# AN EXPLORATION OF THE RELATIONSHIP BETWEEN USE OF PARKS AND ACCESS, PARK APPEAL, AND COMMUNICATION EFFECTIVENESS

A Dissertation

by

JAMIE RAE WALKER

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2008

Major Subject: Recreation, Park and Tourism Sciences

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# ABSTRACT

An Exploration of the Relationship between Use of Parks and Access, Park Appeal, and Communication Effectiveness. (December 2008)

Jamie Rae Walker, B.S.; M.S., Texas A&M University

Chair of Advisory Committee: Dr. John L. Crompton

Understanding what variables influence park use would assist park providers and policy makers in acquiring, designing, managing, and funding initiatives which encourage or support park use.

Previous studies indicate that access to parks (measured by both objective and perceived distances), park appeal in terms of being well-maintained, and effective communication between constituents and park suppliers, relate positively to park use.

This study explores the relationships between access, appeal, and communication and park use. Access is operationalized as four objective distances from household to nearest park using both Euclidian and Network measures, and by subjective self-reported measures of ability to access parks on foot or by bicycle. Appeal is concerned with the influence of parks' perceived level of maintenance and availability of amenities on the probability of park use. Effective communication is operationalized by three variables: perceptions of being well-informed, being included in the planning process, and being able to give feedback to park leaders. These variables and selected demographic data were extracted from an existing data set: the City of College Station Needs Assessment.

Findings indicated that a) respondents with access to parks are more likely to use parks, b) level of maintenance and available amenities influenced use, and c) respondents who are well-informed are more likely to use parks.

# DEDICATION

In memory of Dr. Richard Ewing

# ACKNOWLEDGEMENTS

I would like to thank my committee chair, Dr. John L. Crompton, for his patience, guidance, and encouragement.  On a humorous yet sincere note, I would also like to thank him for “relishing in punishing” his students – despite many competing priorities, his push has helped me grow more than I thought possible. Thanks to my committee members: Dr. James McNamara for his steadfast dedication to my progress and his timely walks past the Academic building; Dr. Shafer for listening, and listening, and listening…; Dr. Wunnburger for helping me with many complex decisions brought on when utilizing GIS; to Dr. Hodges for always being on call when needed; and to MVD for making sure we all moved forward and met deadlines.

Thanks to the many campus administrators and leaders for supporting and assisting me while I was involved in a level of campus service in which I never expected to be engaged.

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Special thanks to my grandmother, parents, siblings, in-laws, nieces and nephews, Molly, and extended family for unconditional love and support and lots of laughter. Get the Shark tent out -- I am free to play!

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# CHAPTER I

# INTRODUCTION: THE IMPORTANCE OF RESEARCH

## Scope of the Study

Attractive, proximate parks have been publically provided for urbanites in the United States since the 1850s when Central Park was developed to provide city dwellers an escape from busy, overloaded, unnatural city life (Edinton et al., 1995). During the rise of the Industrial era, parks were also seen as an opportunity to allow people to get out of the factories to socialize with other community members and to engage in physical activity. In today's information age, plagued with sprawl; information overload; auto-dependency; and technology dependency, urban parks and the community level benefits they provide remain important. Communities with extensive, proximate, and attractive park spaces tend to be cited as restorative, active, and friendly communities. Parks contribute significantly to making communities places where people desire to live. Developing a better understanding of the extent to which proximity, appeal, and communication relate to park use is important not only for providing information pertinent to improving service levels, but also for understanding the broader benefits accruing from increased park use at the community level.

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This dissertation follows the style of the *Journal of Leisure Research*.

*Restoration and Improved Physiological Health*

Early leaders developed urban parks based on notions of the physiological or restorative befits they provided city dwellers (Olmsted F.L., 1870). Access to and knowledge of attractive park spaces supports urbanites' city experiences by providing exposure to natural settings and the associated "preventative" benefits (Hartig, et al,, 2003, p. 122). Empirical evidence supports the notions that interacting visually or physically with nature can have positive outcomes on one's health (Kaplan and Kaplan, 1989; Kaplan, Kaplan, and Ryan, 1998):

> The results of various studies provide strong support that nearby nature affords a wide range of both psychological and physical benefits. People feel more satisfied with their homes, with their lives, and with their jobs when they have sufficient access to nature in the urban environment" (Kaplan and Kaplan, 1989, p. 162).

Self-reported stress measures and physiological measures indicate that people in some state of stress experience greater degrees of restoration when viewing nature scenes compared to viewing those viewing urban scenes (Ulrich, 1979). Patients recovering from surgery in hospital show more improvement when viewing nature scenes compared to when viewing monotonous, plain urban scenes (Ulrich, 1984).

Stress reduction rates of participants walking in a nature environment after being exposed to a stressor exceeded the rates of participants subjected to an urban walk or reading and listening to music (Hartig et al, 2003).

According to Marcus and Francis (1997), "A park is often considered an oasis of greenery in a concrete desert. For passersby as well as those who come into a park, its natural elements provide visual relief, seasonal change, and a link to the natural world" (p 89). That is, parks that are attractive that contain desired features and are proximate can serve as nature scenes and the “exposures” which reduce everyday stressors associated with urban life. A discussion with park users revealed that “the word ‘parks’ was often used interchangeably with natural environment” (Yuen, 1996, p. 305).

Many people use parks for these reasons. For example, park users in both London and San Francisco cited “contact with nature”, “relaxing”, and “resting as primary” reasons for visiting parks. When users from both high and low density areas were asked to describe parks, terms such as “greenery”, “nature”, “relaxing”, “comfortable”, “tranquil”, “peaceful”, “calm”, “urban oasis”, and “sanctuary” were shared by more than 50% of park users (Marcus and Francis, 1997).

Qualitative analysis of Singapore residents’ perceptions of neighborhood parks provided multiple examples of the restorative or physiological benefits they perceive they gained from having attractive, proximate parks. Respondents often talked about the parks as a place to “think”, “calm down”, “to forget their worries”, and “to regain sanity and serenity” (Yuen, 1996, p. 306). One respondent indicated that compared to her “built” home and “concrete” block, “parks were relaxing because of nature” (Yuen, 1996, p. 305). Another respondent indicated that “when I am in this park, I feel very relaxed and fresh, especially when you are surrounded with beautiful flowers, ponds, green and nice landscape, and birds flying across you” (Yuen, 1996, p. 305). Complementing studies indicate that access or views of nature can reduce stress levels, a layman park user explained, “[the park] helps to calm one’s feelings…” (Yuen, 1996, p. 306).

*Activity-Friendly Environments*

While researchers have been working for decades to document the role of parks in providing restorative environments that assist stress recovery and improve mental health, community health issues related to the recent obesity epidemic have served as an impetus to better understand the role of proximate, attractive parks in sustaining or encouraging physical activity.

Lack of physical activity in daily lifestyles not only deters the potential for good health but can be a catalyst for acquiring chronic diseases (Brownson, et al, 1997). In order to improve the overall US population health outcomes and combat the rise in obesity, the Center for Disease Control, CDC, continues to encourage citizens to increase the amount of physical activity in their daily lives (U.S. Department of Health and Human Services, 2000). In addition to focusing on efforts concentrated on the individual, the CDC has expressed concern about environmental influences deterring or supporting human activity. They are concerned about the role the built environment, and particularly auto-dependent infrastructure plays in impacting activity rates. Many communities are designed to discourage physical activity -- especially in communities that primarily support auto-use and discourage walking.

People's physical activity rates are influenced by both recreational and utilitarian activities (Lee and Moudon, 2004). Park and park-like environments play a role in supporting and encouraging both (Crompton, 2007). From utilitarian activity perspective, greenways, linear parks, and trails can serve as connections to community amenities and necessities such as stores, work places, and schools.

Parks and park-like environments that do not serve as connectors are also seen as a key contributor to creating active-friendly environments (Lee and Moudon, 2004). Proximate, attractive parks serve as ‘safe’, ‘enjoyable, places for people to exercise (Lee and Moudon, 2004; Giles-Corti et al., 2005; Frank et al., 2005; Booth et al., 2000; Crompton, 2007, Powell et al., 2003).When asked where people prefer to walk or exercise within their communities, parks are consistently listed as one of their top choices (Booth et al., 2000, Lee and Moudon, 2004; Powell et al., 2003).

Proximity and attractiveness are two main factors in park design that influence parks’ contributions to creating active friendly communities. Research indicates that a clear relationship exists between residential proximity to parks and park use (Booth et al., 2000, Lee and Moudon, 2004; Giles-Corti et al., 2005; Frank et al., 2005; Powell et al., 2003; Kaczynski and Henderson, 2007). The importance of proximity and attractiveness are well documented with several user groups including seniors, youth, and adolescents (King et al., 2003; Booth et al., 2000; Giles Cortes et al. 2005; Sallis et al., 1999).

In addition to serving as safe and enjoyable places to exercise, proximate attractive parks also serve as destinations that encourage physical activity (Kaplan and Kaplan, 2003; Lee and Moudon, 2004). While many people engage in sedentary behaviors at parks, most park users walk to the park (Cohen et al. 2006; Yuen, 1996). Thus, the desire to go to a park inadvertently encourages physical activity.

*Social Support and Sense of Community*

A caveat of the recent surge in understanding active-friendly environments research has been the development of a better understanding of the role of parks and park-like environments in providing socialization and a sense of community. Active-friendly environments contribute to creating a sense of community by fostering interactions with neighbors.

Auto-dependent communities not only negatively impact physical activity patterns, but also negatively impact community interactions. “The residential patterns that have mushroomed across the country in the last half century have reduced the sense of community leading to social isolation, to ‘disconnect and fragmentation’ (Kaplan and Kaplan, 2003, p. 1484). People cannot interact with each other from their cars. (Kaplan and Kaplan 2003, p. 1484).

An investigation of the impact community environments have on social capital found that respondents living in auto-dependent communities experienced lower degrees of social capital than those living in mixed-use, walkable neighborhoods (Leyden, 2003). “Respondents living in walkable neighborhoods were more likely to know their neighbors, participate politically, trust others, and be socially engaged” (Leyden, 2003) These findings relate to the ideas that environments can facilitate “casual” interactions at community places such as parks and walkable spaces. Thus active-friendly communities promote social interactions that develop social capital.

The mere presence of natural elements, such as trees, also increases the likelihood of creating places that encourage social interactions (Coley et al, 1997).

Cohen et al. (2006) also reported that “parks are venues for social interaction. “More than 70% of participants in a study of California park users indicated they interact with others when at the park (Cohen et al, 2006). Female users of a New York park described the park as “friendly”, “neighborly”, “neighborhoody”, and “a feel of a community” (Krenichyn, 2004, p. 126). The New York park users discussed their enjoyment in encountering and “interacting with others whom they ordinarily might not” (Krenichyn, 2004, p. 123). The users explained the value and meaning of familiarity derived from:

- “Chance meetings with friends and acquaintances in the park” (p. 123)
- “Becoming better acquainted with others whom they saw in the park regularly” (p. 123)
- “Developing a sense of familiarity and friendliness with strangers who none the less remained anonymous” (p. 123)

“Some described very brief, casual encounters, such as a quick smile and ‘hello’ when they passed other joggers whom they saw regularly, which were enough to foster a sense of familiarity, if not intimacy” (Krenichyn, 2004, p. 123).

They also discussed how the park felt like “a small community” and how they valued the diversity of people they encountered and interacted with (Krenichyn, 2004, p. 123). Parks can serve as “green magnets” or as a means to pull people from different backgrounds and even proximate neighborhoods together (Gobster, 1998).

Park users in Singapore felt proximity was important in that “the neighborhood park provides a convenient place for social contact and interaction” (Yuen, 1996, p.304). It was evident from interviews with these users that parks can facilitate social opportunities and foster relationships by providing a gathering place for groups such as teens and socially isolated mothers to meet other people. Discussions about park uses clearly indicated that parks promoted social interactions with neighbors and friends (Yuen, 1996).

Trails are also credited for fostering social interactions and a sense of community (Shafer et al., 2000). These interactions are often in the form of a wave or smile. When trails provide an environment that promotes social interactions, they create a sense of familiarity and contribute to the quality of life perceived by community members (Shafer et al., 2000).

Jane Jacobs (1961) indicated over 50 years ago that parks can serve as places that foster social interaction. Many communities are seeing this today, Some residents of the City of Henderson attribute the increases in sociability their town is experiencing to recent developments in their park system. One community member explained, "sociability between neighbors is reappearing in cities like Henderson because they have a developing park and trail system…It is a very welcome trend after so many people practiced social isolation" (Anonymous, 1998).

The outcomes gained by communities and constituents who use proximate, attractive parks are well-documented. The relationship between proximity and attractiveness and associated household park use needs further investigation. The purpose of this study is to better understand the relationships between proximity and attractiveness and household's probability of park use. Learning more about these relationships can provide an important step forward in better understanding the role of these factors in influencing perceived outcomes experienced by households and communities at large.

## Purpose

This study explores the relationship between the use of selected parks and household proximity to parks, appeal of park services, and communication with park leaders.

The study has these purposes. First, to evaluate the role of access in facilitating use by relating a household's proximity to the nearest neighborhood/community park with the household's use of neighborhood/ community parks. Both objective and subjective measures were used. This proximity-use relationship was measured objectively using both Euclidian and Network approaches with multiple operationalizations of the dependent variable, proximate. Previous studies have attested to the need for proximity to be explored at various distances rather than a single arbitrary measure (Nicholls, 1999; Kaczynski and Henderson, 2007) and this study extends previous work by using multiple operationalizations of proximity. No studies were found in the literature that explored the proximity park use relationship utilizing both various distances and measuring distance using both straight-line and network approaches. Perceived access was measured by relating residents' perceptions of accessibility to parks by foot or by bicycle with their household's use of parks.

The study's second purpose was to explore the relationship between park use and (i) respondents' perceptions of traffic surrounding parks; (ii) the influence of developed parks in the proximity use relationship; and (iii) respondents' appraisals of park maintenance and upkeep.

The third purpose was to study the relationship between park use and (i) how well-informed respondents perceived they were regarding parks; (ii) how well-informed respondents perceived they regarding plans for neighborhood parks; and (iii) respondents’ perceived ease in communicating with park leaders.

As indicated in Figure 1.1., *Access* was operationalized using both objective and perceptual measures. The objective measure, distance from household to park, was tested using both Euclidian distance and Network distance. Significance and probability of use were explored at four distances ( ¼ mile, ½ mile, ¾ mile, and 1 mile).Perceived access was operationalized using respondents’ perceptions of whether they could access a park on foot or by bicycle.

*Conceptual Frameworks, Operationalizations, and Hypotheses*

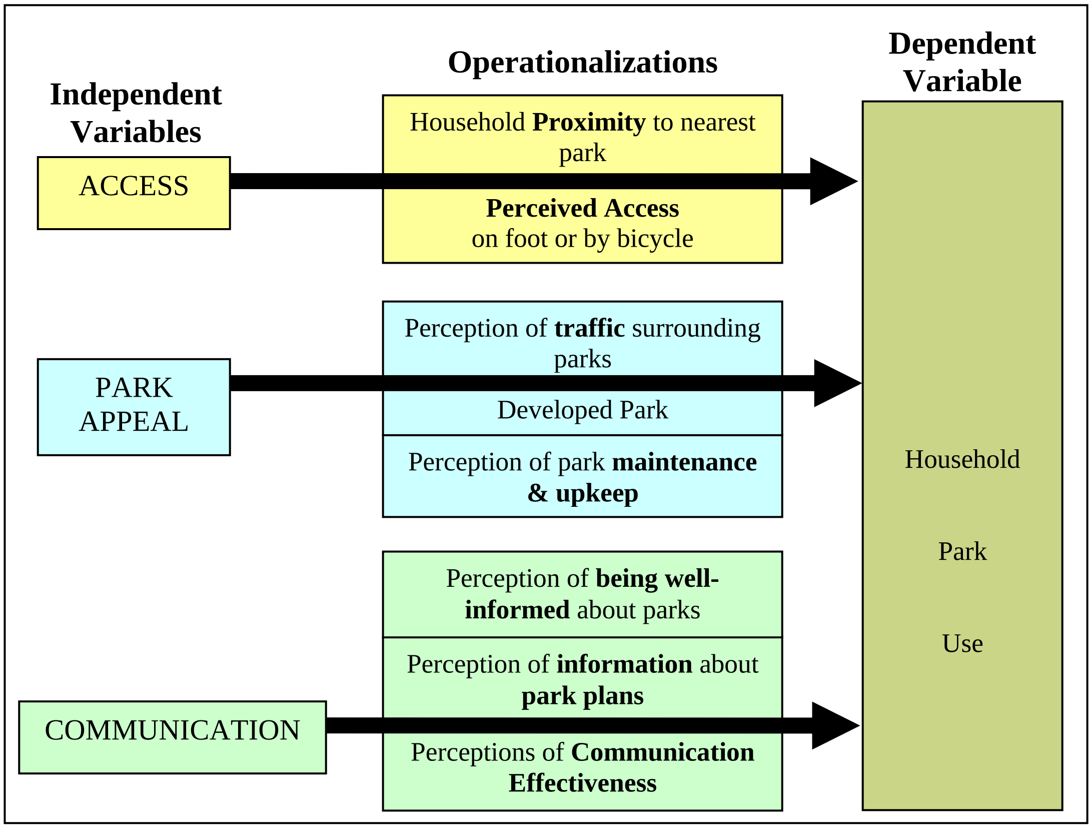


**Figure 1.1**
Conceptual Framework of the Study

The variables relating to park *Appeal* were perceptions of whether traffic surrounding parks should be slowed down, type of park, and perceptions of upkeep and maintenance. These data were collected in a survey and were collapsed into agree and disagree categories.

Communication effectiveness was operationalized by survey questions which asked respondents if they were well-informed, if they knew about plans for their neighborhood parks, and in they could easily obtain feedback from park providers. These responses were coded into binary (agree, disagree) categories.

Simple logistics and likelihoods of use were calculated for all three sets of variables to better understand their relationship with park use.

*Hypotheses*

- Hypothesis 1a: Respondents living within a ¼ Euclidian mile of a neighborhood or community park are more likely to use parks than respondents living beyond that distance.
- Hypothesis 1b: Respondents living within a ½ Euclidian mile of a neighborhood or community park are more likely to use parks than respondents living beyond that distance.
- Hypothesis 1c: Respondents living within a ¾ Euclidian mile of a neighborhood or community park are more likely to use parks than respondents living beyond that distance.
- Hypothesis 1d: Respondents living within 1 Euclidian mile of a neighborhood or community park are more likely to use parks than respondents living beyond that distance.
- Hypothesis 1e: Respondents living within a ¼ Network mile of a neighborhood or community park are more likely to use parks than respondents living beyond that distance.

- Hypothesis 1f: Respondents living within a ½ Network mile of a neighborhood or community park are more likely to use parks than respondents living beyond that distance.
- Hypothesis 1g: Respondents living within a ¾ Network mile of a neighborhood or community park are more likely to use parks than respondents living beyond that distance.
- Hypothesis 1h: Respondents living within 1 Network mile of a neighborhood or community park are more likely to use parks than respondents living beyond that distance.
- Hypothesis 2a: Respondents who perceive they can access a park on foot or by bicycle are more likely to use parks than respondents who do not perceive they can access a park on foot or by bicycle.
- Hypothesis 2b: Respondents who perceive they can access a park on foot or by bicycle are more likely to use parks than respondents who indicate they have no knowledge of whether they can access a park on foot or by bicycle.
- Hypothesis 3: Respondents who perceive that traffic around parks should be slowed down are less likely to use parks than respondents who do not perceive that traffic around parks should be slowed down.
- Hypothesis 4a: Respondents living within a ¼ Euclidian mile of a developed neighborhood or community park are more likely to use parks than respondents living beyond that distance from a developed park.

- Hypothesis 4b:  Respondents living within a ½ Euclidian mile of a developed neighborhood or community park are more likely to use parks than respondents living beyond that distance from a developed park.
- Hypothesis 4c: Respondents living within a ¾ Euclidian mile of a developed neighborhood or community park are more likely to use parks than respondents living beyond that distance from a developed park.
- Hypothesis 4d: Respondents living within 1 Euclidian mile of a developed neighborhood or community park are more likely to use parks than respondents living beyond that distance from a developed park.
- Hypothesis 4e: Respondents living within a ¼ Network mile of a developed neighborhood or community park are more likely to use parks than respondents living beyond that distance from a developed park.
- Hypothesis 4f: Respondents living within a ½ Network mile of a developed neighborhood or community park are more likely to use parks than respondents living beyond that distance from a developed park.
- Hypothesis 4g: Respondents living within a ¾ Network mile of a developed neighborhood or community park are more likely to use parks than respondents living beyond that distance from a developed park.
- Hypothesis 4h: Respondents living within 1 Network mile of a developed neighborhood or community park are more likely to use parks than respondents living beyond that distance from a developed park.

- Hypothesis 5: Respondents who perceive parks are well-maintained and clean are more likely to use parks than respondents who perceive parks are not well-maintained and clean.
- Hypothesis 6: Respondents who agree they are well-informed about park facilities are more likely to use parks than respondents who do not agree that they are well-informed.
- Hypothesis 7: Respondents who agree they are well-informed about plans for neighborhood parks are more likely to use parks than respondents who do not agree that they are well-informed about plans for neighborhood parks.
- Hypothesis 8: Respondents who agree that they can easily communicate with park leaders are more likely to use parks than respondents who disagree that they can easily communicate with park leaders.

*Research Questions*

- RQ1a: What magnitude of difference in "more likely to use parks" occurs between proximate and aproximate respondents?
- RQ1b: As the distance used to create the dichotomy for the predictor variable proximity increases, what patterns in probabilities of park use, if any, occur across the various specified distances for Euclidian measures?
- RQ1c: As the distance used to create the dichotomy for the predictor variable proximity increases, what patterns in probabilities of park use, if any, occur across the various specified distances for Network measures?

- RQ1d: What, if any, patterns exist in the differences of probabilities of park use between the proximate and aproximate groups when the specified distances for the predictor variable, proximity, are measured using Euclidian distance compared to Network distance?
- RQ2a: What magnitude of difference in “more likely to use parks” occurs between respondents who perceive they can access a park on foot or by bicycle, and those who perceive they cannot access a park on foot or by bicycle?
- RQ2b: What magnitude of difference in “more likely to use parks” occurs between respondents who perceive they can access a park on foot or by bicycle, and those who have no knowledge regarding accessing a park on foot or by bicycle?
- RQ3: What magnitude of difference in “more likely to use parks” occurs between respondents who perceive that traffic around parks should be slowed down and those who do not perceive that traffic around parks should be slowed down?
- RQ4a: When the selected parks are limited to the sample of developed parks what magnitude of difference in “more likely to use parks” occurs between proximate and aproximate respondents?
- RQ4b: When the selected parks are limited to the sample of developed parks and the distance used to create the dichotomy for the predictor variable proximity increases, what patterns of probabilities of park use, if any, occur across the various cut points for Euclidian measures?

- RQ4c: When the selected parks are limited to the sample of developed parks and the distance used to create the dichotomy for the predictor variable proximity increases, what patterns of probabilities of park use, if any, occur across the various cut points for Network measures?
- RQ4d: When the selected parks are limited to the sample of developed parks, what, if any, patterns exist in the differences of probabilities of use between the proximate and aproximate groups when the specified distance for the predictor variable, proximity, are measured using Euclidian distance compared to Network distance?
- RQ5: What magnitude of difference in "more likely to use parks" occurs between respondents who perceive parks are well-maintained and clean, and respondents who do not perceive parks are well-maintained and clean?
- RQ6: What magnitude of difference in "more likely to use parks" occurs between respondents who perceive they are well-informed and respondents who do not perceive they are well-informed?
- RQ7: What magnitude of difference in "more likely to use parks" occurs between respondents who perceive they are well-informed about plans for neighborhood parks and respondents who do not perceive they are well-informed about plans for neighborhood parks?
- RQ8: What magnitude of difference in "more likely to use parks" occurs between respondents who agree they can easily communicate with park leaders and

respondents who do not agree that they can easily communicate with park leaders?

## Organization of the Dissertation

Chapter II provides a literature review. Chapter III describes the methods used to modify the secondary data set and create spatial variables using GIS. Chapter IV presents statistical analyses and findings. Chapter V summarizes the findings, discusses their implications, and acknowledges the study's limitations.

# CHAPTER II

# LITERATURE REVIEW

This chapter discusses previous research regarding relationships between park use and (i) household proximity, (ii) respondents' perceptions of being able to access parks on foot or bicycle; (iii) influence of slowed traffic around parks; (iv) type of park; (v) park maintenance & upkeep; (vi) being well-informed about parks,; (vii) information about park plans; and (viii) communicating effectively with park leaders are discussed in this chapter.

## Household Proximity and Park Use Relationship

Dee and Liebman's (1970) seminal investigation of the relationship between household distance to playgrounds and playground use in Baltimore employed two types of distance measures -- direct distance and number of street crossings. The former measured the most direct straight line distance from A, the home, to B, the playground, while the latter measured the minimum number of street crossings required to access the playground from home.

They reported that when distance was measured by number of street crossings, it was effective in predicting playground use. They identified a distance from a playground beyond which use appeared to be discouraged. That is, children residing in households beyond that distance were less likely to use playgrounds. The cut point distances were related to playgrounds' attributes such as size and type of facility.

Their findings indicated that competing resources such as backyard swimming pools and backyard swing sets influenced use patterns so those who had these amenities were less likely to use public playgrounds. This research also investigated the impact type of park had on the proximity-use relationship. For example, smaller, less developed facilities referred to in this study as Type 1 (defined by the author as “an asphalt jungle -- generally an area having an asphalt surface and containing a few swings and slides and a basketball court” (pp. 147) were used only by very proximate households, while Type II (similar to Type 1 but including a building) and Type III (similar to Type II but including a swimming pool) affected clientele from a greater distance.

Bangs and Maher (1970) provided empirical data regarding household proximity and related open space use rates in their case study examining park use among children in three row house neighborhoods in Baltimore, Maryland.  Although their initial purpose was to explore the effectiveness of the city’s 1963 guideline requiring developers to set aside park land in new developments, a corollary of reviewing the requirement’s effectiveness was insight regarding the proximity-use relationship. While the city initially suggested developers set aside park space within a service distance of no more than 650 feet, Bangs and Maher (1970) concluded that a 400 foot service distance would encourage greater park use. Their recommendation was based on park usage and household distance relationship data acquired from 154 children.

Bangs and Maher (1970) defined park users as children who used neighborhood parks at least once a week, while those using them only a few times a year or never were considered nonusers. Respondents were categorized into groups based on the distance their households were located from a neighborhood park. These groupings were: 0-299 feet; 300- 699 feet; 700 – 1,099 feet; and 1,100 feet or more. Although the authors did not state whether they used straight-line or network distances, figures depicting maps of households and parks infer that a straight-line distance was utilized. Their findings indicated that children's use of neighborhood parks declined as distance from the park increased. Two additional factors, size of the park and visual and pedestrian access, also influenced use.

Rates of use declined rapidly at 400 feet from the park for the largest park and at 200 feet for the smallest park. When a service area of 300 feet was employed to compare percentage of users at three parks of varying sizes, the smallest park's service area contained 51% of the park users, the mid-size park's service area contained 65.2% of the park users, and the largest park service area contained 95% of the park users (Bangs and Maher, 1970). Thus the larger and more attractive the park, the more clientele it attracted from a 300 foot service area.

Calculating the proportion of users to non-users in relation to density may provide a more legitimate comparison (Hodges, 1971). For example, Cohen et al. reported that upon initial review of percentage data a majority of park users were within 1 mile of a park, however, when accounting for density of the area, a greater portion of constituents living within ¼ mile were served. Variability in the number of users attracted to differing size parks might also be influenced by the variety and novelty of amenities offered in the parks. All else equal, the expectation would be that large parks have more attraction power than small parks (Gold, 1972; Gold 1977).

Bengtsson (1970) discussed results of studies conducted in Stockholm play parks which suggested that play parks should be located within a 400 meter walking distance of homes. Bengtsson (1970) highlighted three additional factors influencing use: park size, topography, and linkages (accessibility to homes, schools, and stores). His design suggestions for increased use were to make play parks serve as the center of the neighborhood, keeping play parks within walking distance of homes, and allowing parks to serve as meeting places.

Hodge's (1971) dissertation provided one of the first studies in the park literature that used computer aided applications to better understand the relationship between household location and recreation center use. He employed SYMAPPING software (which was a precursor to GIS) to analyze patterns of visitation to recreation centers in order to predict where to locate new centers. Thiessen polygons were used to determine nearest recreation centers for houses in various areas of the city. Buffers, or concentric rings, were also constructed at half-mile intervals from each center to chart how many residents attended each recreation center within half-mile increments. Use data were acquired from center attendance logs.

As part of the prediction process, Hodges (1971) examined pooled data from recreation centers' use patterns and confirmed that a significant relationship existed between distance and visitation rates. However, he reported that considerable variability existed when the distance- use relationship for individual recreation centers was examined. He concluded that his results were limited by lack of information and by not accounting for competing opportunities, attractiveness, utility, and capacity of each center. Furthermore, the author concluded that economic factors especially those related to means of transportation and density levels surrounding a facility and the presence of competing uses may influence distance-use relationships. Qualitative interviews indicated leadership at the center impacted use rates.

Hodges (1971) reviewed Dallas' 1966 study which noted that the relationship between distance and likelihood of use was impacted by the nature of members of a household. For example, distance to a facility influenced the likelihood that a parent would accompany a child in route. This study noted that when comparing service area standards for playgrounds, play fields, and large parks to data for actual use patterns, differences occurred. Service areas standards (0.5, 1.0, and 3 miles, respectively) when accounting for 80-90% of users were underestimated (actual distances users came from: 1.5, 2.75, and 8 miles, respectively) and were overestimated when accounting for 50% of the users (actual 0.25, 0.5, and 1 mile respectively).

Gold (1972; 1977) focused on why people do not use neighborhood parks. He postulated three categories of constraints leading to nonuse. These were: behavioral, environmental, and institutional. A breakdown of the variables creating each category is listed in Figure 2.1.

**Major Causes of Nonuse in Neighborhood Parks**

| *Behavioral* | *Environmental* | *Institutional* |
|---|---|---|
| User Orientation* | Convenient Access* | Goal Differences* |
| Social Restraints* | Site Characteristics* | Personal Safety* |
| Previous Conditioning | Weather and Climate | Relevant Program |
| Competing Activities | Physical Location | Management Practices |
| User Satisfaction | Facilities & Development | Maintenance Levels |

*Most significant in each category relative to all factors.

**Figure 2.1**
Gold's (1977) Categories Underling Nonuse of Neighborhood Parks

Gold (1972) suggested user orientation, social restraints, convenient access, site characteristics, goal differences, and personal safety were the most significant constraints on park use. Convenient access, site characteristics, and physical location are all pertinent to the proximity-use relationship. Gold (1972) did not provide an explanation of physical location, but he defined convenient access in terms of physical distance. Based on a review of previous work by Bengtsson (1970), Bangs and Maher (1970), and himself, Gold (1972) suggested that most neighborhood park users came from within a ¼ mile radius service area and concluded that living beyond a ¼ mile was a predictor of nonuse.

Distances users are willing to travel are impacted by age, gender, and novelty of activities provided on site (Gold, 1972). For example, older children are willing to travel further; parks have larger service areas for reaching males than females; and neighborhood parks with novel activities such as a swimming pool have larger service areas. Use and willingness to travel to a park are also influenced by site characteristics such as topography, landscaping, water, shade, shelter from winds, rain or sun, quiet` areas, privacy, and diversity (Gold, 1977).

Another suggestion pertaining to distance made by Gold (1977) was the need to improve bicycle access. He suggested cities could extend access by providing safe, convenient connectivity to and from home to a park, and to and from a park and area facilities (schools, churches, and day care centers). Bangs and Maher (1970) also emphasized the importance of accessible streets and paths, and their positive impact on enhancing service area distances.

Hatry and Dunn (1971) produced a workbook intended to guide municipalities on service measures. It addressed the impact on nonuse of facility distance, overcrowding, safety, price, lack of knowledge, lack of childcare, lack of interest, inadequacy, and unattractiveness. Regarding the proximity-use relationship they stated,

> The geographical accessibility of potential users is a principal factor in the adequacy of recreation opportunities in any community… other things being equal, the further a person lives from the service, the less likely he is to use it. Therefore, the distribution of a community’s population in relation to the recreation facilities and activities is very important (pp. 25).

They recognized the tradition of measuring accessibly in terms of miles, but indicated that time measures were more meaningful. They urged practitioners to use walking time measures for users coming from within the neighborhood and to use driving time measures for those coming from outside the neighborhood. If possible, mass transit travel times should be calculated for those constituents using such means (Hatry and Dunn, 1971).

Hatry and Dunn (1971) indicated ¼ to ½ mile was a typical neighborhood park service area which they equated to a 15 minute time distance. These suggestions were based on straight-line distances from the home to a park. When measuring time travel, they instructed practitioners to use walking times. Barriers decreasing or preventing access were considered in these time and distance calculations. “Frustration factors” affecting accessibility included such factors as freeways, railroads, industrial sites, and similar barriers which adversely impacted people’s abilities to access parks (Hatry and Dunn, 1971).

When exploring distance-use relationships, Hatry and Dunn (1971) suggested that target markets should be considered. That is, if the activity is for children, (i.e. a playground) children’s distance-use relationships should be used (Hatry, 1971). This “client focus” took into account the different needs or constraints associated with varying groups (age group, gender, ADA, income, ethnicity, family composition) (Hatry and Dunn, 1971).

Bialeschki and Henderson (1988) examined constraints for users and nonusers among a stratified random sample of 423 individuals from Wisconsin. Phone interview data regarding trail use indicated that 27% of respondents used at least one trail in the last year, while 32% of respondents reported constraints to trail use. Among this 32%, leading barriers to trail use included time (61%), lack of information about the trail

(36%), money (24%), health (23%), and distance from home (22%). Poor transportation (7%) and poor maintenance (6%) were reported as low constraints.

Godbey and Blazey's (1983) review of senior citizens' park use conducted in five major US cities reported that over 80% of respondents using parks lived within three miles of the park, while the largest group of users lived within one mile. Cohen et al. (2006) reported that 81% of park users in Los Angels lived within 1 mile of the park and only 6% lived more than 2 miles from the park. Thus it seems that variability exists when comparing data in individual cities.

Howard and Crompton (1984) investigated users and nonusers in Dade County, Florida; Austin, Texas; and Springfield, Oregon. The authors presented data on constraints to use in all three cites. When viewing the percentage of respondents who ranked each constraint, distance to facility was ranked fourth (24%), fifth (13%), and seventh (15%) for Dade, Austin, and Springfield respondents, respectively (Howard and Crompton, 1984). The leading constraints across the three cities were: I'm too busy or don't have enough time to go; I prefer to stay home; I never think about going; and I do not feel very safe.

Godbey's (1985) data in an eastern US county also found transportation and distance to be constraints. Telephone survey data for 550 households indicated that 15% of respondents cited "lack of transportation" and 47 % of respondents cited "location as inconvenient" as reasons for nonuse.

In a review of Lansing, Michigan, residents' knowledge of parks, Spotts and Stynes (1984) used rectangular distance to examine the relationship between knowledge of parks and household distance to parks. Rectangular distance is the sum of two legs of a right angled triangle whose hypotenuse serves as the line connecting two locations. It was employed by Spotts and Stynes (1984) to account for residents needing to follow a grid-type road pattern to access parks. Findings indicated that those respondents categorized as living “far” from parks (far was not defined) reported lower awareness levels of city parks than the sample average. Some randomness occurred when reviewing disaggregated data at varying distances. That is, distances relating to knowledge varied from 1.5 miles to 4-6.5 miles according to the park being explored. A predictor model for neighborhood awareness levels showed that distance from a neighborhood to a park was a powerful predictor, and that distance and awareness were negatively related (Spotts and Stynes, 1984).

Yuen’s (1996) exploration of Singapore residents’ uses of neighborhood parks provided insight into the proximity-park use relationship. Respondents in Yuen’s study used neighborhood parks more often than any other open space facilities. Of the respondents classified as neighborhood park users, 50% used only one neighborhood park and 85% of these 50% could access the park on foot in less than ten minutes.

The relationship between proximity and park use was reiterated in this study’s qualitative results and the theme “convenient places” was used to describe it. Yuen (1996) reported that the importance of neighborhood parks as being convenient places was consistently emphasized. He concluded, “the value of neighborhood parks in the urban fabric lies in their convenient location, that is, proximity to the home” (pp. 304).

The proximity of local parks also served as a pull factor. Yuen explained, “Proximity, from this perspective, is a valued quality in the open space experience that ‘pull’ or attract respondents to the open space” ( p. 302) One respondent explained his use of the neighborhood park as “simple, convenience as it is very near my house (p. 302) ” Yuen (1996) also provided data regarding the importance of the walk to the park,

> As respondents talked about their visits to neighborhood parks, it became apparent that there is a common feeling that the walk to the park itself is an integral part of the park visit and experience. The walk to and from the open space is viewed by many respondents as important in that it affords them opportunities for escape, contemplation, and restoration (p. 298).

Scott and Jackson (1996) employed random digit dialing to compile data on how frequently 1,054 respondents used public parks in the Greater Cleveland area. Infrequent users, those who used parks less than once a month, and nonusers cited: lack of information, parks being too far way, lack of public transportation, and no way to get to a park, as constraints to their use. Respondents over 66 years of age were more likely than respondents from other age cohorts to report fear of crime and no way to get to parks as constraints to park use (Scott and Jackson, 1996).

In order to understand what changes park providers could make to encourage or improve use, respondents were asked what adaptations might be effective. In terms of the proximity-use relationship, over 40% indicated developing parks close to home might increase use, while almost 30% indicated providing public transportation to parks could enhance use rates (Scott and Jackson, 1996).

An analysis from the same data set by Scott and Munson (1994) examined perceived constraints to park usage among individuals with low incomes. A sub-sample of 636 respondents were classified as nonusers and infrequent users (respondents indicating they used parks less than once a month).

Responses from infrequent and nonusers to factors limiting their park use indicated an array of reasons. Parks are too far away (13%) ; no way to get to parks, (11%); and lack of transportation, (11%) were ranked 8 through 10, respectively in severity of potential constraints. When comparing respondents in low income groups (those with incomes less than $15,000, N= 129) to those in high income groups (>$50,000, N= 224), those with low incomes were four times more likely to report parks being far away as a constraint (Scott and Munson, 1994). When participants were asked to indicate what changes could affect future park use (these were yes/no responses to a presented list of changes), 50% of non and infrequent users said they might use park more often if parks were developed close to home (Scott and Munson, 1994).

Lindsey (1999) did user counts on three Indianapolis trail segments and conducted user surveys on two of those segments. He examined patterns of proximity and use on two different trial segments. Self-reported data collected from respondents revealed approximately 64% using one trail segment lived within 1 mile of the trail; approximately 50% lived within ½ mile; and 25% within ¼ mile. (These results overlapped because a respondent living within ¼ mile also lived within ½ mile and 1 mile of the trail). Fifty percent (50 %) of respondents walked to the trail.

Only 29% of respondents using the second trail segment lived within 1 mile and only 20% lived within ½ mile. A majority, 62%, of the second trail segment users drove to it (Lindsey, 1999). Hodges (1971) suggested differences in the proximity-use relationship could be influenced by the density of homes surrounding each park environment. Further, maps indicated the second trail segment was further from the city center, while the first trail appeared to be more central. Thus, a lack of alternate trail opportunities for those using the second trail could make this segment the nearest resource for users and be a possible reason for them driving to the trail, as well as influencing distance from the trail. The study provided another example of how different facilities may exhibit different findings regarding the proximity-use relationship (Hodges, 1971; Bangs and Maher, 1970).

Mowen and Confer (2003) investigated intentions to become regular users of a park. Straight-line distances from 505 park visitors' geocoded addresses to the nearest park edge were used to measure if distance played a significant role in intent to become a regular park visitor. Only 18% of intended regular users lived within 1 mile of the park. The authors surmised that the low number of residential homes surrounding the park may have accounted for the low number of users living within one mile of the park.

Survey data, observation, and GIS measures were used to better understand park use at a sample of twelve neighborhood parks in Los Angeles, CA. This study, a RAND report (Cohen et al., 2006) was an in-depth work examining attributes of park use, park users, and physical activity.

Data were collected from two groups. On-site park users were systematically selected and stratified by most busy park area and least busy park area, sedentary users and active users, and males and females. Sixty-three percent (63%) of on-site park users agreed to complete face-to face interviews. Nearest intersection data were acquired during interviews and used to calculate on-site park users' household distances to the park (Cohen et al., 2006).

GIS and census data were employed to select residents living within two miles of each park. Twenty addresses were randomly selected from predefined strata (within ¼ mile, ¼ - ½ mile, ½ mile to 1 mile, and 1 mile to 2 miles). Eighty-eight percent (88%) of households approached agreed to engage in face-to-face interviews (Cohen et al., 2006).

Cohen et al. (2006) indicated Los Angeles' parks were designed to accommodate a two to two-and-a-half mile radius service area. However, the study's findings indicated that a majority of users came from within a Euclidian service area of 1 mile.

A comparison of all respondents grouped by cut point (¼, ½, 1, and 2 miles) indicate that those residing within ¼ mile and those within 1 mile were more likely to use parks at least once a week or more, than those living beyond 1 mile. Variability existed for those within ½ mile. Most respondents indicated they used their neighborhood park regularly and rarely visited other parks. The RAND study results also indicated that gender and age were factors which influenced use (Cohen et al., 2006).

Jilcott et al. (2007) provided an example of the most recent approach to reviewing the relationship between physical activity and proximate places in which to engage in physical activity. They examined proximity, resources, and physical activity among low-income, midlife women in selected southeastern North Carolina counties. Physical activity resources were defined as parks, gyms or recreation centers, and schools. Road network distances from home to the closest resource, and to the number of resources within 1 mile and 2 mile distances were measured using GIS Network Analyst.

Geocoded street addresses were mapped for all parks and homes. Additional points were added at the parking lots of large parks. As a result of this procedure, 107 park points were mapped to spatially depict 102 parks. Network distances from households to nearest physical activity facility were generated with Network Analyst. One and two mile Euclidian distances were created to determine the number of facilities within each cut point from houses. Perceived measures were derived from two survey questions, "How close is your home in miles to the closest (school, gym or recreation center, park)" and "Is there a (school, park, or gym or recreation center) where you can exercise in your neighborhood?" The latter was coded as yes, no, or don't know. Neighborhood was defined by the researcher as a 10 minute drive from the household (Jilcott, et al., 2007).

The survey results from 199 women indicated proximity, when measured both by perceived and objective measures, was not statistically significant. This finding could have been influenced by using only one address point to represent each facility. This approach could lead to an overestimate of the distance required to reach a park, since users have to reach the street address of the park rather than their nearest point of access (except for large parks in which additional points were also mapped for parking areas) (Jilcott et al., 2007).

There were inconsistencies between women's perceived measures and their objective measures regarding the presence of gyms and parks. In some cases women reported gyms or parks were not present in their neighborhoods, but GIS maps indicated they were present. In other cases, women in rural areas reported parks existed, but such amenities were not present on GIS maps. The former could be an indication of lack of knowledge of facilities, while the latter could be a misinterpretation of what constitutes a public park. That is, the researcher used GIS maps to locate public park facilities. Residents in this study might have reported use of park-like environments and not realize they were not considered a park for the purpose of that study (Jilcott et al., 2007).

Kaczynski and Henderson (2007) provided a comprehensive review of physical activity research related to recreation and parks. As part of this review, they summarized studies investigating relationships between proximity to a park or recreation facility and physical activity levels. In reviewing the concept of proximity, Kaczynski and Henderson (2007) discussed the wide range of operationalizations utilized. These included perceived measures such as, "within my neighborhood", "within walking distance of my home", and "near where I live", and objective measures such as distances ranging from 400 meters to 1500 meters, or time measures (e.g., 20 minutes walking distance).

Studies employing different operationalizations of proximity reported inconsistent findings regarding relationship between the proximity to facilities and physical activity. Kaczynski and Henderson (2007) did not address the availability of amenities that would encourage or support physical activity. For example, small neighborhood parks may not have trails, some parks or trails may not have lights for night use; and some parks may only provide passive amenities. The presence of such amenities could influence the park use and physical activity relationship.

Kaczynski and Henderson’s (2007) review identified six studies that employed continuous or multi-level distances when measuring proximity. A majority of these studies reported positive associations between proximity to a park and recreation facility and physical activity. The authors suggested that future research such as this dissertation should explore this relationship using continuous or multi-levels when operationalizing proximity.

**Table 2.1**
Overview of Studies Reviewing or Employing Proximity to Park Measures

| Authors | Study Focus | Proximity Measure Employed |
|---|---|---|
| Dee and Liebman’s (1970) | Relationship between household distance to playgrounds and playground use in Baltimore | Direct distance from point A to point B<br><br>Minimum number of street crossings required to access playground |
| Bangs and Maher (1970) | Examining park use among children in three row house neighborhoods in Baltimore, Maryland | Not reported (but maps indicate straight-line distance). |
| Bengtsson (1970) | Review of studies conducted in Stockholm play parks | n/a |
| Hodge’s (1971) | Recreation Center Use in Dallas, Texas<br>Review of Dallas 1966 Study | SYMAPPING,<br>Thiessen polygons<br>Buffers |
| Gold (1972, 1977) | Review and qualitative analysis of previous literature and data sets addressing factors influencing nonuse | n/a |

**Table 2.1 continued**

| Authors | Study Focus | Proximity Measure Employed |
|---|---|---|
| Hatry and Dunn (1971) | Produced a workbook intended to guide municipalities on service measures | Miles (1/4 or 1/2 Euclidian)<br><br>Time<br>walking time –from neighborhood<br>driving time –outside neighborhood<br>mass transit – if used |
| Bialeschki and Henderson (1988) | Constraints for users and nonusers individuals from Wisconsin | Self reported survey data<br>Distance [a]<br>Lack of Transportation [a] |
| Howard and Crompton (1984) | Investigating constraints for users and nonusers in Dade County, Florida; Austin, Texas; and Springfield, Oregon | Self reported survey data<br>Distance to facility [a]<br>Not enough time [a] |
| Godbey (1985) | Proposed model for nonuse of public leisure services | Self reported survey<br>Lack of Transportation [a]<br>Location is inconvenient [a] |
| Spotts and Stynes (1984) | Review of Lansing, Michigan residents' knowledge of parks | Rectangular Distance – the sum of two legs of a right angle triangle whose hypotenuse serves as the connecting two locations- employed to account for residents needing to follow a grid-type road pattern to access parks |
| Yuen (1996) | Review of Singapore residents uses of neighborhood parks | Qualitative Interviews "proximate" defined by individuals |
| Scott and Jackson (1996) | Review of Cleveland area residents frequency of park use | Telephone surveys<br>Parks too far away [a]<br>Lack of public transportation [a]<br>No way to get to park [a] |
| Lindsey (1999) | Review of Indianapolis Trail Users | Self reported distance data |
| Mowen and Confer (2003) | Intent to become regular park user | GIS to measure straight line distance (Euclidian) to nearest park edge |

**Table 2.1 continued**

| Authors | Study Focus | Proximity Measure Employed |
|---|---|---|
| Cohen et al. (2006) | Examining Park use and Physical Activity rates in selected Los Angeles parks | Self reported nearest intersection<br>0- ¼ mile; ¼ mile – ½ mile, ½ mile – 1 mile, and 1 mile – 2 mile buffers |
| Jilcott et al. (2007) | Relationship between Physical Activity and proximate physical activity places | GIS network analysis to measure road network distances from home to closest physical activity resource<br><br>Number of resources within 1 and mile buffers |
| Kaczynski and Henderson (2007) | Review of literature and methods of physical activity research related to recreation and parks | Perceived Access<br>Within walking distance of my home [b]<br>Near where I live [b]<br>Objective Measures<br>Distances (e.g., 400 meters; 1500 meters) [b]<br>Time (e.g. 20 minutes walking) [b] |

a. Proximity related constraints chosen from a list presented to respondents
b. These measures were reviewed but not implemented in this study

Despite clear evidence supporting the distance-use relationship (see Table 2.1), Jane Jacobs (1961) strongly argued that many parks proximate to dense neighborhoods have people walk by them who never use them. Research on factors other than proximity that influence park use is not as plentiful, but authors have discussed or empirically identified factors influencing park use. The following sections of the chapter review the elements of this work that relate to the objectives of this study.

## The Park Appeal and Park Use Relationship

### *Perceptions of Traffic Surrounding Parks*

Kaplan and Kaplan's (1989) seminal book The Experience of Nature: a psychological perspective highlights the impact of traffic on perceived access to nearby nature. In a discussion regarding proximity being measured as time distance, physical distance, and perceived distance the authors state,

> Even if a nature place is, in fact, only minutes away, if the distance is substantial, the setting is pragmatically far away. Thus a green place that requires crossing a major highway with no traffic light in sight is appropriately considered far away (p. 155).

Bangs and Maher (1970) discussed the implications of high traffic roads on pedestrian access to parks. In their study of the proximity-use relationship among a sample of children in Baltimore, Maryland, the authors were concerned about the impact a local access street bordering one park might have on use. This concern was mitigated because the adjacent roadway was closed during peak play hours in the summer months. However, findings relating to park use and access indicated that a perception of visual barriers that inhibited pedestrian access influenced use.

Hatry and Dunn's (1971) discussion of "frustration factors" encouraged park practitioners to evaluate the impact freeways, railroads, and similar barriers had on accessing parks. The author indicated that major streets could serve as barriers to parks by blocking access.

Berg and Medrich (1980) explored play patterns of children residing in four different neighborhoods on Oakland, California. Their results identified traffic patterns, particularly heavy ones, and the need to cross major thoroughfares, as constraints that consistently influenced use in all four neighborhoods.

*Type of Park*

Dee and Liebman (1970) discussed the influence type of park appeal had on park use, especially as it related to level of development or number and type of facilities, relate to park use. The authors reported that type of park influenced the proximity-park use relationship. Nicholls' (1999) study of equity and access suggested it was inappropriate to treat all parks the same and suggested the impact would be different if a park was developed compared to whether it was undeveloped.

*Perceptions of Park Maintenance & Upkeep*

Gold (1977) cited maintenance as an institutional factor affecting nonuse. He discussed the level of importance of this issue, since it is a constraint that park managers have the ability to alleviate. Godbey's (1985) study was one of the few studies that explored a relationship between maintenance and park use. He reported that 8 % of respondents indicated poorly maintained parks or facilities were a reason influencing their nonuse (Godbey, 1985).

## Communication and Park Use Relationship

*Well-informed*

Hatry and Dunn (1971) reported that one reason people did not use neighborhood parks was because they did not know where they were located. Similarly, Godbey's (1985) study on nonuse of parks indicated that 15% of respondents did not use parks because they did not know enough about the site. These results were supported by Howard and Crompton's (1984) research in three communities (Dade County, FL; Austin, TX and Springfield, OR) in which 22%, 9%, and 26% percent of respondents, respectively, indicated they did not use parks because they had no knowledge of them. When data were viewed by a subset of low income respondents, lack of knowledge was prominently cited as a constraint to park use.

Spotts and Stynes' (1984) investigation of respondents' knowledge of 19 parks in Lansing Michigan, indicated that respondents were uncertain or had never heard of 7 parks. Based on work by Hatry and Dunn (1971) and on his own research, Gold (1977) suggested placing directional signs in park gateway areas or adjacent neighborhoods to parks in order to increase knowledge and encourage use. He also suggested locating parks so they are bordered with streets rather than houses. When parks are bordered by houses and hidden from public view, then public knowledge of and access to parks are impeded.

Schroeder and Wiens (1986) studied nonuse of parks and recreation facilities in Tulsa, Oklahoma. Findings were derived from 524 participants who were randomly selected for telephone interviews. The primary causes of inhibiting use were: lack of interest in offerings, lack of information, and lack of time.

Scott and Munson (1994) reported that 70% of all nonusers and infrequent users in the Cleveland Metro Parks study indicated they would increase their future park use if they were better informed.

*Perceptions of Information about Park Plans and Communication*

In reviewing previous work discussing factors discouraging nonuse, Gold (1977) commented on the impact of involving citizens throughout the planning and communication processes. He said, “most neighborhood parks are a tragic monument…because they usually reflect the objectives, values, and conditioning of the suppliers or decision makers instead of the users” (p. 375).

Such statements indicate the incongruence of a park’s abilities to meeting users’ needs or intended outcomes when people in the area are not included in the planning process. While including constituents in the planning process is a primary reason for conducting needs assessments, little research in the field has tested this relationship.

# CHAPTER III

# METHODOLOGY

## Study Area

College Station, Texas, was selected for this study because it was convenient. The city's population is 84,339. Its land area is approximately 40.3 square miles and includes over 1,238 acres of public parks and sports facilities, which translates to 15.1 acres per 1000 residents.

## Data Collection

Data were acquired from the City of College Station Park and Recreation Department's Needs Assessment. Information used for this research was taken from sections of the study examining households' frequency of use of parks and respondents' perceptions of accessibility, appeal of park services, and communication with park leaders.

Needs assessment data collection started in June 2005 when surveys were mailed to 1200 residents. The sample was stratified so 800 were delivered to single family homes and 400 to multiple dwelling units. The assumption was that single family homes were more likely to contain permanent residents, while multiple dwelling units were more likely to reflect the community's college population. Greater emphasis was given to permanent residents since many college student residents utilize university amenities and open space, and tend to exhibit relatively little interest in city affairs.

Two samples of 800 and 400 residents were drawn from the city's list of utility customers. Every nth name was drawn from the list so it was a probability (representative) sample. The 1200 total number was used because, based on past surveys of this nature, it was anticipated that the return rate for this study would approximate forty percent thus providing 450-500 surveys.

Every survey included a cover letter offering two incentives: (1) a "buy one admit one free" ice skating pass, and (2) a chance to win one of four family summer pool passes. Three days after mailing the surveys, reminder post cards were sent to every resident in the sample. Two weeks later, a second survey was sent to all non-respondents. Four weeks after the first mail-out, a final survey was sent to the remaining non-respondents.

Five hundred and forty-six (546) residents returned surveys usable for the purpose of the needs assessment study which represents a 45.5% response rate. Fifteen were discarded from the analysis because they were returned but not completed. A profile of residents who completed the questionnaire was compared with the profile of College Station's total population which was provided by the city's planning department. Table 3.1 shows the youngest age cohort, 18-34, was underrepresented in the sample, while the 35-64 and 65 or older age groups were overrepresented. Underrepresentation among 18-34 year olds presumably reflects the much smaller university enrollments during summer months when fewer young people reside in the city. This interpretation is supported by an imbalance in profiles between student respondents (25.6%) and non-student respondents (74.3%). It probably also explains some of the underrepresentation of apartment dwellers and overrepresentation of single family home owners (17.7%; 74.5%).

However, some of this imbalance was deliberately structured into the needs assessment survey by selecting twice as many single family homes as apartments to survey in order to avoid apartment respondents' (primarily college students) use rates from dominating the results.

**Table 3.1**
Primary Data Respondent Demographics

| | Survey Demographics % | City Demographics % |
|---|---|---|
| Age | | |
| 18-34 | 42.36 | 74.76 |
| 35-64 | 46.43 | 21.07 |
| 65+ | 11.22 | 4.47 |
| Dwelling Type | | |
| Mobile Home | 1.01 | 1.62 |
| Apartment | 17.71 | 52.02 |
| Town House/Condo | 6.84 | 5.37 |
| Single Family | 74.45 | 40.98 |
| Student Population | | |
| Student | 25.75 | 53.50 |
| Non-Student | 74.25 | 46.50 |
| Gender | | |
| Female | 50.75 | 48.80 |
| Male | 49.25 | 51.20 |

**Table 3.1 continued**

| | Survey Demographics % | City Demographics % |
|---|---|---|
| Own/Rent | | |
| Own | 66.42 | 69.30 |
| Rent | 33.58 | 30.70 |
| Ethnicity | | |
| Hispanic | 6.09 | 9.70 |
| Caucasian/Anglo | 84.09 | 77.60 |
| Black/African American | 2.36 | 5.00 |
| Asian | 7.07 | 7.35 |
| American Indian | 0.39 | 0.35 |

Ethnic, gender, and rental/owner profiles of the sample's respondents were reasonably compatible with those of the city (see Table 3.1).

## Preparation of the Secondary Data Set

The needs assessment data were modified to test the hypotheses and answer the research questions posed in this study. The following sections outline the procedures used to prepare the secondary data set.

### *GIS Methods*

GIS data layers comprising city street map data, parcel data, and city boundaries were acquired from the city. ESRI ArcMap, ArcCatalog, and ArcInfo were used to perform GIS functions. Procedures for geocoding household data and performing distance measures are described in the subsequent sections.

*Household Data*

To measure household proximity to the nearest park respondents' addresses data and relevant survey information were entered into a spreadsheet in Microsoft Excel. The file was exported as a tab delimited file into ESRI's ArcMap.

Geocode address tools were utilized to match each survey respondent's address to the city parcel layer. A decision was made to match addresses with parcel layer data instead of street layer data because parcel matches improved the level of accuracy. That is, when simple street matching is employed, streets are divided into equal segments based on the number of parcels on each street. Matches are assigned to equally divided street segments representing street addresses. This introduces a source of error for longer streets, streets with unequal or oddly shaped parcels, and streets with cul-de-sacs. Geocoding to parcel data matches each respondent's address to parcel layer polygons representing spatially accurate plots for each address.

ArcMap review/rematch functions allowed verification of parcel matches. Unmatched addresses and ties were also corrected or removed at this time. All ties in this process occurred when two or more respondents lived at the same apartment complex. In such cases, data were not corrected or changed. Parcels went unmatched when incompatible suffix information was provided; new streets had not been added to, or located on, the street network; or respondents utilized post office boxes or out of town addresses. Problems associated with the former two situations were corrected manually when the correct suffix information or street location could be identified. Post office box and out of town locations were excluded from the study. Although some studies geocode post office boxes in the center of the associated post office's zip code, actual household locations were preferred due to the nature of this study and the significant role of each distance measure.

*Park Data*

The park data were acquired from the City of College Station Parks and Recreation Department. Park layer data included spatial location information for each park and an associated park attribute table containing name, size, state of development, and amenity data. Forty-two parks were used in this study. Eastgate Park, a mini park consisting of a small grass field and flower bed adjacent to a major city gateway, was not included in the study due to its small size (about 1.7 acres) and lack of amenities.

To calculate distances from households to each park, an X Tools feature was used to create both park centroids and park points. Park centroids are points in the exact middle of each park and park points are placed along park boundaries (see Figure 3.1). Park centroids were used for centroid to centroid measures when capturing Euclidian distance measures. Given that network routes stop at a centroid's nearest intersection with street network data, park points were used to capture network distances since they points provide multiple opportunities for network routes to stop.

**Park Points**

**Park**

**Figure 3.1**
Park Points and Park Centroids

*Euclidian Distance Measures*

Euclidian distances are the shortest, straight-line distance from point A to point B (Figure 3.2). Distance from point A, each household centroid, to point B, nearest park centroid, was calculated using the *Near* feature in ArcInfo. The *Point Distance* feature was then utilized to generate the distance from each household to every park.

Centroid to centroid methods were employed to create distance data because of the simplicity of the method. Utilizing straight-line measures introduces minimal limitations for small, regular shaped household parcels and parks, but can substantially negatively impact results when parks or parcels are very large or oddly shaped. The latter scenario may substantially increase distances measured between household centroids and park centroids (Figure 3.3).

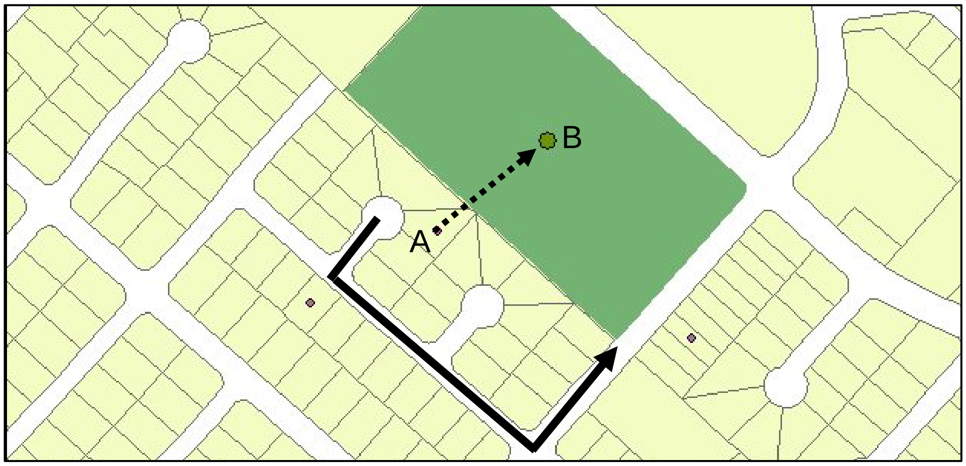


**Figure 3.2**
Euclidian and Network Measures from Point A to Point B

**Figure 3.3**
Centroid Measure Limitations for Odd Shaped Parks

Crow fly methodologies also pose limitations in that they fail to account for respondents' inability to move through barriers formed by various natural and man-made features, such as creeks, highways, houses, yards, or businesses. In most instances, it is highly unlikely that people could actually travel from their home to their neighborhood or community park via crow fly routes.

*Network Distance Measures*

Network distances are the shortest distance from point A to point B along the street network (Figure 3.2). ArcCatalog and ArcMap Network Analysis features were implemented to capture the network distances between each household and its nearest park. Three main features are utilized in network analysis: closest facility, incidents (households for the purpose of this analysis), and routes. Layers representing each of these features were ascribed to the first two features (park points to closest facilities and household centroids to incidents).

After loading all facilities and incidents, their locations were confirmed ensuring each facility and incident was recognized on the street network. Distances to nearest facilities then were calculated for each household. ArcMap color codes features, provides a *loaded* count to depict if, and how many, features were recognized. Approximately 40 points were manually moved in order to be classified as *loaded*. Since centroids were placed in the middle of each parcel, this procedure was necessary when they represented large or odd shaped parcels – making them too far from the street to be recognized.

The loading process matched incident and facility centroids to the nearest point on the street network. Proper placement confirmation was necessary for validity purposes. This was especially important in cases when cul-de-sac and corner parcel centroids were matched to streets next to, or behind, parcels instead of to the street in front of the house which was the proper address. In such occurrences, household centroids were appropriately matched to the street network (Figure 3.4)

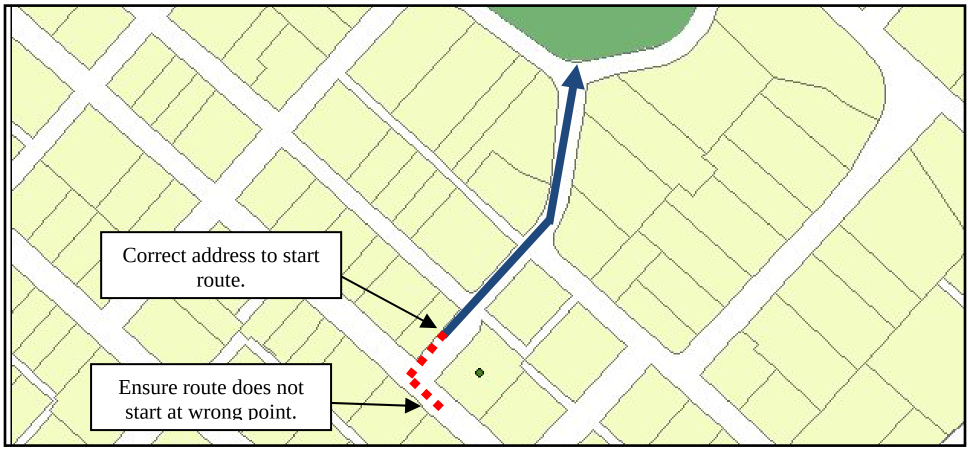


**Figure 3.4**
Proper Placement of Household Addresses for Network Routes

In addition to calculating distances from each household to its nearest park, shortest network distances were calculated from each household to each park. For this procedure, 42 individual park layers were created each containing the park points ascribed to that park. Network analysis was used to run closest facility procedures for each of the forty-eight park layers.

Deriving network distance measures necessitates several steps to verify the accuracy of all points on the street network. These processes can be tedious and time consuming when working with a large number of points (park points and household points). Further, this approach has limitations in that routes are forced to follow street network travel. This grossly inflates distance measures when members of a household can visit their nearest park using a shorter distance not traveled along the street network. For instance, a household could border, or live near, a park which could be entered directly from the rear or side, or by traveling along a short alley or right-of-way. However, street network travel forces residents to start their routes at their front door (proper street address) and travel along the street network.

*Variable Selection and Modification*

Variables of interest and relevant demographic data were abstracted from the primary City of College Station and Recreation Department's Needs Assessment data set and imported into an SPSS spreadsheet (see Table 3.2). Original survey data were based on a five point Lickert-type scale and were collapsed and recoded into binary responses for the purpose of this study. An overview of meanings ascribed to these primary variables of interest is provided in Table 3.2 and is discussed in more detail in subsequent text.

**Table 3.2**
Variable Selection and Operationalization

| Variable | Binary Value | Definition |
|---|---|---|
| Park User | 1 | Uses parks once a month or more |
| Nonuser | 0 | Users parks less than once a month |
| Proximate[a, b] | 1 | Lives within specified cut point distance of nearest park |
| Aproximate | 0 | Lives beyond specified cut point distance of nearest park |
| Accessible[c] | 1 | Perceives park is accessible by foot/bike |
| | 0 | Perceives park is not accessible by foot/bike |
| Slow Traffic | 1 | Perceives traffic around parks should be slowed down |
| | 0 | Ttraffic around parks should not be slowed down |

**Table 3.2 continued**

| Variable | Binary Value | Definition |
|---|---|---|
| Maintained | 1 | Perceives parks are well maintained and clean |
| | 0 | Does not perceive parks are well maintained and clean |
| Well-informed programs | 1 | Well-informed about park facilities and recreation |
| | 0 | Not informed about park facilities and recreation programs |
| Plans | 1 | Well-informed about plans for Neighborhood Park |
| | 0 | Not informed about plans for Neighborhood Park |
| Feedback | 1 | Perceives ease in two-way communication with PARD |
| | 0 | Does not perceive ease in two-way communication with PARD |

a. Proximate respondents are often referred to as the within group since they reside within the cut point while aproximate respondents are often referred to as the beyond group since they reside beyond the cut point
b. Cut points were created and tested at ¼; ½; ¾; and 1 mile of each park using both Euclidian and Network distance measures
c. Two approaches were utilized to recode Lickert scale type data into binary data. Further explanation is provided later in the chapter.

*Park User and Nonuser*

Park user and nonuser data were collected as part of the primary survey. Respondents were instructed to provide information regarding how often their household's members collectively used neighborhood and community parks. Choices included: almost daily, about once a week, about once a month, a few times a year, and not at all (Figure 3.5). For the purpose of secondary analysis, data were recoded in binary form. Park users were defined as those households using the park at least once a month or more, while nonusers consisted of households using neighborhood and community parks less than once a month or not at all.

| How often do you and/or someone in your household use each of the following College Station Park facilities and recreation programs? (Circle one on each line) | Almost Daily | About Once a Week | About Once a Month | A few Times a Year | Not at All |
|---|---|---|---|---|---|
| Neighborhood/Community Parks | D | W | M | Y | N |

**Figure 3.5**
Primary Data Survey Question Related to Neighborhood and Community Park Use

*Proximate and Aproximate*

Exact household to nearest park measures initially were captured using the GIS methods discussed earlier in the chapter in the GIS methods section. New, binary variables were created for each distance unit used to operationalize proximity ( ¼ mile, ½ mile, ¾ mile, 1 mile). For example, when a household was further than one-fourth of a mile from the nearest park, data were coded "0" –meaning aproximate -- whereas, if household distance was within one-fourth a mile of the nearest park it was coded "1" – meaning proximate. This procedure was replicated for all operationalizations of the dependent variable using both Euclidian and Network measures of distance. This procedure created the within (a.k.a. proximate) and beyond (a.k.a. aproximate) samples based on households' geographical locations.

**Table 3.3**
Number of Households Mapped Within and Beyond Each Cut Point

| Cut Point | Euclidian | | Network | |
|---|---|---|---|---|
| | Within | Beyond | Within | Beyond |
| ¼ mile | 197 | 261 | 210 | 248 |
| ½ mile | 403 | 55 | 360 | 98 |
| ¾ mile | 441 | 17 | 429 | 29 |
| 1 mile | 456 | 2 | 449 | 9 |

As indicated by the sub-samples presented in Table 3.3, the procedure employed to create distance data altered the sample distribution and introduced a post facto sampling limitation. That is, by segmenting secondary data based on geographical associations instead of randomly selecting an equal sample within each geographic range ( ¼ mile, ½ mile, ¾ mile, 1 mile), sample sizes were explicitly uneven.

*Developed Park*

To explore the role of type of park (developed) on the proximity – park use relationship, attribute data associated with the GIS park layer were used to determine each park's state of development. These were coded as developed and non-developed. Since distance measures were captured from every household to each park, exact distances to the nearest developed park were determined for each household.

Out of the 42 parks 34 were defined as "developed". Proximate and aproximate measures were calculated for the "developed park" data set.

*Accessible, Slow Traffic, Well-Informed, Maintained, Informed Plans, and Feedback*

Six of 14 perception variables that addressed issues of concern in this dissertation were selected from primary survey data and were modified for use in this study (Figure 3.6). Originally, respondents were asked if they strongly agreed, agreed, had no knowledge, disagreed, or strongly disagreed with statements relating to accessing parks on foot or by bike, directing or slowing traffic around parks, being well-informed about facilities and programs, maintaining parks, knowing about park plans, and obtaining and offering park feedback (see Figure 3.3).

In all cases, data were coded into binary form in which both agree and strongly agree, and disagree and strongly disagree were consolidated (see Tables 3.4 and 3.5).

**In the following section, please read each statement and CIRCLE the response which indicates how much you agree or disagree with each statement regarding College Station Park and Recreation Services?**

| | **Strongly Agree** | **Agree** | **I have no Knowledge** | **Disagree** | **Strongly Disagree** |
|---|---|---|---|---|---|
| I can get to my favorite park facilities on foot or by bicycle | SA | A | NK | D | SD |
| Automobile traffic around parks should be diverted or slowed down……………... | SA | A | NK | D | SD |
| College Station Parks are well-maintained and clean | SA | A | NK | D | SD |
| I am well-informed about College Station's park and recreation programs……... | SA | A | NK | D | SD |
| I am well-informed about plans for parks in my neighborhood | SA | A | NK | D | SD |
| It is easy for me to offer feedback to the park department and to obtain answers from them to any questions……………….. | SA | A | NK | D | SD |

**Figure 3.6**
Primary Data Survey Questions Related to Accessibility, Slowing Traffic, Being Well-Informed, Maintaining Level of Parks, Informed About Plans, and Feedback

When recoding primary data into binary form, decisions had to be made regarding how to code data from respondents indicating they "have no knowledge". In cases which relationships being investigated utilize variables representing knowledge (i.e., are respondents well-informed) it was unclear why some respondents indicated that they disagreed while others indicated they had no knowledge.  It seemed necessary to understand if the group lacking knowledge had different characteristics from those who indicated they were informed (i.e., they agreed or disagreed).

Thus, for each of the four perception variables in which level of knowledge was relevant, statistical tests were run using agree and strongly agree collapsed into an agree cohort; disagree and strongly disagree collapsed into a disagree cohort, and a no knowledge cohort. Data also were tested with agree collapsed in the same manner, no knowledge coded as disagree, and disagree and strongly disagree coded as non-response. This allowed exploration of differences between those who agree they are informed and those who disagree, and between those who agree they are informed and those who indicate they have no knowledge. Operationalizations and statistical tests associated with this variable are described in Tables 3.4 and 3.5.

**Table 3.4**
Variable Selection and Operationalization

| Variable<br>I: Independent<br>D: Dependent | | Operationalization |
|---|---|---|
| H1a(I) | Proximity to Nearest Park | Yes (within ¼ Euclidian Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >) Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H1b(I) | Proximity to Nearest Park | Yes (within ½ Euclidian Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H1c(I) | Proximity to Nearest Park | Yes (within ¾ Euclidian Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5 |
| H1d(I) | Proximity to Nearest Park | Yes (within 1 Euclidian Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H1e(I) | Proximity to Nearest Park | Yes (within ¼ Network Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H1f(I) | Proximity to Nearest Park | Yes (within ½ Network Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H1g(I) | Proximity to Nearest Park | Yes (within ¾ Network Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |

**Table 3.4 continued**

| Variable<br>I: Independent<br>D: Dependent | | Operationalization |
|---|---|---|
| H1h(I) | Proximity to Nearest Park | Yes (within 1 Network Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H2a(I) | Accessible | Yes (Strongly Agree, Agree); No (Strongly Disagree, Disagree); 99999( No Knowledge)[a] |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H2b(I) | Accessible | Yes (Strongly Agree, Agree); No (No Knowledge); 99999 (Strongly Disagree, Disagree) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H3a(I) | Traffic | Yes (Strongly Agree, Agree); No (Strongly Disagree, Disagree); 99999( No Knowledge)[a] |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H4a(I) | Proximity to Nearest Dev. Park | Yes (within ¼ Euclidian Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H4b(I) | Proximity to Nearest Dev. Park | Yes (within ½ Euclidian Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H4c(I) | Proximity to Nearest Dev. Park | Yes (within ¾ Euclidian Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H4d(I) | Proximity to Nearest Dev. Park | Yes (within 1 Euclidian Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >) /Nonuse; (< Once a month) (coded from L1,<L2,…L5) |
| H4e(I) | Proximity to Nearest Dev. Park | Yes (within ¼ Network Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H4f(I) | Proximity to Nearest Dev. Park | Yes (within ½ Network Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H4g(I) | Proximity to Nearest Dev. Park | Yes (within ¾ Network Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H4h(I) | Proximity to Nearest Dev. Park | Yes (within 1 Network Mile); No (beyond ¼ mile) (coded from exact distance) |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H5a(I) | Maintained | Yes (Strongly Agree, Agree); No (Strongly Disagree, Disagree); 99999( No Knowledge)[a] |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H6(I) | Well-Informed | Yes (Strongly Agree, Agree); No (Strongly Disagree, Disagree); 99999( No Knowledge)[a] |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H7(I) | Informed Plans | Yes (Strongly Agree, Agree); No (Strongly Disagree, Disagree); 99999( No Knowledge)[a] |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |
| H8(I) | Feedback | Yes (Strongly Agree, Agree); No (Strongly Disagree, Disagree); 99999( No Knowledge)[a] |
| (D) | Household Use of Parks | User (Once a month or >); Nonuser (< Once a month) (coded from L1,<L2,…L5) |

a. Coded from SA,A,KN,D,SD

## Data Analysis Procedures

After preparing the GIS and secondary data, they were compiled into one spreadsheet and analyzed statistically in SPSS.

Simple logistical regression was utilized to test all eight hypotheses (see Table 3.6). While these procedures can provide results which support or reject each hypotheses, likelihoods were calculated to better understand the magnitude of difference between groups. While it is meaningful to know if one group is significantly more likely to use a park, likelihoods, odds ratios, and odds, provide a more in-depth understanding of the proximity-use relationship. That is, if one group is significantly more likely to use parks, it is helpful to know if its members are one percent or forty percent more likely to use parks.  Thus, probability and odds calculations were posed as research questions and run for each hypothesis.

Patterns of likelihood also were explored to better understand if the proximity-use relationship was consistent when the operationalization of the dependent variable was modified by type of measure (Euclidian and Network) and by distance cut point ( ¼ mile, ½ mile, ¾ mile and 1 mile).

**Table 3.5**
Methods of Analysis

| Variables<br>I: Independent; D: Dependent | | Analysis |
|---|---|---|
| H1a(I)<br>(D) | Proximity to Park ( ¼ Euc. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H1b(I)<br>(D) | Proximity to Park ( ½ Euc. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H1c(I)<br>(D) | Proximity to Park ( ¾ Euc. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H1d(I)<br>(D) | Proximity to Park ( 1 Euc. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H1e(I)<br>(D) | Proximity to Park ( ¼ Net. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H1f(I)<br>(D) | Proximity to Park ( ½ Net. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H1g(I)<br>(D) | Proximity to Park ( ¾ Net. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H1h(I)<br>(D) | Proximity to Park ( 1 Net. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H2a(I)<br>(D) | Accessible (SA,A: KN,D, SD)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H2b(I)<br>(D) | Accessible (SA,A: KN)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H3a(I)<br>(D) | Slow Traffic (SA,A: KN,D, SD)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H4a(I)<br>(D) | Proximity to Developed Park (¼ Euc. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H4b(I)<br>(D) | Proximity to Developed Park (½ Euc. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H4c(I)<br>(D) | Proximity to Developed Park (¾ Euc. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H4d(I)<br>(D) | Proximity to Developed Park (1 Euc. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H4e(I)<br>(D) | Proximity to Developed Park ( ¼ Net. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H4f(I)<br>(D) | Proximity to Developed Park ( ½ Net. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H4g(I)<br>(D) | Proximity to Developed Park ( ¾ Net. mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H4h(I)<br>(D) | Proximity to Developed Park ( 1 Net mile)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |

**Table 3.5 continued**

| Variables<br>I: Independent; D: Dependent | | Analysis |
|---|---|---|
| H5a(I)<br>(D) | Maintained (SA,A: KN,D, SD)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H6a(I)<br>(D) | Well-Informed (SA,A: KN,D, SD)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H6b(I)<br>(D) | Well-Informed (SA,A: KN)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H7a(I)<br>(D) | Informed Plans (SA,A: KN,D, SD)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H7b(I)<br>(D) | Informed Plans (SA,A: KN)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H8a(I)<br>(D) | Feedback (SA,A: KN,D, SD)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |
| H8b(I)<br>(D) | Feedback (SA,A: KN)<br>Household Use of Parks | Simple Logistics<br>Probability and Odds Calculations |

Nagelkerke R2, Chi-square, Chi-square significance., B, S.E., Walk, df, Sig, and Exp (B) results were reported for all simple logistic tests. Descriptive data in the form of contingency tables, probability calculations, odds calculations, and differences in probabilities between groups were reported for each relationship in order to explore what magnitude of differences occurred between groups.

*Secondary Data*

The modified data set consisted of 458 mapped households (see Figure 3.6), and they comprised the secondary data set used for the analysis in this dissertation. A profile of respondents included in the secondary data analysis is compared with the profile of College Station's total population (Table 3.6). The disparities and similarities between the two profiles essentially reflect those reported in Table 3.6 where the total population profile was compared with the Needs Assessment sample profile.

**Table 3.6**
Respondent Demographics for Secondary Data Set

| | Survey Demographics % | City Demographics % |
|---|---|---|
| Age | | |
| 18-34 | 45.90 | 74.76 |
| 35-64 | 42.80 | 21.07 |
| 65+ | 11.40 | 4.47 |
| Dwelling Type | | |
| Mobile Home | 0.07 | 1.62 |
| Apartment | 16.20 | 52.02 |
| Town House/Condo | 6.60 | 5.37 |
| Single Family | 69.00 | 40.98 |
| Student Population | | |
| Student | 26.60 | 53.50 |
| Non-Student | 73.10 | 46.50 |
| Gender | | |
| Female | 48.00 | 48.80 |
| Male | 52.00 | 51.20 |
| Own/Rent | | |
| Own | 66.20 | 69.30 |
| Rent | 33.80 | 30.70 |
| Ethnicity | | |
| Hispanic | 5.70 | 9.70 |
| Caucasian/Anglo | 81.40 | 77.60 |
| Black/African American | 2.40 | 5.00 |
| Asian | 5.90 | 7.35 |
| American Indian | 0.00 | 0.35 |

# CHAPTER IV

# FINDINGS

## Hypothesis 1

Respondents living proximate, within a specific cut point, to a neighborhood or community park are more likely to use parks than respondents living aproximate, beyond the specific cut point, to a park.

*Findings Relating to Euclidian Measures for Hypothesis 1*

**Table 4.1**
Proximity and Park Use Simple Logistic Statistics for Euclidian ¼, ½, ¾, and 1 Mile

| Operationalization | Nagelkerke $R^2$ | Chi-square | Chi-square Sig. | B | S.E. | Wald | df | Sig. | Exp (B) |
|---|---|---|---|---|---|---|---|---|---|
| a. ¼ Euclidian Mile | 0.022 | 7.667 | 0.006 | 0.534 | 0.194 | 7.560 | 1 | 0.006 | 1.705 |
| b. ½ Euclidian Mile | 0.018 | 6.326 | 0.012 | 0.727 | 0.292 | 6.222 | 1 | 0.013 | 2.070 |
| c. ¾ Euclidian Mile | 0.017 | 5.743 | 0.017 | 1.228 | 0.541 | 5.155 | 1 | 0.023 | 3.415 |
| d. 1 Euclidian Mile | 0.000 | 0.047 | 0.828 | 0.309 | 1.417 | 0.048 | 1 | 0.827 | 1.363 |

*Hypothesis 1a: Operationalization ¼ Euclidian Mile*

[p(7.560) = 0.006] < alpha = 0.05; Accept $H_{(1a)}$

Statistical results reported in Table 4.1 indicate proximity has a significant impact on park use. Thus, data support the hypothesis: respondents living within ¼ Euclidian mile of a park are more likely to use parks than respondents living beyond ¼ mile.

*Hypothesis 1b: Operationalization ½ Euclidian Mile*

[p(6.222) = 0.013] < alpha = 0.05; Accept $H_{(1b)}$

The hypothesis, respondents living within ½ Euclidian mile to a park are more likely to use parks, is verified by the statistically significant impact the independent variable proximity has on the dependent variable park use (see Table 4.1).

*Hypothesis 1c: Operationalization ¾ Euclidian Mile*

[p(5.155) = 0.023] < alpha = 0.05; Accept $H_{(1c)}$

According to statistical data reported in Table 4.1, park use is significantly impacted by proximity; therefore, findings indicate to accept the hypothesis that respondents living proximate (i.e., within ¾ Euclidian mile) to a park are more likely to use parks than those living beyond ¾ mile.

*Hypothesis 1d: Operationalization 1 Euclidian Mile*

[p(0.048) = 0.827] > alpha = 0.05; Reject $H_{(1d)}$

Statistically proximity, when defined as living within 1 Euclidian mile, is not significant. Therefore, H (1d) is rejected (see Table 4.1)

*Findings Relating to Network Measures for Hypothesis 1*

**Table 4.2**
Proximity and Park Use Simple Logistic Statistics for Network ¼, ½, ¾ and 1 Mile

| Operationalization | Nagelkerke $R^2$ | Chi-square | Chi-square Sig. | B | S.E. | Wald | df | Sig. | Exp (B) |
|---|---|---|---|---|---|---|---|---|---|
| e. ¼ Network Mile | 0.015 | 5.166 | 0.023 | 0.434 | 0.192 | 5.123 | 1 | 0.024 | 1.543 |
| f. ½ Network Mile | 0.037 | 12.628 | 0.000 | 0.817 | 0.232 | 12.416 | 1 | 0.000 | 2.263 |
| g. ¾ Network Mile | 0.020 | 6.730 | 0.009 | 1.014 | 0.403 | 6.341 | 1 | 0.012 | 2.758 |
| h. 1 Network Mile | 0.006 | 2.200 | 0.138 | 1.021 | 0.714 | 2.048 | 1 | 0.152 | 2.777 |

*Hypothesis 1e: Operationalization ¼ Network Mile*

[p(5.123) = 0.024] < alpha = 0.05; Accept $H_{(1e)}$

The significant relationship reported in Table 4.2 between the variables of interest proximity and park use provides evidence which supports the hypothesis: respondents living proximate (i.e., within ¼ Network mile) to a park are more likely to use parks.

*Hypothesis 1f: Operationalization ½ Network Mile*

[p(12.461) = 0.000] < alpha = 0.05; Accept $H_{(1f)}$

The hypothesis, respondents living proximate (i.e., within ½ Network mile) to a park are more likely to use parks, is accepted due to the significant impact of the predictor variable proximity on park use (see Table 4.2).

*Hypothesis 1g: Operationalization ¾ Network Mile*

[p(6.341) = 0.012] < alpha = 0.05; Accept $H_{(1g)}$

The significant relationship between the explanatory variable proximity and the response variable park use confirms the hypothesis: respondents living proximate (i.e., within ¾ Network mile) to a park are more likely to use parks (see Table 4.2).

*Hypothesis 1h: Operationalization 1 Network Mile*

[p(2.048) = 0.152] > alpha = 0.05; Reject $H_{(1h)}$

Given the lack of statistical significance reported in Table 4.2 the hypothesis, respondents living proximate (i.e., within 1 Network mile) to a park are more likely to use parks, is rejected.

Hypothesis 2

Respondents who perceive they can reach a park on foot or by bicycle are more likely to use parks than respondents who do not perceive they can reach a park on foot or by bicycle.

**Table 4.3**
Access on Foot or By Bicycle and Park User Simple Logistic Statistics

| Operationalization | Nagelkerke $R^2$ | Chi-square | Chi-square Sig. | B | S.E. | Wald | df | Sig. | Exp (B) |
|---|---|---|---|---|---|---|---|---|---|
| a. Access | 0.010 | 3.039 | 0.081 | 0.377 | 0.216 | 3.051 | 1 | 0.081 | 1.458 |
| b. Access | 0.144 | 36.340 | 0.000 | 1.919 | 0.351 | 29.907 | 1 | 0.000 | 6.816 |

a. Coded agree for strongly agree and agree; coded disagree for strongly disagree and disagree; and coded 99999 for no knowledge.
b. Coded agree for strongly agree, and agree and coded disagree for no knowledge.

[P(3.051) = 0.081] > alpha = 0.05; Reject $H_{(4a)}$

[P(29.907) = 0.000] > alpha = 0.05; Accept $H_{(4b)}$

According to data presented in Table 4.3, respondents who perceive they can reach a park on foot or by bicycle are not significantly more likely to use parks than respondents who do not perceive they can reach a park on foot or by bicycle. However, respondents who perceive they can access a park on foot or by bicycle are significantly more likely to use parks than respondents who indicate they have no knowledge if they can reach a park on foot or by bicycle.

Hypothesis 3

Respondents who perceive traffic around parks should be slowed down are less likely to use parks than respondents who do not perceive traffic around parks should be slowed down.

**Table 4.4**
Traffic and Park User Simple Logistic Statistics

| Operationalization | Nagelkerke $R^2$ | Chi-square | Chi-square Sig. | B | S.E. | Wald | df | Sig. | Exp (B) |
|---|---|---|---|---|---|---|---|---|---|
| a. Traffic | 0.000 | 0.079 | 0.779 | -0.070 | 0.249 | 0.078 | 1 | 0.779 | 0.933 |

a. Coded agree for strongly agree and agree; coded disagree for strongly disagree and disagree; and coded 99999 for no knowledge.

[P(0.078) = 0.779] > alpha = 0.05; Reject $H_{(4)}$

Slowing traffic down is not statistically related to park use so the hypothesis is rejected (see Table 4.4).

Hypothesis 4

Respondents living proximate to a developed neighborhood or community park, within a specific cut point, are more likely to use parks than those respondents living aproximate, beyond the specific cut point, to a developed park.

*Findings Relating to Euclidian and Nearest Developed Park Measures for Hypothesis 4*

**Table 4.5**
Proximity and Developed Park Use Simple Logistic Statistics for Euclidian ¼, ½, ¾, and 1 Mile

| Operationalization | Nagelkerke $R^2$ | Chi-square | Chi-square Sig. | B | S.E. | Wald | df | Sig. | Exp (B) |
|---|---|---|---|---|---|---|---|---|---|
| a. ¼ Euclidian Mile | 0.039 | 13.595 | 0.000 | 0.757 | 0.209 | 13.080 | 1 | 0.000 | 2.132 |
| b. ½ Euclidian Mile | 0.024 | 8.324 | 0.004 | 0.626 | 0.218 | 8.280 | 1 | 0.004 | 1.870 |
| c. ¾ Euclidian Mile | 0.014 | 4.793 | 0.029 | 0.691 | 0.318 | 4.721 | 1 | 0.030 | 1.996 |
| d. 1 Euclidian Mile | 0.004 | 1.273 | 0.259 | 0.615 | 0.549 | 1.256 | 1 | 0.262 | 1.849 |

*Hypothesis 4a: Operationalization ¼ Euclidian Mile to Nearest Developed Park*

[p(13.080) = 0.000] < alpha = 0.05; Accept $H_{(2a)}$

The statistically significant relationship between proximity and park use validates the hypothesis respondents living proximate (i.e., within ¼ Euclidian mile) to a developed park are more likely to use parks (see Table 4.5).

*Hypothesis 4b: Operationalization ½ Euclidian Mile to Nearest Developed Park*

[p(8.280) = 0.004] < alpha = 0.05; Accept $H_{(2b)}$

According to the statistical findings reported in Table 4.5, the significant relationship between proximity and park use upholds the hypothesis: respondents living proximate (i.e., within ½ Euclidian mile) to a developed park are more likely to use parks.

*Hypothesis 4c: Operationalization ¾ Euclidian Mile to Nearest Developed Park*

[p(4.721) = 0.030] < alpha = 0.05; Accept $H_{(2c)}$

Evidence supporting the hypothesis respondents living proximate (i.e., within ¾ Euclidian mile) to a developed park are more likely to use parks, is provided by the significant relationship between the variables of interest proximity and park use (see Table 4.5).

*Hypothesis 4d: Operationalization 1 Euclidian Mile to Nearest Developed Park*

[p(1.256) = 0.262] > alpha = 0.05; Reject $H_{(2d)}$

Data presented in Table 4.3 do not support the hypothesis: respondents living proximate, within 1 Euclidian mile, to a developed park are not more likely to use parks.

*Findings Relating to Network Measures to Nearest Developed Park Measures for Hypothesis 4*

**Table 4.6**
Proximity and Developed Park Use Simple Logistic Statistics for Network ¼. ½, ¾, and 1 Mile

| Operationalization | Nagelkerke $R^2$ | Chi-square | Chi-square Sig. | B | S.E. | Wald | df | Sig. | Exp (B) |
|---|---|---|---|---|---|---|---|---|---|
| e. ¼ Network Mile | 0.031 | 10.760 | 0.001 | 0.645 | 0.199 | 10.510 | 1 | 0.001 | 1.907 |
| f. ½ Network Mile | 0.051 | 17.895 | 0.000 | 0.902 | 0.215 | 17.543 | 1 | 0.000 | 2.465 |
| g. ¾ Network Mile | 0.016 | 5.504 | 0.019 | 0.765 | 0.330 | 5.382 | 1 | 0.020 | 2.149 |
| h. 1 Network Mile | 0.004 | 1.273 | 0.259 | 0.615 | 0.549 | 1.256 | 1 | 0.262 | 1.849 |

*Hypothesis 4e: Operationalization ¼ Network Mile to Nearest Developed Park*

[p(10.510) = 0.001] < alpha = 0.05; Accept $H_{(2e)}$

The hypothesis, respondents living proximate (i.e., within ¼ Network mile) to a developed park are more likely to use parks, is confirmed by the significant relation between proximity and park use (see Table 4.6).

*Hypothesis 4f: Operationalization ½ Network Mile to Nearest Developed Park*

[p(17.543) = 0.000] < alpha = 0.05; Accept $H_{(2f)}$

Statistical evidence shown in Table 4.6 validates the hypothesis; respondents living proximate (i.e., within ½ Network mile) to a developed park are more likely to use parks.

*Hypothesis 4g: Operationalization ¾ Network Mile to Nearest Developed Park*

[p(5.382) = 0.020] < alpha = 0.05; Accept $H_{(2g)}$

Statistical findings corroborating the hypothesis, respondents living proximate (i.e., within ¾ Network mile) to a developed park are more likely to use parks, are reported in Table 4.6.

*Hypothesis 4h: Operationalization 1 Network Mile to Nearest Developed Park*

[p(1.256) = 0.262] > alpha = 0.05; Reject $H_{(2h)}$

The hypothesis, respondents living proximate (i.e., within one Network mile) to a developed park are more likely to use parks, must be rejected since results reported in Table 4.6 indicate a non-significant relationship between proximity and park use.

Hypothesis 5

Respondents who perceive parks are well-maintained and clean are more likely to use parks than respondents who perceive parks are not well-maintained and clean.

**Table 4.7**
Well-maintained and Park User Simple Logistic Statistics

| Operationalization | Nagelkerke $R^2$ | Chi-square | Chi-square Sig. | B | S.E. | Wald | df | Sig. | Exp (B) |
|---|---|---|---|---|---|---|---|---|---|
| a. Maintained | 0.012 | 3.574 | 0.059 | -0.687 | 0.379 | 3.275 | 1 | 0.070 | 0.503 |

a. Coded agree for strongly agree and agree; coded disagree for strongly disagree and disagree; and coded 99999 for no knowledge.

[P(3.275) = 0.070] > alpha = 0.05; Reject $H_{(2h)}$

Data reported in Table 4.7 do not provide statistical evidence to support the hypothesis, thus perceptions of parks being well-maintained and clean and park use are not related.

Hypothesis 6

Respondents who perceive they are well-informed about park facilities are more likely to use parks than respondents who do not perceive they are well-informed about park facilities.

**Table 4.8**
Well-informed and Park User Simple Logistic Statistics

| Operationalization | Nagelkerke $R^2$ | Chi-square | Chi-square Sig. | B | S.E. | Wald | df | Sig. | Exp (B) |
|---|---|---|---|---|---|---|---|---|---|
| a. Well-Informed | 0.024 | 6.919 | 0.009 | 0.572 | 0.218 | 6.909 | 1 | 0.009 | 1.772 |

a. Coded agree for strongly agree and agree; coded disagree for strongly disagree and disagree; and coded 99999 for no knowledge.

$[P(6.909) = 0.009] > \text{alpha} = 0.05$; Accept $H_{(5a)}$

Statistics reported in Table 4.8 confirm that well-informed respondents are more likely to use parks than respondents who do not feel they are well-informed.

Hypothesis 7

Respondents who perceive they are well-informed about plans for neighborhood parks are more likely to use parks than respondents who do not perceive they are well-informed about plans for neighborhood parks.

**Table 4.9**
Well-informed about Park Plans and Park User Simple Logistic Statistics

| Operationalization | Nagelkerke $R^2$ | Chi-square | Chi-square Sig. | B | S.E. | Wald | df | Sig. | Exp (B) |
|---|---|---|---|---|---|---|---|---|---|
| a. Plans | 0.001 | 0.171 | 0.679 | 0.112 | 0.270 | 0.170 | 1 | 0.680 | 1.118 |

a. Coded agree for strongly agree and agree; coded disagree for strongly disagree and disagree; and coded 99999 for no knowledge.

[P(0.170) = 0.680] > alpha = 0.05; Reject $H_{(7a)}$

Participants who report they are not aware or have no knowledge about plans for their neighborhood parks are statistically no less likely to use parks than those who report they are well-informed about plans (see Table 4.9).

Hypothesis 8

Respondents who perceive they can easily communicate with park leaders are more likely to use parks than respondents who do not perceive they can easily communicate with park leaders.

**Table 4.10**
Communication and Park User Simple Logistic Statistics

| Operationalization | Nagelkerke $R^2$ | Chi-square | Chi-square Sig. | B | S.E. | Wald | df | Sig. | Exp (B) |
|---|---|---|---|---|---|---|---|---|---|
| a. Communication | 0.005 | 0.796 | 0.372 | 0.285 | 0.318 | 0.801 | 1 | 0.371 | 1.329 |

a. Coded agree for strongly agree and agree; coded disagree for strongly disagree and disagree; and coded 99999 for no knowledge.

[P(0.801) = 0.371] > alpha = 0.05; Reject $H_{(2h)}$

According to data presented in Table 4.10, respondents who perceive they can communicate effectively with park departments are no more likely to use parks than those who do not perceive they can communicate effectively.

## Research Question 1a

What magnitude of difference in “more likely to use parks” occurs between proximate and aproximate respondents?

### *Operationalization ¼ Euclidian Mile*

When the independent variable proximity is operationalized as ¼ Euclidian mile, there is a 65% probability respondents living proximate to a park use parks. The odds of these respondents using parks are 1.86 times the odds of not using parks. Data reported in Table 4.11 indicate respondents living beyond ¼ mile of a park have a 52% probability of using parks. These respondents are 1.09 times more likely to use a park than not (see Table 4.11).

**Table 4.11**
Likelihood and Odds Calculations for ¼ Euclidian Mile and Park User

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 128 | 197 | 0.65 | 69 | 197 | 0.35 | 1.86 |
| Beyond | 136 | 261 | 0.52 | 125 | 261 | 0.48 | 1.09 |
| Difference [a] | | | 13% | | | | |
| Odds Ratio [b] | | | | | | | 1.71 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.006)

The odds of park use for proximate households are 1.71 times the odds of park use for aproximate residents (see Table 4.11). Proximate households are 13% more likely to use parks than aproximate households.

*Operationalization ½ Euclidian Mile*

Calculations presented in Table 4.12 indicate respondents living proximate to a park, within ½ Euclidian mile, have a 60% probability of using parks. The proximate group's park use odds are 1.49 times the odds of not using a park.

For respondents living beyond ½ Euclidian mile of a park their odds of park use are 0.72 the odds of not using a park. Thus, there is only a 42% probability that aproximate respondents will use parks (see Table 4.12).

**Table 4.12**
Likelihood and Odds Calculations for ½ Euclidian Mile and Park Use

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 241 | 403 | 0.60 | 162 | 403 | 0.40 | 1.49 |
| Beyond | 23 | 55 | 0.42 | 32 | 55 | 0.58 | 0.72 |
| Difference [a] | | | 18% | | | | |
| Odds Ratio [b] | | | | | | | 2.07 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.013)

When classified as living proximate to a park, within ½ mile, respondents' odds of park use are 2.07 times those of respondents living beyond ½ mile of a park. The likelihood of park use is 18% higher for respondents proximate to parks (see Table 4.12).

*Operationalization ¾ Euclidian Mile*

According to data presented in Table 4.13, the odds of park use for respondents living proximate to a park are 3.42 times the odds of park use for respondents living aproximate to a park. That is, respondents living close to parks are 30% more likely to use parks than respondents living beyond ¾ a mile from a park.

**Table 4.13**
Likelihood and Odds Calculations for ¾ Euclidian Mile and Park Use

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 259 | 441 | 0.59 | 182 | 441 | 0.41 | 1.42 |
| Beyond | 5 | 17 | 0.29 | 12 | 17 | 0.71 | 0.42 |
| Difference [a] | | | 30% | | | | |
| Odds Ratio [b] | | | | | | | 3.42 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.023)

As shown in Table 4.14, the sample of respondents living within ¾ mile of a park has a 60% likelihood of using parks (odds 1.42). Respondents living beyond ¾ mile from a park only have a 29% likelihood of park use (odds 0.42).

*Operationalization 1 Euclidian Mile*

**Table 4.14**
Likelihood and Odds Calculations for 1 Euclidian Mile and Park Use

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 263 | 456 | 0.58 | 193 | 456 | 0.42 | 1.36 |
| Beyond | 1 | 2 | 0.50 | 1 | 2 | 0.50 | 1.00 |
| Difference [a] | | | 8% | | | | |
| Odds Ratio [b] | | | | | | | 1.36 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.827)

This finding was not significant so a discussion of differences in likelihood is irrelevant (Table 4.14).

*Operationalization ¼ Network Mile*

Results calculated in Table 4.15 provide comparisons of probability of use between respondents living proximate and aproximate to a park. The 63% probability of use for proximate respondents indicates they are 1.73 times more likely to use a park than not. Meanwhile, the respondents living beyond 1/4 mile from a park are 1.12 times more likely to use a park (i.e., a 53% probability of park use).

**Table 4.15**
Likelihood and Odds Calculations for ¼ Network Mile and Park Use

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 133 | 210 | 0.63 | 77 | 210 | 0.37 | 1.73 |
| Beyond | 131 | 248 | 0.53 | 117 | 248 | 0.47 | 1.12 |
| Difference [a] | | | 10% | | | | |
| Odds Ratio [b] | | | | | | | 1.54 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.024)

When comparing odds of park use for respondents living proximate to parks to odds of park use for respondents living aproximate to a park, the proximate group's odds are 1.54 times the aproximate group's odds. This yields a 10% difference in likelihood of use between the proximate and aproximate groups (see Table 4.15).

*Operationalization ½ Network Mile*

Probability and odds calculations presented in Table 4.16 reveal a 62% probability of park use for respondents living within ½ mile of a park and a 42% probability of park use for respondents living beyond ½ mile of a park. The odds of park use to non-use are 1.63 for those close to parks and 0.72 for those beyond the ½ mile cut point defining proximate.

**Table 4.16**

Likelihood and Odds Calculations for ½ Network Mile and Park Use

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 223 | 360 | 0.62 | 137 | 360 | 0.38 | 1.63 |
| Beyond | 41 | 98 | 0.42 | 57 | 98 | 0.58 | 0.72 |
| Difference [a] | | | 20% | | | | |
| Odds Ratio [b] | | | | | | | 2.26 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.000)

Thus, the odds of park use for respondents living close to parks are 2.26 times odds of park use for those living beyond ½ mile. That is a 20% difference in how likely each group is to use parks (see Table 4.16).

*Operationalization ¾ Network Mile*

As indicated in Table 4.17, respondents living proximate to a park have a 60% probability of park use. Participants living beyond ¾ mile only have a 34% probability of park use. The associated odds are 1.45 for proximate respondents and 0.53 for those living beyond ¾ mile.

**Table 4.17**

Likelihood and Odds Calculations for ¾ Network Mile and Park Use

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 254 | 429 | 0.59 | 175 | 429 | 0.41 | 1.45 |
| Beyond | 10 | 29 | 0.34 | 19 | 29 | 0.66 | 0.53 |
| Difference [a] | | | 25% | | | | |
| Odds Ratio [b] | | | | | | | 2.76 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.012)

Accordingly, proximate respondents have park use odds 2.76 times aproximate respondents and are 25% times more likely to use parks (see Table 4.17).

*Operationalization 1 Network Mile*

**Table 4.18**
Likelihood and Odds Calculations for 1 Network Mile and Park Use

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 261 | 449 | 0.58 | 188 | 449 | 0.42 | 1.39 |
| Beyond | 3 | 9 | 0.33 | 6 | 9 | 0.67 | 0.50 |
| Difference [a] | | | 25% | | | | |
| Odds Ratio [b] | | | | | | | 2.77 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.152)

Findings relating to the relationship between 1 Network mile and park use are not statistically significant (see Table 4.18).

Research Question 1b

As the distance used to create the dichotomy for the predictor variable proximity increases, what patterns in probability of use, if any, occur across the various cut points for Euclidian measures?

**Table 4.19**
Comparisons of Probability of Use for Euclidian Distances ¼, ½, ¾, and 1 Mile

| Operationalization | Within | Beyond | Difference |
|---|---|---|---|
| ¼ Mile | 0.65 | 0.52 | 13% |
| ½ Mile | 0.60 | 0.42 | 18% |
| ¾ Mile | 0.59 | 0.29 | 30% |
| 1 Mile | - | - | - |

- Indicates the value is not statistically significant

At all significant operationalizations of proximate, respondents living within the cut point are more likely to use parks than respondents living beyond the cut point (see Table 4.19). As the distance used to operationalize the predictor variable increases from ¼ mile to ¾ mile by ¼ mile increments, probability of park use for respondents living proximate declines from 65% at ¼ mile, 60% at ½ mile, and 59% at ¾ mile. Cumulative decline between probabilities of use for park users living within ¼ mile and those within ¾ mile was 6%.

Similar comparisons for beyond groups yields a 23% decrease in probability of park use (associated probabilities are 52% at ¼ mile, 42% at ½ mile, and 29% at ¾ mile).

Differences in probability of use between proximate and aproximate users also increase as cut point distances increase. The total difference between ¼ mile and ¾ mile is 17% while differences associates with each cut point are 13% at ¼ mile, 18% at ½ mile, and 30% at ¾ mile.

Research Question 1c

As the distance used to create the dichotomy for the predictor variable proximity increases, what patterns in probability of use, if any, occur across the various cut points for Network measures?

**Table 4.20**

Comparisons of Probability of Use for Network Distances ¼, ½, ¾, and 1 Mile

| Operationalization | Within | Beyond | Difference |
|---|---|---|---|
| ¼ Mile | 0.63 | 0.53 | 10% |
| ½ Mile | 0.62 | 0.42 | 20% |
| ¾ Mile | 0.59 | 0.34 | 25% |
| 1 Mile | - | - | |

- Indicates the value is not statistically significant

Regardless of the cut point implemented for Network proximity measures, respondents residing proximate to a park have higher probabilities of park use than respondents living aproximate to a park. Significant measures presented in Table 4.20 indicate probabilities of use decrease as distances defining the cut points increase.

Probabilities of use for proximate respondents drop four percent (4%) between the closest cut point, ¼ mile, and the furthest cut point, ¾ mile (63% at ¼ mile, 62% at ½ mile, 59% at ¾ mile). The same comparison for respondents living aproximate signifies an 19% reduction in probability of use (53% for ¼ mile, 42% for ½ mile, and 34% for ¾ mile).

Furthermore, the difference in probability of use between proximate and aproximate respondents rises as distance increases from ¼ mile to ¾ mile ( ¼ mile,10%; ½ mile, 20%; and ¾ mile, 25%) and is collectively 25% between ¼ mile and ¾ mile.

## Research Question 1d

What, if any, patterns exist in the differences of probabilities of use between the proximate and aproximate groups when the cut points for the predictor variable, proximity, are measured using Euclidian distance compared to Network distance.

**Table 4.21**
A Comparison of Differences in Likelihood of Use Between Within and Beyond Groups at Each Operationalization of the Predictor Variable for Both Euclidian and Network Measures

| | Euclidian | | | Network | | |
|---|---|---|---|---|---|---|
| Operationalization | Within | Beyond | Difference | Within | Beyond | Difference |
| ¼ Mile | 0.65 | 0.52 | 13% | 0.63 | 0.53 | 10% |
| ½ Mile | 0.60 | 0.42 | 18% | 0.62 | 0.42 | 20% |
| ¾ Mile | 0.59 | 0.29 | 30% | 0.59 | 0.34 | 25% |
| 1 Mile | - | - | - | - | - | |

Within group probabilities of use are similar for the within groups measured using both Euclidian and Network measures (Table 4.21). Beyond group probabilities of use are similar at ¼ mile and ½ mile cut points for both, but differ by 5% at the ¾ mile cut point (probability of use is 0.29 for the Euclidian measure and 0.34 for the Network measure).

Cumulative difference from Euclidian ¼ mile within group to ¾ Euclidian mile is 6% compared to 4% for the cumulative difference for within group Network measures. Beyond group differences are 23% for Euclidian and 19% for Network.

Differences in probability of use between within and beyond groups decline by 5% at ¼ and ½ Euclidian mile cut points. Probability of use drops an additional 12%

between ½ Euclidian mile and ¾ Euclidian mile. A larger decline initially occurs between ¼ mile and ½ mile Network measure cut points (10%) but the difference between ½ and ¾ Network mile measures is only 5% compared to the a 12% difference between ½ and ¾ Euclidian mile measures.

## Research Question 2

What magnitude of difference in "more likely to use parks" occurs between respondents who perceive they can reach a park on foot or by bicycle and those who perceive they cannot reach a park on foot or by bicycle?

Likelihoods of park use for respondents who do not perceive they can access a park on foot or by bicycle are not statistically significant from those who perceive they can reach a park on foot or by bicycle (Table 4.22).

Respondents who have no knowledge if they can access a park on foot or bicycle are 43% less likely to be a park user than those who perceive they can access a park on foot or by bicycle.

**Table 4.22**
Likelihood and Odds Calculations for Access

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Operationalization A | | | | | | | |
| Agree | 175 | 267 | 0.66 | 92 | 267 | 0.34 | 1.90 |
| Disagree | 77 | 136 | 0.57 | 59 | 136 | 0.43 | 1.31 |
| Difference [a] | | | 9% | | | | |
| Odds Ratio [b] | | | | | | | 1.46 |
| Operationalization B | | | | | | | |
| Agree | 175 | 267 | 0.65 | 92 | 267 | 0.34 | 1.90 |
| Disagree | 12 | 55 | 0.22 | 43 | 55 | 0.78 | 0.28 |
| Difference [a] | | | 43% | | | | |
| Odds Ratio [c] | | | | | | | 6.82 |

[a] in probability of park use between respondents who agree and disagree
[b] Operationalization A odds within to odds beyond (p=0.081)
[c] Operationalization B odds within to odds beyond (p=0.000)

Data provided in Table 4.22 indicate that the odds of park use for respondents who perceive parks are accessible by foot or bicycle are 6.82 times the odds of respondents who aggregately do not perceive they can access the park or have no knowledge if they can access a park on foot or by bike.

## Research Question 3

What magnitude of difference in “more likely to use parks” occurs between respondents who perceive traffic around parks should be slowed down and those who do not perceive traffic around parks should be slowed down?

**Table 4.23**
Likelihood and Odds Calculations for Traffic

| Sample | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 172 | 282 | 0.61 | 110 | 282 | .039 | 1.57 |
| Beyond | 57 | 91 | 0.63 | 34 | 91 | 0.37 | 1.68 |
| Difference [a] | | | -2% | | | | |
| Odds Ratio [b] | | | | | | | 0.93 |

[a] in probability of park use between respondents who agree and disagree
[b] Odds Within to Odds Beyond (p=0.779)

The data reported in Table 4.23 indicate that likelihoods of use between those who perceive traffic should be slowed down around parks and those who do not feel it should be slowed down are not significantly different.

Research Question 4a

When the selected parks are limited to the sample of developed parks and the distance used to create the dichotomy for the predictor variable proximity increases, what patterns, if any, occur across the various cut points for Euclidian measures?

*Operationalization ¼ Euclidian Mile and Developed Park*

A 70% probability for park use and odds of 2.28 for respondents living within ¼ mile of a developed park is calculated in Table 4.21. Respondents living beyond ¼ mile of a developed park have a 52% probability of park use and associated odds of 1.07.

**Table 4.24**
Likelihood and Odds Calculations for ¼ Euclidian Mile and Developed Park Use

| Sample | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 107 | 154 | 0.70 | 47 | 154 | 0.30 | 2.28 |
| Beyond | 157 | 304 | 0.52 | 147 | 304 | 0.48 | 1.07 |
| Difference [a] | | | 18% | | | | |
| Odds Ratio [b] | | | | | | | 2.13 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.000)

The odds ratio of park use for respondents living within ¼ mile of a developed park to those living beyond the cut point is 2.13. Therefore, respondents living within the cut point are 18% more likely to use parks than those residing beyond the cut point (Table 4.24).

*Operationalization ½ Euclidian Mile and Developed Park*

Data reported in Table 4.25 indicate that respondents living proximate to a developed park have a 62% probability of using parks (odds of use to non-use: 1.60), while respondents living farther from a developed park (beyond ½ mile) only have a 46% probability of park use (odds of use to non-use: 0.85).

**Table 4.25**
Likelihood and Odds Calculations for ½ Euclidian Mile and Developed Park Use

| Sample | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 211 | 343 | 0.62 | 132 | 343 | 0.38 | 1.60 |
| Beyond | 53 | 115 | 0.46 | 62 | 115 | 0.54 | 0.85 |
| Difference [a] | | | 18% | | | | |
| Odds Ratio [b] | | | | | | | 1.87 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.004)

Respondents living proximate, within ½ mile of a developed park, are 18% more likely to use parks than the sample of respondents living beyond ½ mile of a developed park. The odds of park use for those within are 1.87 times the odds of park use for those beyond (Table 4.25).

*Operationalization ¾ Euclidian Mile and Developed Park*

The odds of park use for respondents living with ¾ mile of a developed park are 59%. Respondents living beyond ¾ mile have a 42% probability of park use. The odds of use to non-use for those residing within the cut point are 1.46 and are 0.73 for those residing beyond the cut point (calculations provided in Table 4.26).

**Table 4.26**
Likelihood and Odds Calculations for ¾ Euclidian Mile and Developed Park Use

| Sample | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 245 | 413 | 0.59 | 168 | 413 | 0.41 | 1.46 |
| Beyond | 19 | 45 | 0.42 | 26 | 45 | 0.58 | 0.73 |
| Difference [a] | | | 17% | | | | |
| Odds Ratio [b] | | | | | | | 1.99 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.030)

The odds of use for respondents living within the cut point are 1.99 times the odds of use for respondents residing beyond the cut point. Therefore, when ¾ mile is the cut point, the within group respondents are 17% more likely to use parks than respondents in the beyond group (Table 4.26).

*Operationalization 1 Euclidian Mile and Developed Park*

**Table 4.27**
Likelihood and Odds Calculations for 1 Euclidian Mile and Developed Park Use

| Sample | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 258 | 444 | 0.58 | 186 | 444 | 0.42 | 1.39 |
| Beyond | 6 | 14 | 0.43 | 8 | 14 | 0.57 | 0.75 |
| Difference [a] | | | 15% | | | | |
| Odds Ratio [b] | | | | | | | 1.85 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.262)

Findings relating proximity,1 Euclidian mile, and developed park use are not significant (Table 4.27).

*Operationalization ¼ Network Mile and Developed Park*

According to calculation presented in Table 4.28, respondents in this study living within ¼ mile of a developed park have a 67% probability of use (odds of use to non-use equals 2.03), while those living beyond ¼ mile only have a 48% probability of use (odds of use to non-use equals 1.07).

**Table 4.28**
Likelihood and Odds Calculations for ¼ Network Mile and Developed Park Use

| Sample | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 120 | 179 | 0.67 | 59 | 179 | 0.33 | 2.03 |
| Beyond | 144 | 279 | 0.52 | 135 | 279 | 0.48 | 1.07 |
| Difference [a] | | | 15% | | | | |
| Odds Ratio [b] | | | | | | | 1.91 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.001)

Given the findings presented in Table 4.28, a 15% difference exists between the likelihood of use for respondents residing within ¼ mile of a developed park and respondents residing beyond this cut point. Park use odds for residents living proximate to a developed park are 1.91 times park use odds for respondents living aproximate to a developed park.

*Operationalization ½ Network Mile and Developed Park*

Respondents living within ½ mile of a developed park have odds of park use to non-use of 1.75. There is a 64% probability these respondents are park users (see Table 4.29).

Respondents living aproximate, beyond ½ Network mile, have odds of park use to non-use of 0.71 and a 41% probability for park use.

**Table 4.29**
Likelihood and Odds Calculations for ½ Network Mile and Developed Park Use

| Sample | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 213 | 335 | 0.64 | 122 | 335 | 0.36 | 1.75 |
| Beyond | 51 | 123 | 0.41 | 72 | 123 | 0.59 | 0.71 |
| Difference [a] | | | 23% | | | | |
| Odds Ratio [b] | | | | | | | 2.46 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.000)

Because the odds of park use for the group of respondents living within ½ a mile are 2.46 times the odds of park use for the group living beyond ½ a mile, the proximate group is 23% more likely to use parks than the aproximate group (Table 4.29).

*Operationalization ¾ Network Mile and Developed Park*

With proximity operationalized as ¾ mile, there is a 59% probability respondents living proximate to a park use parks.  The odds of this group using parks are 1.46 times their odds of not using parks. Data reported in Table 4.30 indicate that respondents living beyond ¾ mile of a developed park only have a 41% probability of using parks. They are only 0.68 times less likely to use a park than not (Table 4.30).

**Table 4.30**
Likelihood and Odds Calculations for ¾ Network Mile and Developed Park Use

| Sample | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 247 | 416 | 0.59 | 169 | 416 | 0.41 | 1.46 |
| Beyond | 17 | 42 | 0.41 | 25 | 42 | 0.60 | 0.68 |
| Difference [a] | | | 19% | | | | |
| Odds Ratio [b] | | | | | | | 2.14 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.020)

The odds of the proximate group of respondents using parks are 2.14 times the odds of park use for the group of aproximate respondents. Proximate residents are 19% more likely to use parks than aproximate residents (see Table 4.30).

*Operationalization 1 Network Mile and Developed Park*

**Table 4.31**
Likelihood and Odds Calculations for 1 Network Mile and Developed Park Use

| Sample | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Within | 258 | 444 | 0.58 | 186 | 444 | 0.42 | 1.39 |
| Beyond | 6 | 14 | 0.43 | 8 | 14 | 0.57 | 0.75 |
| Difference [a] | | | 15% | | | | |
| Odds Ratio [b] | | | | | | | 1.85 |

[a] in probability of park use between respondents living Within and Beyond
[b] Odds Within to Odds Beyond (p=0.262)

Findings for Network 1 mile and use of developed park is not significant (Table 4.31).

Research Question 4b

When the selected parks are limited to the sample of developed parks and the distance used to create the dichotomy for the predictor variable proximity increases, what patterns of probability of use, if any, occur across the various cut points for Euclidian measures?

**Table 4.32**
Comparisons of Probability of Developed Park Use for Euclidian Distances ¼, ½, ¾, and 1 Mile

| Operationalization | Within | Beyond | Difference |
|---|---|---|---|
| ¼ Mile | 0.70 | 0.52 | 18% |
| ½ Mile | 0.62 | 0.46 | 20% |
| ¾ Mile | 0.59 | 0.42 | 17% |
| 1 Mile | - | - | - |

According to data presented in Table 4.32, respondents' probability of use declines as cut points delineating proximate or aproximate are considered farther away from developed parks. Probabilities for the proximate group decrease by eleven percent (11%) between the closest cut point (¼ mile) and the farthest cut point (¾ mile). The same comparison yields a 10% decrease for the aproximate group.

A review of differences between within and beyond groups at all three significant cut points indicates some variability with an 18% difference for ¼ mile, 20% for ½ mile, and 17% difference for ¾ mile.

## Research Question 4c

When parks are limited to a sample of developed parks and the distance used to create the dichotomy for the predictor variable proximity increases, what patterns in probability of use, if any, occur across the various cut points for Network measures?

**Table 4.33**
Comparisons of Probability of Developed Park Use for Network Distances ¼, ½, ¾, and 1 Mile

| Operationalization | Within | Beyond | Difference |
|---|---|---|---|
| ¼ Mile | 0.67 | 0.52 | 14% |
| ½ Mile | 0.64 | 0.44 | 20% |
| ¾ Mile | 0.59 | 0.41 | 18% |
| 1 Mile | - | - | - |

Probabilities of use decline as across Network distance for both within and beyond groups. Within group probabilities decline from ¼ mile to ½ mile by 3% and from ½ mile to ¾ mile by 5%. The total decline is 8%. Similar comparisons of beyond group declines are 8% and 3% for a total of 11% respectively (Table 4.33). Differences in probability of use between the within group and beyond group were 14% at ¼ mile, 20% at ½ mile, and 18% at ¾ mile.

## Research Question 4d

When the selected parks are limited to the sample of developed parks, what, if any, patterns exist in the differences of probabilities of use between the proximate and aproximate groups when the cut points for the predictor variable, proximity, are measured using Euclidian distance compared to Network distance.

**Table 4.34**
A Comparison of Differences in Likelihood of Developed Park Use Between Within and Beyond Groups at Each Operationalization of the Predictor Variable for Both Euclidian and Network Measures

| | Euclidian | | | Network | | |
|---|---|---|---|---|---|---|
| Operationalization | Within | Beyond | Difference | Within | Beyond | Difference |
| ¼ Mile | 0.70 | 0.52 | 18% | 0.67 | 0.52 | 14% |
| ½ Mile | 0.62 | 0.46 | 20% | 0.64 | 0.44 | 20% |
| ¾ Mile | 0.59 | 0.42 | 17% | 0.59 | 0.41 | 18% |
| 1 Mile | - | - | - | - | - | - |

Probabilities of use for Euclidian ¼ mile within group is 3% higher than Network ¼ mile within group. At ½ mile the Euclidian within group probability is 2% lower than the Network group. Probabilities for ¾ mile are the same for both measures. Beyond group probabilities are the same for ¼ mile, 2% different for ½ mile, and 1% different at ¾ mile (Table 4.34).

Cumulative differences in probability of use between ¼ Euclidian mile and ¾ Euclidian mile was 11%. The difference for the same comparison using Network measures was 8%. Comparisons of differences in probabilities between within and beyond group only present themselves at ¼ mile where there is a 4% difference (Table 4.34).

## Research Question 5

What magnitude of difference in “more likely to use parks” occurs between respondents who perceive parks are well-maintained and clean and respondents who do not perceive parks are well-maintained and clean?

**Table 4.35**
Likelihood and Odds Calculations for the Variable Well-maintained

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Agree | 220 | 361 | 0.61 | 141 | 361 | 0.39 | 1.56 |
| Disagree | 31 | 41 | 0.76 | 10 | 41 | 0.24 | 3.10 |
| Difference [a] | | | 12% | | | | |
| Odds Ratio [b] | | | | | | | 0.50 |

[a] in probability of park use between respondents who agree and disagree
[b] Odds Within to Odds Beyond (p=0.070)

Those who agree and those who disagree that parks are well-maintained do not have statistically different likelihoods or odds of park use (Table 4.35)

Research Question 6

What magnitude of difference in "more likely to use parks" occurs between respondents who perceive they are well-informed about park facilities and respondents who do not perceive they are well-informed about park facilities?

Data calculated in Table 4.36 confirm a 65% probability of use for well-informed respondents and indicates this sample is 1.85 times more likely to use a park than not. Respondents who do not feel they are well-informed are only 1.05 times more likely to use a park. That is, they have a 51% probability of park use.

**Table 4.36**
Likelihood and Odds Calculations for the Variable Well-informed

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Agree | 165 | 254 | 0.65 | 89 | 254 | 0.35 | 1.85 |
| Disagree | 68 | 133 | 0.51 | 65 | 133 | 0.49 | 1.05 |
| Difference [a] | | | 14% | | | | |
| Odds Ratio [b] | | | | | | | 1.77[b] |

[a] in probability of park use between respondents who agree and disagree
[b] Odds within to odds beyond (p=0.009)

Comparisons of the odds of park use for well-informed respondents to non-informed respondents indicate the well-informed group's odds are 1.77 times the latter group's odds -- a 14% difference in probability of use.

## Research Question 7

What magnitude of difference in "more likely to use parks" occurs between respondents who perceive they are well-informed about plans for neighborhood parks and respondents who do not perceive they are well-informed about plans for neighborhood parks?

In terms of probability of park use, respondents who disagree about being informed about plans for parks in their neighborhood do not statistically differ from those who agree they are informed (Table 4.37).

**Table 4.37**

Likelihood and Odds Calculations for the Variable Informed about Park Plans

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Agree | 58 | 90 | 0.64 | 32 | 90 | 0.36 | 1.81 |
| Disagree | 107 | 173 | 0.62 | 66 | 173 | 0.38 | 1.62 |
| Difference [a] | | | 2% | | | | |
| Odds Ratio [b] | | | | | | | 1.12[b] |

[a] in probability of park use between respondents who agree and disagree
[b] Odds within to odds beyond ($p = 0.680$)

Research Question 8

What magnitude of difference in “more likely to use parks” occurs between respondents who perceive they can easily communicate with park leaders and respondents who have no opinion regarding if they can easily communicate with park leaders?

**Table 4.38**

Likelihood and Odds Calculations for the Variable Feedback

| | Park Users | N | Probability Park User | Nonusers | N | Probability Nonuser | Odds User: Nonuser |
|---|---|---|---|---|---|---|---|
| Agree | 95 | 144 | 0.66 | 49 | 144 | 0.34 | 1.94 |
| Disagree | 35 | 59 | 0.60 | 24 | 59 | 0.41 | 1.46 |
| Difference [a] | | | 6% | | | | |
| Odds Ratio [b] | | | | | | | 1.33 [b] |

[a] in probability of park use between respondents who agree and disagree
[b] Odds within to odds beyond (p = $p = 0.371$) .

Respondents who do not agree that they can effective communicate with park department leaders do not have statistically different likelihoods of park use than those who agree there is effective communication (Table 4.38).

# CHAPTER V

# DISCUSSION AND CONCLUSIONS

This chapter reviews the study's findings and suggests their implications.

## Summary of Major Findings

1) When testing access using both Euclidian and Network objective measures at four different cut points ( ¼ mile, ½ mile, ¾, and 1 mile), respondents living within proximate distance of a neighborhood or community park were more likely to use parks than respondents living beyond the proximate distance. Access measured subjectively as self reported perceptions regarding access on foot or by bicycle was significant only at the $p=0.10$ level.
2) Two park appeal variables, level of maintenance and developed parks also yielded significant findings at the 0.10 and 0.50 levels, respectively. A third appeal variable, traffic, did not relate to park use.
3) Likelihood data conveying the differences in probability of use indicates respondents who agreed they were well-informed were more likely to use parks than respondents who perceived they were not well-informed. Respondents' perceptions of being well-informed about park plans and being able to communicate effectively with park leaders were not significantly related to park use.

4) Those respondents who reported they had no knowledge of perceived access were less likely to use parks than those whom perceived they could reach a park via bike or on foot.

## Discussion of the Major Findings

### *Proximity*

**Table 5.1**
Summary of Findings for Proximity-use Data

| Access | Within | | | Beyond | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Prob. of Use | Prob. of Nonuse | Odds | Prob. of Use | Prob. of Nonuse | Odds | Odds Ratio | p | Nag. $R^2$ |
| ¼ Euclidian Mile | 0.65 | 0.35 | 1.86 | 0.52 | 0.48 | 1.09 | 1.71 | 0.0006 | 0.022 |
| ½ Euclidian Mile | 0.60 | 0.40 | 1.49 | 0.42 | 0.58 | 0.72 | 2.07 | 0.013 | 0.018 |
| ¾ Euclidian Mile | 0.59 | 0.41 | 1.42 | 0.29 | 0.71 | 0.42 | 3.42 | 0.023 | 0.017 |
| 1 Euclidian Mile | 0.58 | 0.42 | 1.36 | 0.50 | 0.50 | 1.00 | 1.36 | 0.827 | 0.000 |
| ¼ Network Mile | 0.63 | 0.37 | 1.73 | 0.53 | 0.47 | 1.12 | 1.54 | 0.024 | 0.015 |
| ½ Network Mile | 0.62 | 0.38 | 1.63 | 0.42 | 0.58 | 0.72 | 2.26 | 0.000 | 0.037 |
| ¾ Network Mile | 0.59 | 0.41 | 2.76 | 0.34 | 0.66 | 0.53 | 2.76 | 0.012 | 0.020 |
| 1 Network Mile | 0.58 | 0.42 | 1.39 | 0.33 | 0.67 | 0.50 | 2.78 | 0.152 | 0.006 |
| Access on Foot/Bike | 0.66 | 0.34 | 1.91 | 0.57 | 0.43 | 1.31 | 1.46 | 0.081 | 0.010 |

Objective and perceived measures were used to test the proximity-use relationship. The objective measure, distance, was tested using both Euclidian and Network measures at four cut points ( ¼ mile, ½ mile, ¾ mile, and 1 mile). Findings showed that distance was related to park use at three of these cut points ( ¼ mile, ½ mile, and ¾ mile) for both types of measures (see Table 5.1). There was no significant difference between those who lived beyond 1 mile and those who lived within 1 mile.  Although it was beyond the scope of this study, a cursory exploration of density and park proximity indicates, the lack of density beyond 1 mile of parks in the City of College Station may explain the insignificant findings (Appendix A).

While these findings are generally consistent with those of the RAND study (Cohen et al., 2006) which also tested proximity at various cut points, they differed in that the RAND study reported a significant relationship for proximity and park use when proximity was operationalized as 1 mile. This was important to their study in Los Angles since the city used a 2 – 2.5 mile service radius for planning purposes. Meanwhile, the Los Angeles city layout has less housing density surrounding parks than beyond 1 mile from parks. This is opposite of College Station which has parcel density around most parks (48% within ¼ mile) and has little density beyond 1 mile from parks (1.2 %). Thus, likelihood of park use in relation to the size of town and density surrounding parks at various cut points needs to be considered and statistically tested in future studies (Cohen, et al., 2006; Hodges, 1971).

In addition to confirming a relationship between proximity and park use, the study reported differences in likelihood of use at significant points. For all six significant relationships (¼ Euclidian, ½ Euclidian, ¾ Euclidian, ¼ Network, ½ Network, and ¾ Network) probability of use declined as household distance from the park increased. The difference was as large as 23% in probability of use between respondents living beyond ¼ Euclidian mile (53%) and respondents living beyond ¾ a Euclidian mile (29%). No previous studies have explored likelihood of use when investigating proximity. These findings not only confirm the relationship exists, but provide a quantitative understanding of the magnitude of impact household distance from a park has on likelihood of park use.

Comparisons between Euclidian and Network measures indicated likelihoods of use were similar at some cut points and had some variability when comparing others Euclidian: Network for ¼ mile 0.65, 0.63; ½ mile 0.60, 0.62; ¾ mile 0.59, 0.59; and 1 mile 0.58 and 0.58). Given that the study measured distance from the household to the nearest park, some households may not be within proximate distance of the same park depending on the measure used. That is, a household might have one park serve as its nearest ¼ mile park by Euclidian measures and a different facility serve as its closet park by Network measures. A more legitimate approach for comparing Euclidian and Network measures would be to create a sub-sample of those households proximate to the same parks regardless of measure.

Perceived access measures comparing the park use of those who agree they can access a park on foot or by bicycle with those who disagreed were not significant at p=0.05, but were significant at p=0.10. At the latter levels, respondents who agreed they could access a park on foot or by bicycle were 9% more likely to use parks. Mowen et al. (2007) also reported a positive relationship between perceived access and use.

*Appeal*

**Table 5.2**
Summary of Findings for the Relationship of Appeal with Park Use

| Appeal | Agree: Prob. of Use | Agree: Prob. of Nonuse | Agree: Odds | Disagree: Prob. of Use | Disagree: Prob. of Nonuse | Disagree: Odds | Odds Ratio | p | Nag. $R^2$ |
|---|---|---|---|---|---|---|---|---|---|
| Slow Traffic down around parks | 0.61 | 0.39 | 1.57 | 0.63 | 0.37 | 1.68 | 0.93 | 0.933 | 0.000 |
| Perceptions of Maintenance | 0.61 | 0.39 | 1.56 | 0.76 | 0.24 | 3.10 | 0.50 | 0.503 | 0.012 |
| Developed Park | | Within | | | Beyond | | | | |
| ¼ Euclidian Mile | 0.70 | 0.30 | 2.28 | 0.52 | 0.48 | 1.07 | 2.13 | 0.000 | 0.039 |
| ½ Euclidian Mile | 0.62 | 0.38 | 1.60 | 0.46 | 0.54 | 0.85 | 1.87 | 0.004 | 0.024 |
| ¾ Euclidian Mile | 0.59 | 0.41 | 1.46 | 0.42 | 0.58 | 0.73 | 1.99 | 0.030 | 0.014 |
| 1 Euclidian Mile | 0.58 | 0.42 | 1.39 | 0.43 | 0.57 | 0.75 | 1.85 | 0.262 | 0.004 |
| ¼ Network Mile | 0.67 | 0.33 | 2.03 | 0.52 | 0.48 | 1.07 | 1.91 | 0.001 | 0.031 |
| ½ Network Mile | 0.64 | 0.36 | 1.75 | 0.41 | 0.59 | 0.71 | 2.46 | 0.000 | 0.051 |
| ¾ Network Mile | 0.59 | 0.41 | 1.46 | 0.41 | 0.60 | 0.68 | 2.14 | 0.020 | 0.016 |
| 1 Network Mile | 0.58 | 0.42 | 1.39 | 0.43 | 0.57 | 0.75 | 1.85 | 0.262 | 0.004 |

Two appeal variables, maintenance and whether the park was developed had some influence on likelihood of use. Findings for maintenance were significant at p=0.10. Surprisingly, respondents who felt parks were not well maintained were 12% more likely to use them. This finding conflicts with Godbey's (1985) study which reported that indicating poor maintenance was a constraint to park use. These results are apparently counterintuitive and could be a reflection of the asymmetrical sample since the n for those who disagree was only 41 (see Table 5.2).

In the sub-sample of developed parks proximity-use likelihood of use was higher for five of the eight cut points. These indicate that type of park has some influence on likelihood of use. Theses findings are consistent with previous research which discusses the role type of park has on the distance-use relationship (Gold, 1977; Dee and Liebman, 1970).

*Communication*

**Table 5.3**
Summary of Findings for the Relationship of Communication with Park Use

| | Agree | | | Disagree | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Communication | Prob. of Use | Prob. of Nonuse | Odds | Prob. of Use | Prob. of Nonuse | Odds | Odds Ratio | p | Nag. $R^2$ |
| Well-Informed | 0.65 | 0.35 | 1.85 | 0.51 | 0.49 | 1.05 | 1.77 | 0.009 | 0.024 |
| Know about park plans | 0.64 | 0.36 | 1.81 | 0.62 | 0.38 | 1.62 | 1.11 | 0.680 | 0.001 |
| Feedback | 0.66 | 0.44 | 1.94 | 0.60 | 0.41 | 1.46 | 1.33 | 0.371 | 0.022 |

Respondents who agree they are well-informed about parks are 14% more likely to use parks than those who disagree they are informed (0.65 – 0.51). These findings are consistent with those of others which reported on the role of being information on park use (Hatry and Dunn, 1971; Godbey, 1985; Howard and Crompton, 1984; and Scott and Munson, 1994).

Results indicated that the relationships between those knowing about park plans and receiving feedback and use were not significant (see Table 5.3).

*The Sub-Sample of Ill-Informed Respondents*

**Table 5.4**
Summary of Findings for Respondents with No Knowledge

| | Agree | | | No Knowledge | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Prob. of Use | Prob. of Nonuse | Odds | Prob. of Use | Prob. of Nonuse | Odds | Odds Ratio | p | Nag. $R^2$ |
| Access | 0.65 | 0.34 | 1.90 | 0.22 | 0.78 | 0.279 | 6.816 | 0.000 | 0.144 |
| Well-Informed | 0.65 | 0.35 | 1.85 | 0.44 | 0.56 | 0.775 | 2.392 | 0.001 | 0.042 |
| Know about park plans | 0.64 | 0.36 | 1.81 | 0.51 | 0.49 | 1.031 | 1.758 | 0.032 | 0.022 |
| Feedback | 0.66 | 0.44 | 1.94 | 0.53 | 0.47 | 1.107 | 1.751 | 0.010 | 0.023 |

According to data presented in Table 5.4, The subset of respondents who reported they had no knowledge were 43% less likely to use parks than those who agree they can access parks on foot or by bicycle (0.65 – 0.22).

Godbey (1985) discussed the impact of having no knowledge on park use. He recognized the importance of this issue since park providers have some control in how well constituents are informed. He comments on the ability to change use rates for those lacking knowledge who want to participate compared to those wanting to participate but needing to mitigate a significant personal or structural constraint (e.g., transportation, no park to visit). Thus, park providers should concentrate efforts on factors over which they exercise some control (i.e. educated the ill-informed about park opportunities).

## Implications for Park Providers

Household proximity to parks plays a role in level of use of parks, and should be considered when acquiring land for parks. Factors influencing perceived access to parks (e.g. walkability) should also be considered when planning new parks and should be reviewed for existing parks. PARDs may need to collaborate with other city departments to ensure or improve positive perceptions of access on foot or bike to neighborhood parks.

With increasing capabilities to complete spatial analysis, PARDs interested in enhancing the citizen input process and receiving feedback should consider geocoding respondent's household locations and reviewing the spatial distribution of respondents to determine if (1) groups from specific neighborhoods, communities, or distinct areas of the city are underrepresented, and (2) to explore the relationship between area of the city in which one resides and use of PARD facilities and services. PARDs should also consider ensuring that needs assessment data be collection both aggregately and by neighborhood or community level. Such analysis could assist in understanding if issues such as maintenance or perceived access are relevant city-wide or in specific areas.

Park providers should consider likelihood of use data rather than percentage data. The likelihood analysis gives a measure of the impact respondents perceptions have on use whereas percentage data comparing who agrees with who disagrees on issues such as well-informed and maintenance do not relate that information to use.

Park providers need to develop strategies to reach those who have no knowledge of how to access parks.  Signage and wayfinding can address some of the lack of knowledge issues by leading people into parks. Signage for trails and parks may increase use if they stand out and speak clearly to users. Providers should consider developing and incorporating amenity symbols into park entrance signs (as in state parks and roads signs). This might assist potential users in learning about resources that are not visually apparent especially in large irregularly shaped parks.

Because signs cannot always lead people to a park, providers should consider creating environmental cues that may draw people into parks by creating a park-like environment and walkable area around parks (i.e., park gateways). By weaving park-like infrastructure into streets, right-of-ways, and easements, distinct paths and regions could increase knowledge of, and access to parks (Lynch, 1960).

As research develops to better explain what factors influence park use, practitioners and planners need to work with researchers to ensure community level instruments are available to assess and evaluate a park's ability to attract or encourage use as well as to consider and include these findings in future management practices, land acquisition decisions, and designs.

## Limitations

Methodological limitations relating to GIS were discussed in chapter III. This section provides an overview of other study limitations.

First the Nagelkerke $R^2$ suggests the explanatory values for the variables are low. This is consistent with Mowen et al. (2007) and Hodges (1971) who also reported low explanatory values. However, some feel this measure should be reported as an approximation and not equivalent of an $R^2$.

Park use data may be exaggerated since people in general overestimate park use on surveys. Cohen et al. compared observed park use data to self reported park use data and concluded that respondents overestimated park visitation.

The College Station data set was not collected for the purpose of this study and therefore introduces reliability issues. Further, the city of College Station population is relatively young, educated, and often referred to as an active population. The community profile diminishes the generalizability of the findings.

Differences among parks were not considered except for the sub sample of developed parks. No attractiveness index was developed. Distance to the closest park was used for each household. Thus, the data did not control for or explore the impact of living proximate to more than one park. The exact distance was used to categorize a respondent's household distance from a park into less than ¼ mile, less than ½ mile, less than ¾ mile, less than 1 mile, and greater than 1 mile. This procedure does not account for respondents who may live within reasonable distance of more than one park and in some neighborhoods of College Station in which several parks are very close together.

## Implications for Future Research

Future research should focus on defining and operationalizing proximity; understanding the limitations of these definitions and operationalizations; and comparing findings relating proximity and use when employing these different definitions and operationalizations. Instruments need to be tested in multiple communities.

Given that the RAND study (Cohen et al., 2006) reported Los Angles had proximity-use relationships at one mile while in College Station there was no significant difference at 1 mile, researchers need to further explore and develop an understanding of the variability reported in aggregate compared to disaggregated samples. Further, researchers need to better understand what factors (e.g. density) might influence differences in park use and proximity reported for various cities.

Route measures need to include trails, paths, and alleys instead of just streets (Chin, 2008).

To make better use of GIS, there is a need to learn more about how and where people access parks, so coding or creating access points in GIS can be done more accurately. It is evident that these decisions can drastically skew outcomes.

Proximity from home is an important measure but as children and parents spend more time away from home, future research should also explore relationships between where people spend time (e.g., daycare, school, and work) and park use. Future research should also examine if such amenities are on routes traversed between these places and the home in order to explore if encountering a park on the route to and from home relates to park use.

Proximity to parks influences use which in turn may influence outcomes. Future research needs to explore the latter relationship and test both findings on various types of open spaces, such as types of parks, greenways, creeks, plazas, playgrounds, and green streets programs, to determine the role of proximity to types of spaces and the associated outcomes experienced or gained.

Crompton and Lamb (1986) posited that outcomes were more important than attendance numbers. Gray and Greben’s (1974) seminal article states,

> We should have discovered long ago the nature of the business we are in, but we have not… it is not activities or facilities or programs that are central; it is what happens to people (p. 49)

That is, what outcomes did they get out of it? Future research needs to better understand the link between proximity increasing use rates and the associated improved outcomes. Qualitative data from Yuen (1996) indicated that the proximity of parks has a direct relationship to the outcomes. Respondents indicated that neighborhood parks were “convenient places to relax, enjoy nature, and socialize…”. The study data inferred that convenience of the park was key to the benefits. Thus, the framework for the proximity-use relationship may need to be expanded to account for the associated outcomes.

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# APPENDIX A

**Table A.1**
Parcel Distribution for the City of College Station by Euclidian Measures

| | City Parcel Data | | Study Sample | | Park Users | | Proportion User: Sample |
|---|---|---|---|---|---|---|---|
| Distance From Park | N | % | N | % | N | % | |
| Within 1/4 mile | 7390 | 43.55% | 197 | 43.01% | 128 | 48.48% | 0.65 |
| 1/4 - 1/2 mile | 7467 | 44.00% | 206 | 44.98% | 113 | 42.80% | 0.55 |
| 1/2 - 3/4 mile | 1311 | 7.73% | 38 | 8.30% | 18 | 6.82% | 0.47 |
| 3/4 - 1 mile | 598 | 3.52% | 15 | 3.28% | 4 | 1.52% | 0.27 |
| Beyond 1 mile | 204 | 1.20% | 2 | 0.44% | 1 | 0.38% | 0.50 |
| Total | 16970 | 100.00% | 458 | 100.00% | 264 | 100.00% | |

Although the cursory look at parcel distribution and park use does not provide statistical tests verifying the distance/use relationship when the data is stratified by ¼ mile buffer rings as opposed to cut points, the data presented in Table A.1 does verify that the geographic distribution of the sample is similar to the geographic distribution of the city parcel data. It also provides information regarding the proportion of households in this study served within each cut point.

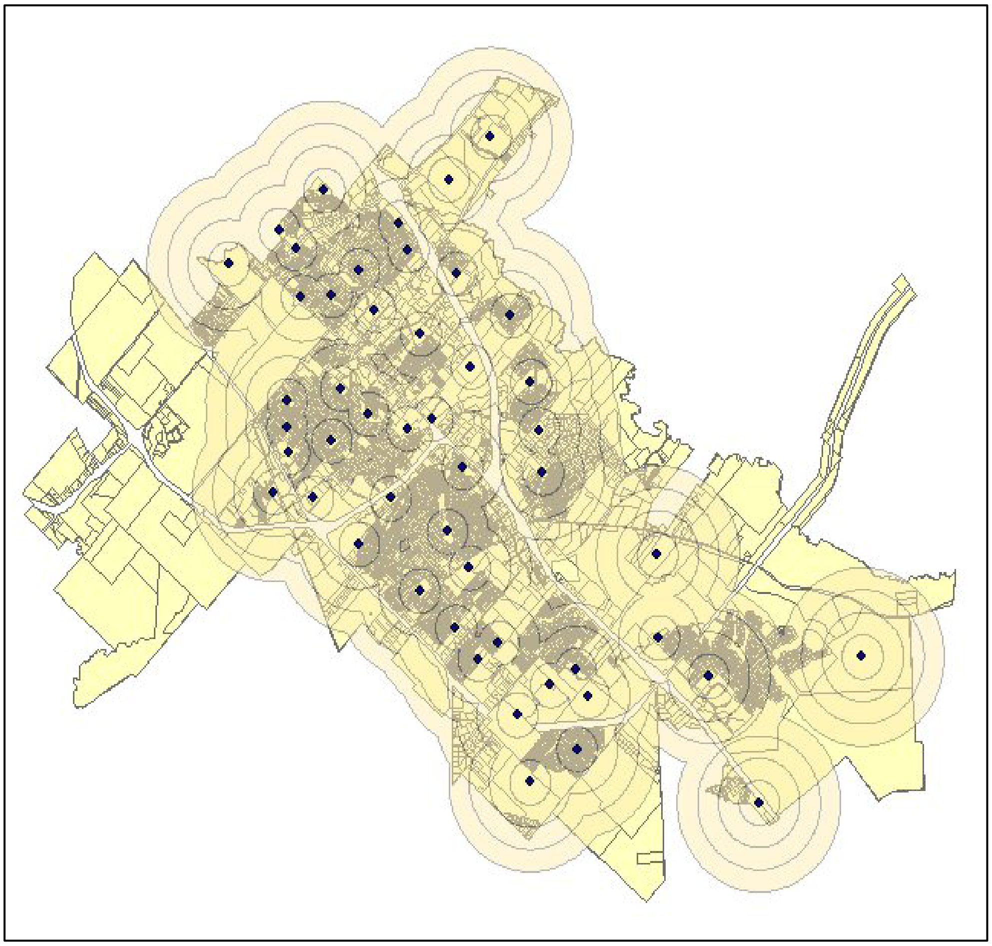

**Figure A.1**
Euclidian Buffer Rings Incremented from ¼ Mile of Park Centroid to 1 Mile by ¼ Mile Intervals Overlaid with the City of College Station, TX Parcel Data

# VITA

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