect the needs of the park user will facilitate greater park-based physical activity opportunities. Ultimately, the success of urban parks in increasing physical activity and reducing obesity depends on accessibility. Park-based physical activity is a modifiable behavior. An individual's success in reaching the park and utilizing the resources contained within the park is reliant on the accessibility of the park. The proposed conceptual model of accessibility fills a current gap in the research on the effect of public parks on reducing obesity. Understanding park use by the conceptualization of accessibility highlights how specific park characteristics lead to increased utilization. Structural park design, that includes the arrangement of park resources, can further increase park-based physical activity. Combining improved accessibility with structural design will promote park-based physical activity that can ultimately help reduce obesity.

The model divides accessibility between park availability and proximity. The availability of a park is predicated on the research that supply of parks and park services are associated with increased utilization. While a large number of people visit parks, the frequency of use is very low. Increasing the frequency of park visits is the first requirement to increasing park-based physical activity. Secondly, the proximity of a park is important to physical activity. Proximity of a park is one of the most commonly acknowledged factors in neighborhood resident physical activity levels. Taken together, this model shows how increasing park-based physical activity is primarily dependent on the accessibility of the park within the neighborhood.

Utilizing the conceptual model of accessibility will benefit policy-makers and urban planners in their attempt to increase health services to the population. Since this is the first conceptualization of accessibility for park use that is intended to examine physical activity, the next step would be to operationalize the dimensions of the model. For example, quantifying each component of the accessibility model could benefit policy-makers when designing future park investments. If properly quantified, the measurement of each access component could be charted to anticipate park design challenges within the neighborhood. The quantification of the measures could allow the development of a scale that would rate the potential impact of a park construction or modification in a neighborhood. Health Impact Assessments (HIAs) that utilize multi-disciplinary methods would benefit from the development of this conceptual model of park accessibility.

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