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The Impact of the Physical Environment on the Social Integration of Individuals with Disabilities in Community

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THE IMPACT OF THE PHYSICAL ENVIRONMENT ON THE SOCIAL INTEGRATION OF INDIVIDUALS WITH DISABILITIES IN COMMUNITY

by

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ABSTRACT

The Impact of the Physical Environment on the Social Integration of Individuals with Disabilities in Community

by

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Social integration in community is especially important for individuals with disabilities well-being. Although individuals with disabilities reside within the community's physical environment, they are often marginalized in the social environment. This may be the result of individuals with disabilities residing in physical environments that negatively affect opportunities for integration in the social environment. However, there has been little investigation to understand the impact of the physical environment on the social integration of individuals with disabilities in community.

The purpose of this investigation was to (a) examine the current body of evidence concerning the impact of a community's physical environment on opportunities for social integration, and (b) determine to what extent individuals with disabilities reside in physical environments that contribute to opportunities for social integration in community.

To address the first study purpose, a review of the current body of evidence suggests that community environments that are pedestrian-oriented, possess appropriate common spaces, and fewer neighborhood incivilities, are likely to promote social integration.

Secondly, two questions were evaluated: (a) to what extent adults with disabilities' places of residence are correlated with mixed-land use community environments, and (b) to what extent adults with disabilities' place of residence are correlated with community common space. Linear regression was used to determine the magnitude of the relationship between Utah's Davis and Weber counties' census block groups' percent of population with disabilities, percent of population below poverty level, land use diversity, and the percent of the area within walking distance of community common space.

The most significant association with individuals with disabilities places of residence are socioeconomic. This study indicates that poverty level predicts 30-35% of the variance in individuals with disabilities place of residence. Given, the very modest association with mixed-land use (4%) and common space (2%), poverty level is the most useful predictor of an individual with disabilities place of residence.

Future research should explore more appropriate measures of community common space, at the residence and neighborhood level, and the pedestrian-orientation of the community environment. Future research should also explore the strong association between socioeconomic factors and individuals with disabilities places of residence.

(133 pages)

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CHAPTER I

INTRODUCTION

Social integration in community is important for an individual's well-being. Communities are social environments that facilitate coordination and cooperation for the mutual benefit of their members; including security, freedom, economy, health, and affiliation. The social environment is located in the physical environment, and the two interact in very important ways. For example, the character of the physical environment affects individuals' opportunities for integration in the social environment. Social integration in community is especially important for individuals with disabilities. Although individuals with disabilities reside within the community's physical environment, they are often marginalized in the social environment. This may be the result of individuals with disabilities residing in physical environments which negatively affect opportunities for integration in the social environment. However, there has been little investigation to understand the impact of the physical environment on the social integration of individuals with disabilities in community.

Purpose

The purpose of this investigation is (a) to examine the current body of evidence concerning the impact of a community's physical environment on opportunities for social integration, and (b) to determine to what extent individuals with disabilities reside in physical environments that contribute to opportunities for social integration in community.

Background and Significance

Social integration refers to the participation and involvement of a person in the patterns of human relations in community and society (Laireiter & Baumann, 1992), or citizenship in community (Ware, Hopper, Tugenberg, Dickey & Fisher, 2007). Indeed, the term community is used to describe a social construct where social interaction is a key element (Keane, 1991). The social interactions on which community is based facilitate cooperation and coordination for mutual benefit and include security, freedom, and affiliation. "Life is easier in a community blessed with a substantial stock of social [interaction]" (Putnam, 1995, p. 67). A substantial body of evidence, too voluminous to include in this discussion, indicates that social integration is important for a person's physical and mental well-being (e.g., Broadhead et al., 1983; House, Landis, & Umberson, 1988; Seeman, 1996; Yen & Syme, 1999), including greater competence and control (Zimmerman, 2000); decreased alienation (Chavis & Wandersman, 1990); and better management of chronic illness and disability (Lyons, Sullivan, Ritvo, & Coyne, 1995).

Numerous factors affect social interaction such as personality, social skills, and beliefs (Gracia, Garcia, & Musitu, 1995). In addition to these micro-social factors focused on the individual actor, there are macro-social determinants focused on the societal, cultural, and historical contexts of social interactions such as gender, race/ethnicity, socioeconomic position, and ecological factors (Gracia et al., 1995). While not sufficient to solely create community, ecological factors, or the characteristics of the physical environment, affect opportunities for social integration in communities

independent of socioeconomic and demographic variables. Poor physical environments impoverish the social interactions of those living within it (Garbarino & Sherman, 1980). Conceptually, positive physical environments enhance social interactions through opportunity for passive contact, proximity to others, and appropriate space to interact (Fleming, Baum, & Singer, 1985). Opportunities for passive contact support a process of familiarization through spontaneous casual interactions that may become more involved over time (Fleming et al., 1985), such as "bumping into a neighbor." Passive contacts are more likely among individuals living in close proximity of each other where frequently 'bumping into…' contact is probable (Fleming et al., 1985). Appropriate spaces to interact allow individuals to control and regulate the process of passive contact; they do not force interactions but are conducive to interactions occurring (Halpern, 1995). While these interrelated ecologic factors of the physical environment affect an individual's opportunities for social integration in communities, the effects are complex particularly given the physical environment can be seen as both the medium and outcome of social interactions (Curtis & Jones, 1998).

Social integration in community is especially important for individuals with disabilities. Individuals with disabilities are marginalized by social, economic, and political structures. These contribute to physical environments that further exacerbate social exclusion (Curtis & Jones, 1998). For several decades individuals with disabilities have been working toward community participation and inclusion where they are afforded the same opportunities as people without disabilities (Chenoweth & Stehlik, 2004). Disability is a natural part of the human experience that in no way diminishes the right of individuals to live independently, enjoy self-determination, make choices,

contribute to society, pursue meaningful careers, and enjoy full inclusion and integration in the economic, political, social, cultural, and educational mainstream of society (Silverstein, 2000). These rights are the mutual benefits of community: security, freedom, and affiliation. For individuals with disabilities, social integration in community means being increasingly defined not by disability, but rather as equal citizens in community and society who enjoy the benefits of the same.

However, while many individuals with disabilities reside within the physical environment of communities, they may often still not be socially a part of their community; being "in the community, but not of it" (Chenoweth & Stehlik, 2004; Meyers, Ager, Kerr, & Myles, 1998; Ware et al., 2007). This may be the result of individuals with disabilities residing in the physical environments of community that negatively affect opportunities for social integration. Further, the social isolation of individuals with disabilities may be disproportionately exacerbated by the physical environment as the impact of place is variable, depending on individual attributes (Curtis & Jones, 1998). That is, there may be aspects of the physical environment that reduce opportunities for individuals with disabilities' social interaction, but do not negatively impact the social opportunities of others in the community. Environments may be disproportionately expensive socially for individuals with disabilities to participate in social interactions (Christensen, 2009), perhaps by physically segregating individuals according to ability or making third-party assistance necessary. To support positive social interactions, environments must equitably assess the costs in individual participants' expenditures of time, resources, and energy necessary to participate (Christensen, 2009).

However, little is understood regarding the impact of the physical environment on individuals with disabilities social integration. While there has been limited research examining physical environment factors that affect social integration, there has been even less investigation to understand the impact of the physical environment on the social integration of individuals with disabilities in community.

Theoretical Framework

This study follows an ecological approach to research which examines the contribution of contextual and environmental factors to social disparities (Wilson, 2009). The ecological emphasis stresses these macro-level factors and spatial processes (i.e., suburbanization, urban sprawl, segregation), demonstrating the importance of place and environmental context on behavior. A socio-ecologic approach describes the influence of the built environment on social behavior through macro-level factors and environmental processes which affect social integration by mediating differential access to community resources (Aytur, Rodriquez, Evenson, Catellier, & Rosamond, 2007). Gee and Payne-Sturges (2004) indicate that vulnerable community members are often underserved by community resources that might otherwise limit their vulnerability.

CHAPTER II

LITERATURE REVIEW

In order to investigate to what extent individuals with disabilities reside in physical environments that negatively affect opportunities for social integration in community, this discussion will focus on the current body of evidence concerning the impact of a community's physical environment on opportunities for social integration.

Article Selection

In an effort to understand this community infrastructure, an exhaustive systematic review of physical environment factors that affect social integration was conducted. The systematic review involved identifying and retrieving published research, assessing the quality of the reported evidence, and developing a conceptual approach to organizing and summarizing the evidence.

Originally, literature was identified for inclusion in this review when there was both a clear focus on individuals with disabilities, social integration, and the community's physical environment. However, it quickly became apparent that little information was available according to this narrow scope, disability being the limiting factor, and the search was widened to include all individuals. Using searchable databases, such as Google Scholar and EBSCOhost, literature meeting the inclusion criteria published in books and journals was identified. Roughly one third of the literature was identified in this way. The remainder was identified by reviewing the citations of the previously identified literature, an iterative process which continued until new relevant citations no

longer appeared in the literature. Continued comprehensive searches were performed using related terms for the inclusion criteria found in the identified literature. Literature was identified across multiple fields such as geography, psychology, sociology, environment, disability, and human ecology. Ninety-two publications were identified and retrieved for review. An additional six publications were identified but could not be retrieved for review.

The retrieved literature was reviewed to assess the presence and quality of the reported evidence. Evidence was considered to be empirical data resulting from planned inquiry, qualitative or quantitative, as appropriate for answering questions about the effect of physical environment conditions on social interaction/integration. Whether the evidence was considered to be of high quality was determined by considering threats to validity, such as study population characteristics, variable descriptions, measurement, sampling, data analysis, and interpretation of results; as well as whether the evidence is thought to apply to additional populations and settings. While valuable, literature representing expert opinion was not included unless there was evidence presented in support of the opinion.

Article Organization

The assessment of the literature indicates that we may presume to know more than we actually do about the relationship between the community's physical environment and opportunities for social integration. The field is strong in conceptual analyses of social integration and theory describing its relationship with the community's physical environment. Despite the intuitive appeal of these arguments, of the 92 publications

reviewed, only 18 presented empirical data resulting from planned inquiry as supporting evidence.

The selected literature encompasses evidence describing the effect on social integration from environmental factors such as automobile-oriented infrastructure, pedestrian infrastructure, crime, neighborhood quality, housing quality, housing type, residential density, land use, natural elements, public space, etc. The studies various measures may be organized conceptually around three broad community environment factors: pedestrian-oriented, neighborhood incivilities, and common space. These three community environment factors affect social interactions as they impact opportunity for passive contact, proximity to others, and appropriate space to interact (Fleming et al., 1985). The following summary of the evidence, as shown in Table 1, is presented in narrative form according to the three community environment factors: pedestrian-oriented, neighborhood incivilities, and common space.

Pedestrian Oriented

The following four studies provide evidence to suggest that community environments likely to promote social interaction are those that are mixed use and pedestrian oriented. Pedestrian oriented community environments support community members to perform activities of daily living without the use of an automobile. The pedestrian environment is perceived as being ‘friendly’ with both amenities which make pedestrians comfortable (e.g. shade, benches for resting) and reduced pedestrian-automobile conflict for safety. These community environments are generally mixed land uses where the services and

Table 1

Effect of Community Environment Factors on Social Interactions

Author(s)	Study Design	Participants	Measures	SES control(s)	Reported results	Community factor
Leyden (2003)	Survey research (questionnaire); Multivariate ordered logit model analysis	279 randomly selected participants over 18 years of age in 8 Galway, Ireland neighborhoods	Participant assessed neighborhood walkability, knowledge of neighbors, political participation, trust of others, and social engagement	Age, child in home, watch TV, attend religious services, years in neighborhood, education, and political party strength	Residents of walkable, mixed-land use neighborhoods are more likely to know their neighbors, to participate politically, to trust others, and to be involved socially.	Pedestrian-oriented
Willmott (1963)	Case study (detailed unstructured interview & observation); Reflective & interpretational analysis	Dagenham, England	Researcher observed patterns of local relationships, living, and the community environment.	Researcher acknowledge, but unclear	For the relatively homogeneous community, differences in street design were the major determinant on patterns of neighboring.	Pedestrian-oriented

(table continues)

Author(s)	Study Design	Participants	Measures	SES control(s)	Reported results	Community factor
Halpern (1995)	Survey research (questionnaire); Multiple regression analysis	7400 randomly selected participants in the United Kingdom	Participant assessed residential environment data, neighbor helpfulness. and friendliness	Age, sex, income, house orientation, road type, etc.	The less traffic on a road, the more likely residents were to describe the neighbors as helpful.	Pedestrian-oriented
Appleyard & Lintell (1972)	Case study (unstructured interview & observation); Interpretational analysis	12 participants on a 3 block long street in San Francisco	Participant assessed traffic hazards, noise and pollution, social interactions, privacy, and environmental awareness; Researcher measured traffic activity	Age	Traffic level is inversely related with levels of social interaction.	Pedestrian-oriented
Sampson (1988)	Survey research (questionnaire); Multilevel systemic model using weighted least-squares regression	10,905 randomly selected participants over 16 years of age across 238 geographic units in England and Wales	Participant assessed measures of residential stability, local friendship ties, and collective attachment	Employment, marital status, age, social class, number of children in household, and fear of crime	Local friendship ties, collective attachment, and participation are significantly related to community stability	Neighborhood Incivilities

(table continues)

Author(s)	Study Design	Participants	Measures	SES control(s)	Reported results	Community factor
Brown, Perkins, & Brown (2003)	Survey research (structured interview); Hierarchical linear modeling analysis	619 quasi-randomly selected participants across 55 sample blocks in Salt Lake City, Utah	Participant assessed measures of place attachment, home ownership, perceived incivilities, fear of crime, and social cohesion; Researcher observed housing incivilities	Age, income, gender, religious affiliation, and ethnicity	Residents place attachment is related to home ownership, ethnicity, incivilities, social cohesion, and fear of crime.	Neighborhood Incivilities
Krause (1993)	Survey research (questionnaire); Weighted least-squares regression analysis	640 probability selected participants over 55 years of age across southern Canada	Participant assessed measures of neighborhood deterioration, educational attainment, financial strain, distrust, and social isolation	Age and gender	As the quality of the neighborhood environment declines, elderly people report being more isolated from other individuals.	Neighborhood Incivilities

(table continues)

Author(s)	Study Design	Participants	Measures	SES control(s)	Reported results	Community factor
Krause (1996)	Survey research (structured interview); Ordinary least-squares multiple regression analysis	1,103 randomly selected English-speaking, retired participants over 65 years of age across the coterminous United States	Participant assessed measures of physical health status, neighborhood deterioration, and chronic financial strain	Age, gender, and education	Older adults who live in deteriorated neighborhoods report more health problems, in part due to the effect to friendship strain.	Neighborhood Incivilities
Heller, Miller, & Hsieh (2002)	Longitudinal observation research; Hierarchical regression analysis	186 recruited participants over 30 years of age with mental retardation residing in 38 community residences and 17 nursing homes	Researcher assessed measures of participants' adaptive behavior, mental retardation, physical health, community integration, as well as residence type, size, attractiveness, choice-making opportunities, and family involvement.	Age, level of mental retardation, health, and adaptive behavior	The long-term well-being of adults with mental retardation was influenced by opportunities to make choice, attractiveness of the residential setting, and the extent of family involvement.	Neighborhood Incivilities

(table continues)

Author(s)	Study Design	Participants	Measures	SES control(s)	Reported results	Community factor
Ellaway, Macintyre, & Kearns (2001)	Longitudinal survey research (structured interview and questionnaire); logistic regression analysis	505 participants in 3 cohorts in four Glasgow, Scotland neighborhoods	Participant assessed measures of neighborhood quality, cohesion, and standard of living	Age, sex and social class	Neighborhood of residence is significantly associated with social and environmental problems and neighborhood cohesion.	Neighborhood Incivilities
Gracia, Garcia, & Musitu (1995)	Survey research (questionnaire); K-means cluster analysis method	234 quasi-randomly selected married, with children, majority group participants living in two Valencia City, Spain urban residential areas for over 2 years	Participant assessed measures of community integration/ satisfaction, association/ participation, contribution to community organizations, and resources of social support	Ethnicity/race and social mobility (by participant exclusion criteria); **High risk environments not addressed in terms of SES.**	High risk neighborhood environments reduce the quality of social life for the people who occupy them.	Neighborhood Incivilities

(table continues)

Author(s)	Study Design	Participants	Measures	SES control(s)	Reported results	Community factor
Evans, Wells, & Moch (2003)	Literature review; categorical analysis	63 published studies	Researcher assessed research design, controls, participants, housing type, outcome, and basic results	Researcher assessed reviewed studies design for SES, matching, or statistical controls	In part, less social contact with neighbors partly due to a lack of communal gathering places; interaction nodes affect social interaction patterns.	Common Space
Yancey (1971)	Case study (detailed unstructured interview, questionnaire & observation); reflective & interpretational analysis	Pruitt-Igoe Housing Project, St. Louis, Missouri	Ethnographic approach over 3 years assessing participants' dis/satisfaction with their residential conditions	Social class	Without the presence of semi-public common space and facilities social networks are retarded.	Common Space

(table continues)

Author(s)	Study Design	Participants	Measures	SES control(s)	Reported results	Community factor
Kang (2006)	Survey research (questionnaire, semi-structured interviews & observation); domain analysis and logistic regression	378 quota selected participants residing in two Guangzhou, China communities	Participant assessed measures of socioeconomic composition, neighborhood open spaces, and social engagement	Age, gender, marital status, employment, length of residency, and education	Residents living with a large number of neighborhood open spaces had higher degrees of social and community engagement.	Common Space
Kim & Kaplan (2004)	Comparative case study (questionnaire, interview & observation); separate regression analysis	746 convenience selected participants residing in Kentlands and Orchard Village, Maryland	Participant assessed measures of 4 domains of sense of community and 17 aspects of the community environment	Case selection of socio-economically similar communities	Natural features and open spaces play a role in sense of community, fostering pedestrianism and increasing the likelihood of social interaction.	Common Space

(table continues)

Author(s)	Study Design	Participants	Measures	SES control(s)	Reported results	Community factor
Kuo, Sullivan, Coley, & Brunson (1998)	Case study (structured interview & observation); multiple regression analysis	145 recruited participants residing in 18 buildings of the Robert Taylor Homes development in Chicago, Illinois	Participant assessed measures of common space "greenness", use, neighborhood social ties, sense of safety, and sense of adjustment	Mental fatigue, use of outdoor spaces, levels of stress, and residents' mood; Similar socio-economic status assumed	The more vegetation associated with a resident's apartment, the more they socialized and were more familiar with their neighbors	Common Space
Kweon, Sullivan, & Wiley (1998)	Survey research (structured interview & observation); Ordinary least-squares regression analysis	91 recruited participants over 64 years of age residing in 11 buildings of the Robert Taylor Homes development in Chicago, Illinois	Participant assessed measures of exposure to outdoor common spaces, social integration, sense of community, physical health, and fear of crime	Aggregate-level reliability analysis to identify building-level differences in measures	Exposure to green common spaces is associated with higher levels of social integration and a greater sense of community	Common Space

(table continues)

Author(s)	Study Design	Participants	Measures	SES control(s)	Reported results	Community factor
Lawton & Nahemow (1979)	Survey research (questionnaire); hierarchical regression analysis	2,431 probability sampled participants in 150 US federally-assisted public housing developments	Participant assessed measures of activity participation, family contact, morale, housing satisfaction, mobility, friendship, and five area condition factors	Homogeneous income levels due to income eligibility requirements	Area condition factors were associated with participants' activity participation and friendship behaviors.	Common Space

supports necessary to meet daily needs (e.g. grocery shopping, schools, employment, and recreation) are within walking distance.

Conceptually, pedestrian oriented community environments may facilitate social interaction by supporting opportunity for passive contact. Contact may be intentional or spontaneous, but this casual contact breeds a sense of comfortable familiarity.

According to this premise, Leyden (2003) examined whether pedestrian oriented, mixed use neighborhoods encouraged greater social and community engagement than traditional car oriented suburban neighborhoods. The author used a mailed survey to 750 residents of Galway, Ireland (37.2% response rate). Respondents assessed the degree to which their neighborhoods were pedestrian oriented and mixed use, which was used as a measure of neighborhood walkability. Four aspects of social and community engagement were also measured; how well residents knew their neighbors, their political participation, their trust in other people, and their social engagement. Controlling for age and years living in the neighborhood, the results indicate that residents living in walkable, mixed-land use neighborhoods are more likely to know their neighbors, participate politically, trust others, and be involved socially.

In *The Evolution of a Community*, Willmott (1963) presented an in-depth study of Dagenham, an East London suburban housing project of over 22,000 houses constructed in the 1920s. In his study of Dagenham, Willmott used ethnographic methods of detailed direct communication and observation to explore patterns of local relationships, patterns of living, and the design of the community. Willmott noted that for a relatively homogeneous working class community, differences in street design were the major determinant on patterns of social interaction between neighbors. Residents living on cul-

de-sacs or short narrow streets described a greater sense of community, knew more of their neighbors, and were more likely to describe their neighbors as friendly, than residents living on wider and longer roads.

Halpern (1995) followed up on Willmott's findings using the British Social Attitudes Survey data set on residential environments, containing attitudinal and perception data for approximately 7,400 respondents, and objectively measured traffic counts. By statistically controlling for the level of traffic, Halpern investigated whether the absence of traffic, rather than living on a cul-de-sac per se, was related to resident's perceptions of neighbor helpfulness, a measure of neighborhood friendliness. The results indicate that a neighborhood's measured level of neighbor helpfulness is significantly predicted by the level of traffic through it. Halpern concludes that the volume of automobile traffic is related to social interaction; as traffic volume increases social interaction between neighbors decreases.

Similarly, Appleyard and Lintell (1972) conducted field interviews and observations on three similar San Francisco city blocks with differing traffic levels to determine how traffic conditions affected the quality of the street environment. The three street types were categorized as light, a two-way street carrying an average of 2,000 automobiles over 24 hours, medium, a two-way street carrying an average of 8,700 automobiles, and heavy, a one-way street carrying an average of 15,750 automobiles. Detailed interviews, lasting approximately 1 hour, were held with twelve residents, evenly distributed by age (under 25 years, 25 to 55 years, and over 55 years) for each street (approximately 30% of the households on each street). Residents on the light street were found to have three times as many friends and twice as many acquaintances as those on the heavy street.

There was little difference in social interactions between the medium and heavy streets. Interestingly, younger and older residents' social interactions were more affected by street type than middle-aged residents, who have greater available resources to mitigate the environmental impacts. The findings suggest that heavy traffic is associated with much less social interaction. Conversely, a street with little traffic promotes a richer social climate and a stronger sense of community.

While none of these studies addressed individuals with disabilities, they do support the assertion that pedestrian oriented, mixed use community environments are likely to promote social interaction. While 'walkable' environments are not necessarily 'rollable', community environments which are pedestrian oriented may be more accessible to individuals with disabilities and support participating more fully in the community.

Neighborhood Incivilities

Seven of the following eight studies provide evidence to suggest that community environments likely to promote social interactions are those where individuals feel comfortable and secure. Incivilities are characteristics of the physical community environment directly related to residents' feelings of comfort and security. Physical incivilities can be either passive, such as litter or infrastructure in need of repair (unkempt lawns, crumbling sidewalks, deteriorating housing), or deliberate, such as graffiti and vandalism (Perkins, Florin, Rich, Wandersman, & Chavis, 1990). Social incivilities also include visible signs of social disorder, such as gangs on the street. Incivilities signal neighborhood disinvestment and the absence of a sense of neighborhood attachment.

Neighborhood incivilities hamper social interaction by impeding opportunity for positive passive contact between individuals.

One measure of neighborhood incivilities is residential stability, an indicator of residents' attachment to the neighborhood. Sampson (1988) hypothesized that community residential stability has direct effects on the extent of community-based friendship ties, the level of collective attachment, and social activity patterns. The study was based on a systemic model of community development which assumes that an individual has fewer opportunities to form friendships and participate in areas of high residential turnover. Study data were taken from the 1982 British Crime Survey, a nationwide survey of 10,905 residents of England and Wales across 238 geographic units that were small enough to approximate local communities. In addition to criminal activity and incivilities, the data included whether the respondents were raised within 15-minutes of their current residence (residential stability), percentage of friends within the same area (local friendships), level of sentiment and attachment to community (collective attachment), and patterns of social activities (e.g., visiting friends, organizational participation), in addition to socioeconomic measures. The study suggests that community residential stability has positive effects on social integration, such as friendships and participation in social and leisure activities.

Brown, Perkins, and Brown (2003), conducted a related study examining neighborhood attachment for over 600 residents of a neighborhood exhibiting physical indicators of decline. These physical indicators were residential stability (measured as years of residence), proportion of home ownership, incivilities, and the absence of flower or vegetable gardens. The researchers found that place attachment to the neighborhood is

associated with residents' investment in their environment and social cohesion. Environmental assessments of the physical indicators were conducted by the researchers and correlated with responses from in-person home interviews, which included a measure of social cohesion, representing the frequency of four different informal neighboring activities (e.g., visiting or borrowing/loaning something). While focused primarily on examining place attachment, the study demonstrated that residential stability, home ownership and the physical conditions of the neighborhood are positively associated with neighboring activities.

Similarly, Krause (1993) examined the relationship between social isolation/integration of the elderly and neighborhood conditions associated with decline. The assumption was that declining neighborhoods experience greater incivilities which promote distrust and that older adults who are distrustful of other people tend to be more socially isolated. Data for 640 individuals 55 years of age or older (mean age 65.4 years) were taken from the 1977 national Social Change in Canada Survey. Respondents reported the number of neighbors they associated with, closely maintained friendships, a three-item composite assessing distrust of others, as well as nine measures of neighborhood conditions which included condition of their residence, neighborhood buildings and road condition, noise level, air quality, and safety from crime in the neighborhood. According to the findings, as the quality of the neighborhood environment declines, elderly people report greater social isolation.

Krause (1996) conducted a second investigation focused on the relationship between the physical environment and self-rated health among the elderly. This study involved 1,103 face-to-face interviews in the United States with individuals 65 years of age and

older randomly selected from the Health Care Finance Administration Medicare Beneficiary Eligibility List. Although focused on physical health status, the interviews included neighborhood decline indicators taken from Krause's 1993 study and four questions to assess strain on friendships. Analysis of the relationship between these factors indicates that, independent of socioeconomic factors, as the quality of the neighborhood environment declines, elderly people's friendships are increasingly strained.

One of the rare studies to address individuals with disabilities social integration was reported by Heller, Miller, and Hsieh (2002). The longitudinal study examined the impact of environmental features of residences, which included physical attractiveness (i.e., cleanliness, condition, and aesthetic appeal), on adaptive behavior, community integration, and health of adults with mental retardation over an 8-year period. Participants were 186 individuals over 30 years of age with mental retardation living primarily in 55 various congregate residential settings (38 community residential sites, 14 nursing homes, and 53 individuals residing in three intermediate care facilities). Study findings did not directly associate the attractiveness of the residence with measures of community integration. However, residents who live in more physically attractive settings evidenced higher adaptive behaviors leading the authors to assert that the appeal of the residential environment may communicate to persons with mental retardation that they are valued as persons of dignity. An alternative explanation, acknowledged in part by the authors, is that individuals with higher adaptive behaviors may have been able to select the more physically attractive settings (i.e., the better place to live) as their preferred residence.

Ellaway, Macintyre, and Kearns (2001) conducted an analysis of perceptions of the residential environment and self-reported health in four contrasting neighborhoods in Glasgow. Responses from 505 participants were taken from a postal survey conducted in 1997. Respondents were asked a range of questions concerning their perception of their local area, including quality and safety of the environment by rating the presence of incivilities. Respondents also reported perceived neighborhood cohesion based on neighborhood attraction, neighboring activities, and sense of community. In addition to positive correlation between social cohesion and residential stability and home ownership, the study found that the quality and safety of the residential environment is significantly associated with neighborhood cohesion.

Each of the previous studies controlled in some way for socio-economic factors. Residential environment characteristics' correlation with social integration was also reported by Gracia et al. (1995) who hypothesized that a high risk environment impoverishes the social life of those within it. However, while the authors defined high risk environments as those with poor quality infrastructure and amenities, it is not possible to separate the socio-economic factors also used to define the environment. As a result, for this study it is not possible to assess the impact of the environment factors alone, and draw independent conclusions.

The remaining studies do support the assertion that the quality of a neighborhood and the extent of the incivilities are related to perceptions of safety and social withdrawal and isolation. Residents who feel safer and more secure in their community may be more likely to participate socially in the community. In neighborhoods with significant incivilities individuals with disabilities may be less likely to feel safe and secure, and

more likely to employ avoidance behavior, than the general population (Imrie, 1996; Pain, 2000). Community environments where neighborhood incivilities are found may be less likely to promote individuals with disabilities social integration in the community.

Common Spaces

The following seven studies provide evidence to suggest that community environments likely to promote social interaction are those with appropriate common spaces. Appropriate common spaces may allow individuals to control and regulate social interactions; they do not require or force interactions but are conducive to interactions occurring (Halpern, 1995). An individual's sense of well-being and comfort may be linked with their ability to regulate the pace and intensity of social interactions (Evans, 2003). Whereas uncontrolled social interactions may be associated with social withdrawal, a range of common spaces, from small intimate spaces, group spaces, and larger public interaction opportunities, are likely associated with greater perceived control and comfort (Zimring, 1982).

Conceptually, social interactions are appropriately promoted in spaces by proximity, neutral or common territory (i.e., perceived as public or semi-public space), visual prospect (i.e., visual access to the space prior to making a behavioral commitment), activity generators (e.g., food, sensory stimuli, performing), and amenities arranged to support social behaviors (e.g., seating which allows individuals to face one another). The evidence supporting the relationship between social interactions and common space is focused in two areas, housing type and parks and civic spaces.

A great deal of study has been conducted regarding housing type and quality and social interactions. Evans, Wells, and Moch (2003) conducted a critical review of research on housing and mental health factors describing study design, sample, housing variables, mental health outcome, reliability and validity data, and findings. The review is organized according to housing type (18 studies), floor level of dwellings (8 studies), housing quality (27 studies), and the effect of the previous factors on children's well-being (10 studies). The review specifically did not address neighborhood characteristics or focus on the relationship between housing and social interactions. However, the authors identified the ability of individuals to control and regulate social interaction as a reason for the link between housing and psychological well-being; or that difficulties in regulating social interaction and the lack of gathering places (i.e., common space) for residents contributed to isolation, low self-efficacy, loneliness, and so forth.

Further, the authors describe 6 studies for which a measure of social interaction was the primary outcome. The authors reported that these studies indicate that apartment dwellers complained more about isolation and loneliness (Moore, 1975); high-rise residents were less socially involved with other residents, the incidence of which increased with increasing floor level (Wilcox & Holahan, 1976); residents of single-family detached homes had greater and more involved interactions with neighbors (Zalot & Webber, 1977); high-rise residents report fewer social relations, and less social support (McCarthy & Saegert, 1979); high-rise residents encounter more people but show no difference in perceived social support (Churchman & Ginsberg, 1984); and that individuals living in dilapidated housing experienced greater isolation (Payne, 1997). That housing type, particularly multi-dwelling structures, is associated with social

isolation may be attributable to the lack of appropriate spaces for social interactions to occur.

Yancey (1971) examined the affect of the architectural design of the infamous Pruitt-Igoe Housing Project on the informal social networks of its residents. Pruitt-Igoe consists of 2,762 apartments in 43 11-story buildings representing an extreme example of a national housing policy whose sole goal was the provision of housing with no concern for the development of community. Indeed, Pruitt-Igoe was recognized for its lack of "wasted space" outside of the individual dwellings. Although the exact number and specific methods are unclear, the author indicated conducting over 1,000 resident interviews and controlling for socioeconomic factors. The study found that without the provision of semi-public space and facilities around which informal social networks might develop, the residents retreated into their individual apartments and did not have the social support or interactions found in other working-class neighborhoods.

The evidence indicates that the association between housing type or quality and social interactions are due to the quality and availability of common spaces defined by the architecture. Many building types allocate insufficient resources to spaces that support the development and maintenance of social interactions (Evans, 2003). Less study, of greater variation, has been focused solely on parks and civic spaces not directly defined by housing and social interactions.

Kang (2006) evaluated the relationship between urban residents' social and community engagement, according to five interpersonal factors including social network and belongingness, and neighborhood open spaces. The author compared survey responses describing perceptions of the social and physical environment for 378

participants residing in two communities in Guangzhou, China with observations of the public spaces in the community. Further, the author conducted 10 semi-structured interviews for in-depth contextual information at the factor level. The study indicated that residents living in a community with a large number of neighborhood open spaces had higher degrees of social and community engagement, and that the residents perceived quality of the open space is positively linked with the level of social and community engagement.

Somewhat similarly, Kim and Kaplan (2004) explored the relationship between residents' sense of community and the physical environment of community. The authors conducted 746 surveys and 146 follow-up interviews with the residents of a new urbanist and traditional suburban development to examine 17 distinct aspects of the physical environment and four domains of sense of community; community attachment, community identity, social interaction, and pedestrianism. It appears that the two communities were similar socioeconomically. Although the analysis methods are not well explained, the authors concluded that natural features and open space play a particularly important role in increasing the likelihood of social interaction and fostering a sense of community. Additionally, natural features of the physical environment, such as public greens, footpaths, lakes, wetlands, and street trees and landscaping were particularly important for sense of community and social interaction.

The role of natural open space features was examined by Kuo, Sullivan, Coley, and Brunson (1998) who studied the relationship between 145 urban public housing residents' perceptions of their neighborhood social ties and the amount of vegetation found in the common spaces of 18 architecturally identical public housing buildings. The

authors found that the levels of vegetation in common spaces were positively correlated with both the use of common spaces and neighborhood social ties.

Kweon, Sullivan, and Wiley (1998) conducted a similar study, albeit for older adults (between the ages of 64 and 91). The authors investigated the relationship between exposure to 'green' common spaces and older adults' social integration and sense of community. The study employed structured interviews with 91 older participants residing in two apartment buildings in a Chicago area public housing development, one whose common spaces were significantly more landscaped and grassed than the other. Social integration was measured by 15 Likert-scale survey responses, which generated two factors; neighborly activities (representing residents' neighboring behaviors) and friends and neighbors (representing how well residents know their neighbors). The results indicated that exposure to green common spaces was associated with higher levels of social integration and a greater sense of local community. Further, when the amount of time residents spent in common spaces was held constant, the relationship between social integration and green common spaces was stronger. While not focused on individuals with disabilities, this study suggests that older adults are more sensitive to environmental characteristics than the general population, which may generalize to a similarly vulnerable population, individuals with disabilities.

Lawton and Nahemow (1979) and Lawton, Nahemow, and Teaff (1975) conducted broader studies for the elderly examining the relationship between neighborhood characteristics and the well-being of public housing residents. Over 2,400 residents of over 150 public housing developments were interviewed to solicit residents' perceptions of their well-being, as a measure of participation in neighborhood activities, family

contact, friendship behavior, and so forth. The authors used aggregated USA census data to measure five factors describing the conditions of the neighborhood, which include housing quality, ownership, and values (social-area factors); as well as direct observation of the neighborhood in which the housing was located. The conditions of the neighborhood accounted for significant proportions of variance in residents' social activity, such as friendship behaviors. While the study's links with the physical environment are indirect and weaker, they do suggest that friendship behavior is related to environmental characteristics.

While these studies do not address individuals with disabilities, they do support the assertion that the availability of common spaces is likely to increase the potential for social interaction. Further, the quality of common spaces, as it affects the comfort of the occupant, is positively associated with the potential for social interaction. There is also some indirect support for individuals with disabilities being a population vulnerable to the social impact of characteristics of common spaces (Kweon et al., 1998). Individuals with disabilities may be more likely to experience positive casual contact, social interaction often leading to social integration, in comfortable community common spaces. Common spaces, associated with residential dwellings and neighborhood/civic areas, are likely an important venue for casual social contact. Those which are comfortable and allow an individual to regulate the pace and intensity of interactions may appropriately promote positive social interactions and participation in the community.

Literature Review Conclusions

The assessed literature represents the body of evidence concerning the effect on social integration from three broad community environment factors: pedestrian-oriented, neighborhood incivilities, and quality common space. Community environments which are pedestrian-oriented possess appropriate common spaces, and fewer neighborhood incivilities, are likely to promote social integration. While there is support for these community environment factors affects on the general population, of 18 reported studies, only one study addressed individuals with disabilities' social interactions and neighborhood incivilities. If it is assumed that the elderly are a vulnerable population sharing similar characteristics with individuals with disabilities, an additional four studies support the likely impact of neighborhood incivilities and common space on the social interactions of vulnerable populations.

The limited body of evidence is a limitation of this investigation. Additionally, summarizing and categorizing this limited and disparate body of evidence unavoidably results in the loss of some of the contextual detail of measures and methods.

It is also unlikely that a single set of data can fully elucidate the complexities of an individual's social integration in community and the ways in which they are constrained by social, cultural, and economic environments (Baum et al., 2000). The determinants of social integration in community include micro-social personal (personality, social skills, gender, race/ethnicity) and interpersonal (support from one's social network) factors, as well as macro-social situational or contextual (socioeconomic position, health, community environment) factors (Gracia et al., 1995; Gracia & Herrero, 2004).

Disability itself may be a macro- and micro-social factor in social integration. To elucidate the relationship between the physical environment and social integration, these correlated personal, interpersonal, and contextual factors need to be taken into account.

The issues are complex, particularly given that the physical environment can be seen as both the medium and outcome of social interactions. Known in the literature as the drift hypothesis, individuals whose personal, interpersonal, and situational factors predispose them to greater social integration, may chose physical community environments which support their predilections, or vice versa (Fox, 1990). Likewise, individuals predisposed to greater social integration, or not, may reshape their environment correspondingly.

Further, social integration in community is a process rather than an outcome (Chenoweth & Stehlik, 2004). Social integration may ebb and flow with changes in individuals' personal and contextual circumstances, which may change the effect of the physical community environment on the social integration of individuals with disabilities in community.

However, although the body of evidence is limited and the results of individual studies may be open to alternative interpretations, the pattern of results across the body of evidence supports the likely impact of factors of a community's physical environment on opportunities for social integration, namely pedestrian-oriented, neighborhood incivilities, and quality common space.

Although social integration in community is especially important for individuals with disabilities, who are disproportionately socially excluded within the community and society, much less is understood regarding the relationship of the community's physical

environment and individuals with disabilities' opportunities for social integration, and thereby full participation in society. Understanding better how the physical environment affects the social integration of individuals with disabilities in communities is a critical topic for future research. There is significant potential for researchers, public policy professionals, community planners and designers to participate with individuals with disabilities and advocates to ensure the rights of individuals with disabilities and their families to enjoy fully participating in the mainstream of society.

CHAPTER III

METHODS

The purpose of this study is to determine to what extent individuals with disabilities reside in physical environments that contribute to opportunities for social integration in community. The study involves nonexperimental correlational research to discover relationships, and degree of, between variables. Two research questions were evaluated: in relation to the total population (a) to what extent are adults with disabilities' places of residence correlated with mixed-land use community environments, and (b) to what extent are adults with disabilities' place of residence correlated with community common space. The expectation was that a lower percentage of adults with disabilities reside in mixed-land use community environments or in areas where there is greater community common space.

Study Context

The study was conducted within Utah's Weber and Davis counties, a setting which corresponds with a U.S. Census designated metropolitan/micropolitan statistical area (MMSA). An MMSA consists of a large population nucleus in adjacent communities having a high degree of social and economic integration, and is used by Federal statistical agencies in collecting, tabulating, and publishing Federal statistics. Given the increased attention given to MMSAs, additional data in smaller spatial units is available. The Utah counties of Weber, Davis, and Morgan form the Ogden-Clearfield MMSA.

According to the U.S. Census Bureau's 2008 American Community Survey, the

Ogden-Clearfield MMSA has a population of 531,580 of which 49.6% are female, 7.6% are non-White, 11.1% are Hispanic or Latino, 90.0% are English speaking, and 92.3% are high school graduates or higher. There are 179,831 housing units, 94.1% of which are occupied, with an average family size of 3.1 people and a median annual household income of $59,241. Of the total population, 318,261 individuals are between 18 and 64 years of age, of which 7.9% report being individuals with disabilities according to the U.S. Census Bureau's definition of disability.

However, the majority of the population of the Ogden-Clearfield MMSA reside in Davis and Weber counties (98.7%), rather than Morgan county (7,129 people). Similarly, Morgan county's community development and land use diversity patterns are markedly different than those of Davis and Weber counties, being highly rural with an average housing density of 4 per square mile compared with 243 per square mile in Davis county and 342 per square mile in Weber county. The measures of mixed-land use development and community common space are more appropriate in urban rather than rural land use and development patterns. Therefore, the setting for this study is focused on the Davis and Weber county portions of the Ogden-Clearfield MMSA (Figure 1). This area encompasses 1,294 square miles of area reflecting development and land use diversity patterns consistent with typical urban and suburban U.S. communities (Figure 2).

Within the study setting, the data reflects the population of adults between the age of 16 and 64 years, a range selected to represent the working age population and best correspond with U.S. Census data which is stratified by children age 5 to 15 years, adults age 16 to 64 years, and the elderly age 65 years and older. As the impact of the built

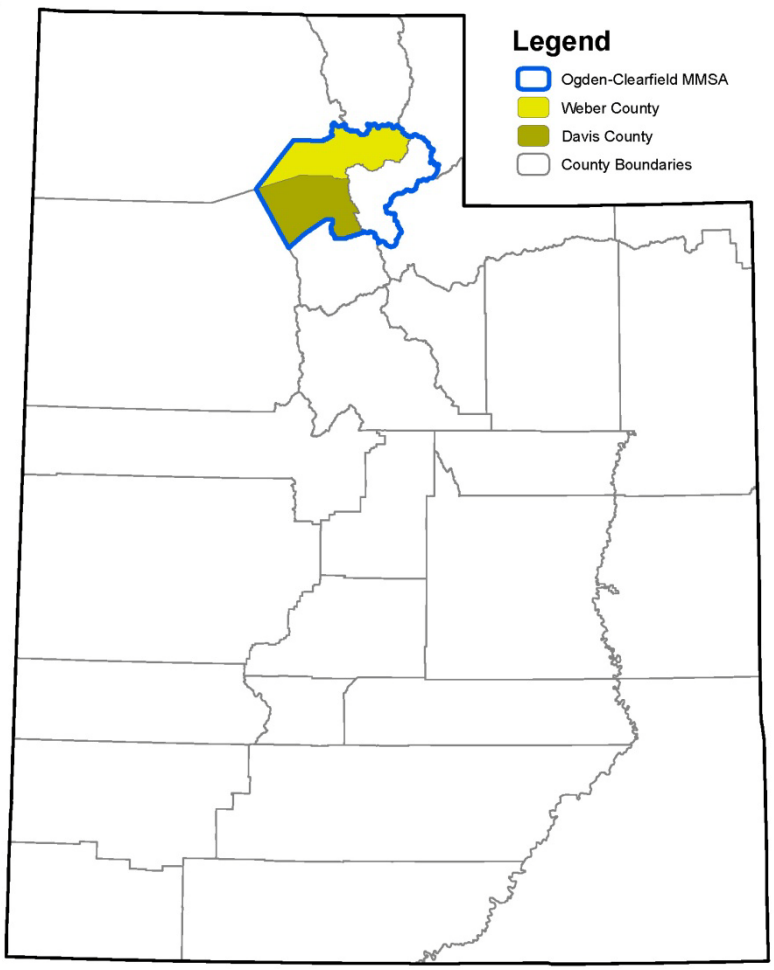

Figure 1. Statewide context of the study setting.

environment on behavior differs significantly across age groups, particularly among children and the elderly, individuals less than 16 years of age and over 64 years of age were not included in the study to reduce the influence of extraneous variables.

The total study population represents 262,875 adults 16-64 years of age residing in Utah's Weber and Davis counties.

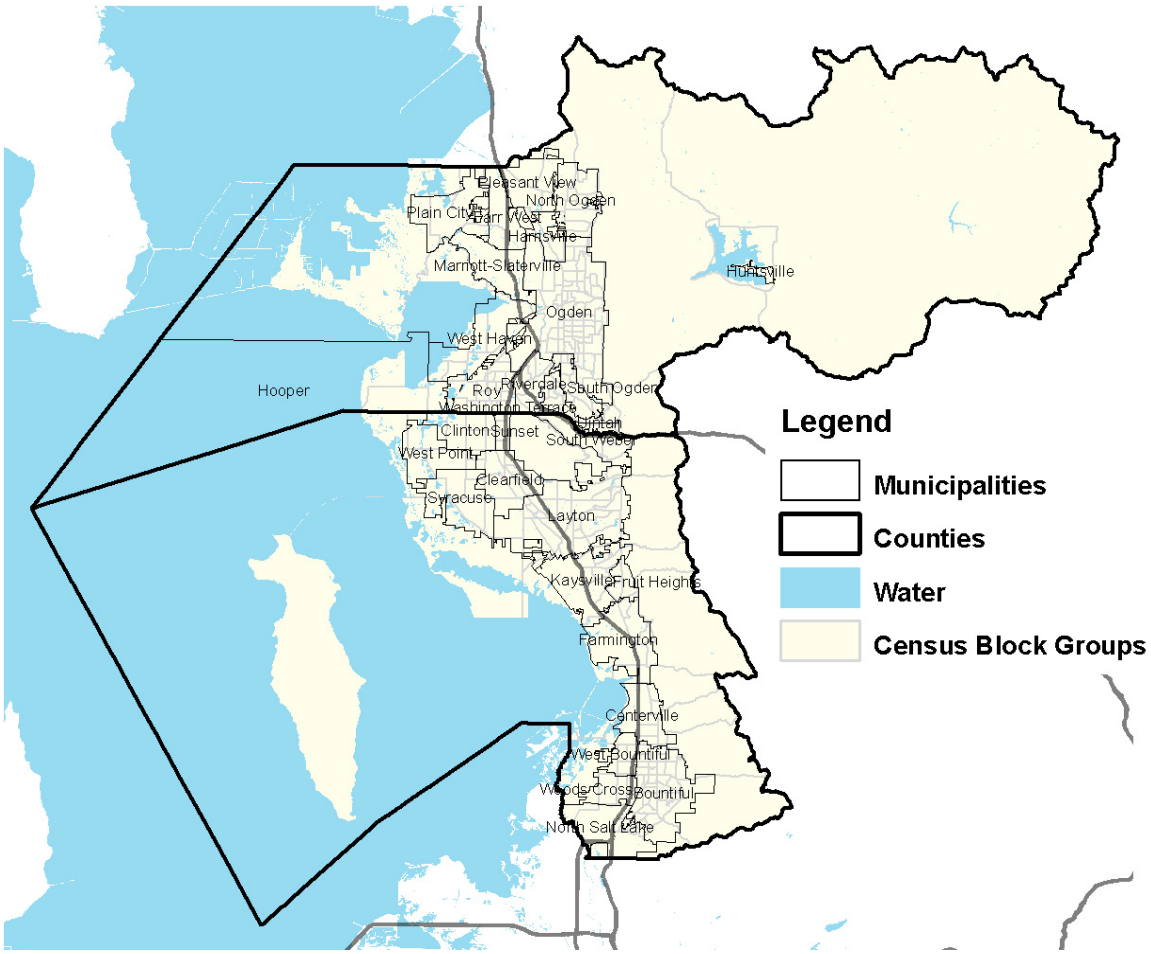

Figure 2. Municipal context of the study setting.

Measures

The measures were determined according to census block groups within the study setting. Block groups are clusters of census blocks created by the Census Bureau as the smallest geographic level for the tabulation of data collected from all households to permit the release of data that cannot be presented at the block level and still maintain confidentiality, such as disability status. Block groups do not cross county boundaries and contain between 600 and 3,000 people, with an optimum size of 1,500 people. Block

groups were delineated by local participants as part of the U.S. Census Bureau's Participant Statistical Areas Program and generally represent socioeconomically homogeneous neighborhoods. In 2000 there were 132 block groups in Weber county and 129 block groups in Davis county encompassing 1,294 square miles. Two block groups, one in each county, were excluded from the study as these block group areas encompass a Department of Defense installation, Hill Air Force base, whose population are not reflected in the disability status measure. Nine block groups were modified to remove large water bodies, where places of residence are not likely, from the block group areas. Nineteen block groups were modified to remove large areas of public lands, such as National Forests where places of residence are not likely, from the block group areas. The modified census block group area is shown in Figure 3 and Table 2. The remaining census block group area, 509 square miles, used in the study is shown in Figure 4 and Appendix A.

An overview of the study measures, their sources, and what they represent are found in Table 3 and described in the following sections. The raw data can be found in Appendix A.

Disability

The population's disability status was determined using Census 2000 Summary File 3 data. Census 2000, made available in 2003, was the most recent decennial census in which population counts were taken of the entire U.S. population for all households. Census 2000 disability data from Summary File 3 is available for block groups. To determine individuals with disabilities likely places of residence for each block group, the

Table 2

Total Census Block Group Area

Modification	Number of Parcels	Area (square miles)
Beginning	244,835	1,294
Remove water bodies	-	609
Remove public lands	6,718	154
Remove Dept. of Defense installation	267	10
Remove parcels without parcel identification numbers*	3,153	12
Designate parcels developed post-2000**	2,331	-
Remaining	234,697	509

* Parcels represented road right-of-ways, canal right-of-ways, and gaps between parcels.
** Parcels were not removed from the raw data, but were recoded as vacant property.

specific disability measures used are “Total civilian noninstitutionalized population 16 to 64 years” and “Total disabilities tallied for the civilian noninstitutionalized population 5 years and over with disabilities: people 16 to 64 years” (Census 2000 Summary File 3 P125001 and P041007, respectively). These measures are estimates determined by the U.S. Census Bureau from a sample using an imputation procedure to compensate for non-responses and to reduce related biases. Individuals who reside in military group quarters such as barracks or dormitories are not represented in this measure. However, armed forces personnel who reside in family housing on or off the military installation are represented at their place of residence in this measure, an important consideration given

Table 3

Study Measures

Measure	Definition	Source
Disability	Percent population with disabilities.	Census 2000 SF3
Poverty	Percent population below poverty level.	Census 2000 SF3
Mixed-Land Use	The diversity of the distribution of single family residential, multi-family residential, retail and services, and institutional land use.	2007 Parcel Boundaries, 2009 Property Tax Records
Common Space	Percent area within .25 miles of public park space.	2007 Parcel Boundaries, Municipal Park Locations

the presence of Hill Air Force base in the study setting. The two measures are used to determine the percentage of individuals with disabilities residing within each census block group as shown in Appendix A and Figure 5.

Prior to 2008, the U.S. Census questionnaires determined disability status according to six disability concepts captured through three questions. The first question asked about long-lasting conditions; either sensory disability, determined by “blindness, deafness, or a severe vision or hearing impairment,” and/or physical disability, determined by “a condition that substantially limits one or more basic physical activities

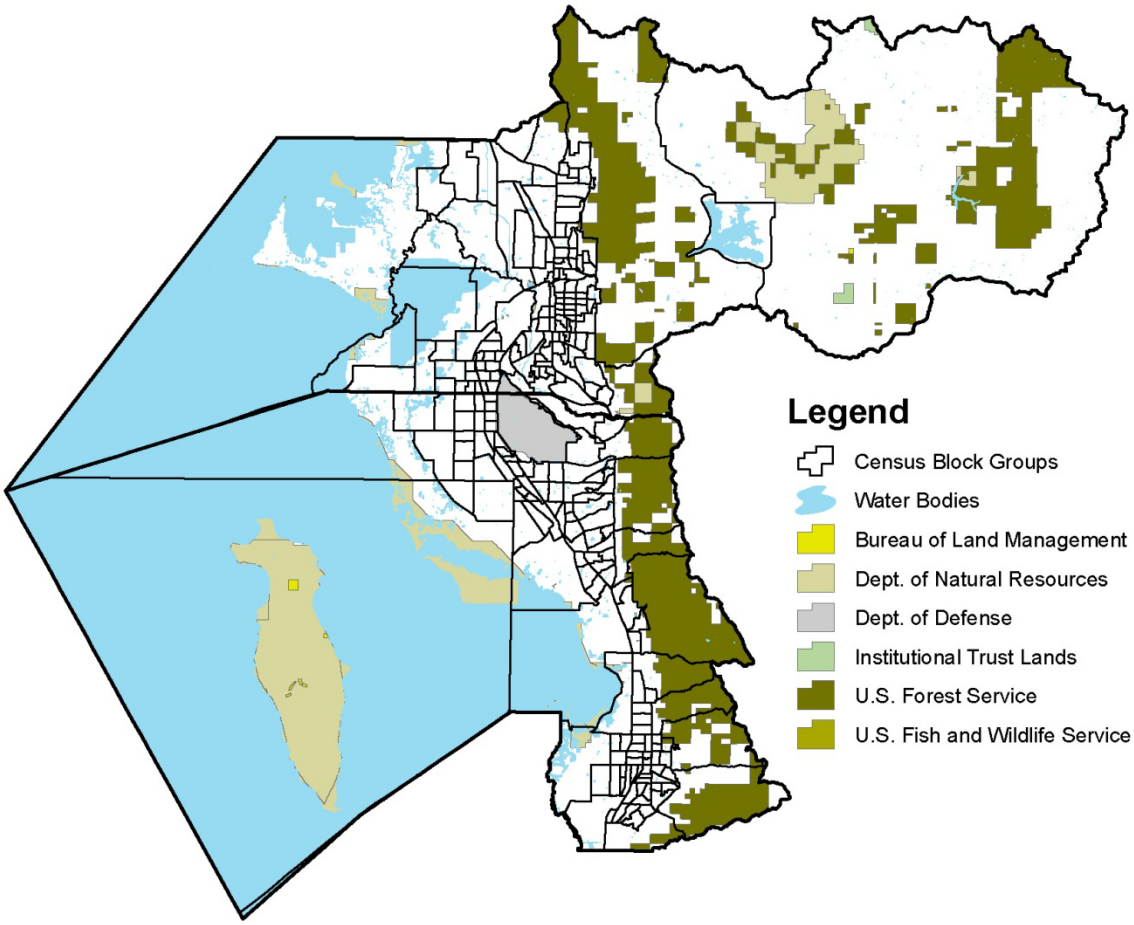

Figure 3. Census block groups, water bodies, and public lands in the study setting.

such as walking, climbing stairs, reaching, lifting, or carrying." The second question asked whether the individual experiences any difficulty doing specific activities because of a physical, mental, or emotional condition lasting 6 months or more. Mental disabilities were determined by difficulty "learning, remembering, or concentrating." Self-care disabilities were determined by difficulty "dressing, bathing, or getting around inside the home." The third question determined difficulty with other activities. Go-outside-home disability was determined by difficulty "going outside the home alone to

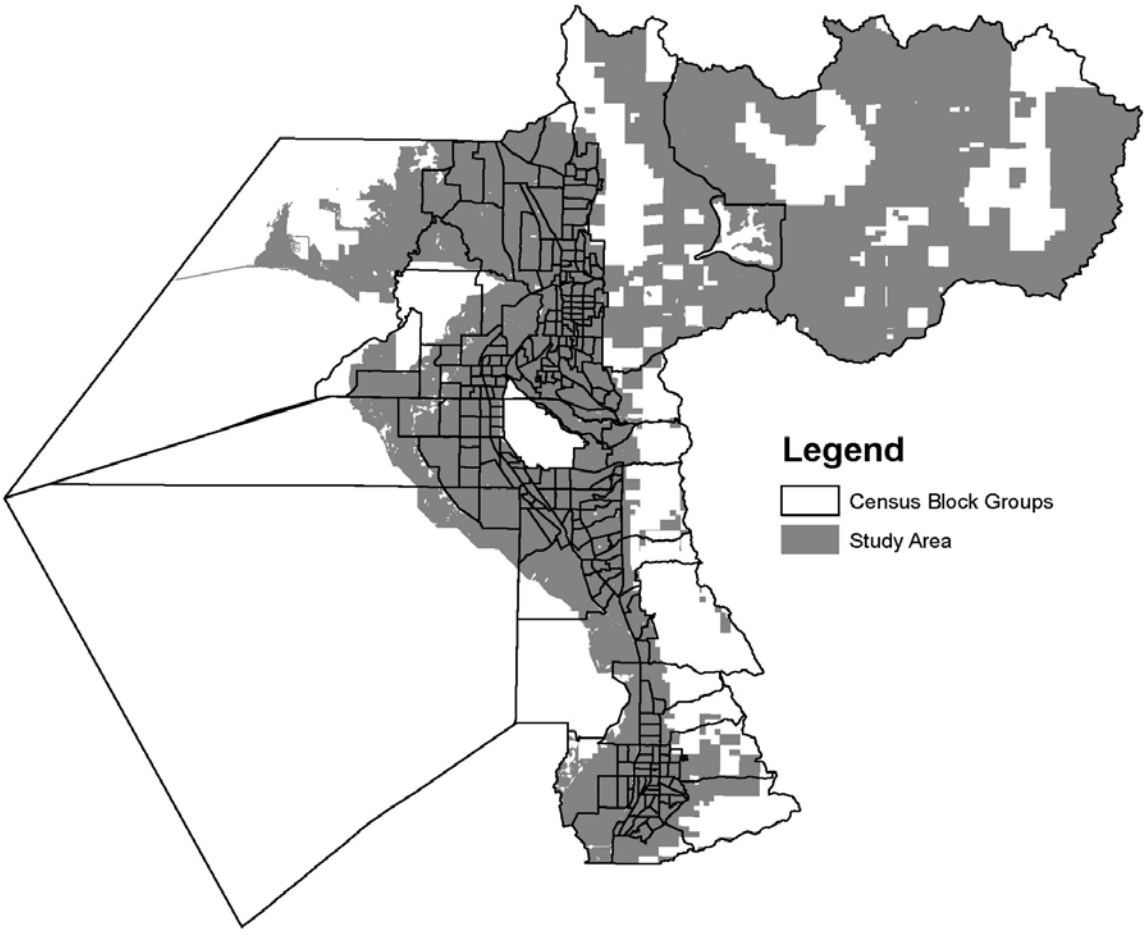

Figure 4. Census block group area in the study setting.

shop or visit a doctor's office." Employment disability was determined by difficulty "working at a job or business."

Poverty

To control for socioeconomic factors between the block groups, "Population for whom poverty status is determined: Total" and "Population for whom poverty status is determined: Income in 1999 below poverty level; 18 to 64 years" (P87001 and P87007

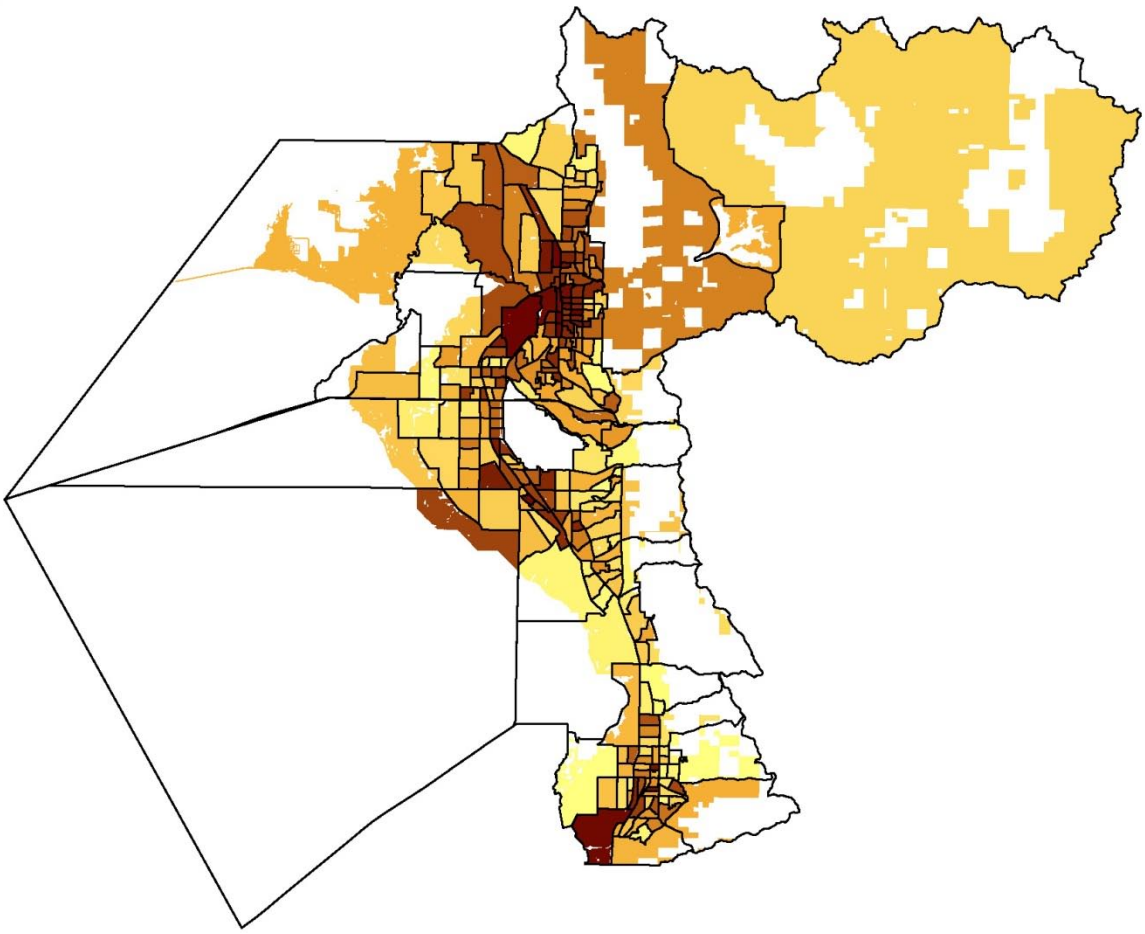

Figure 5. Percentage of individuals with disabilities by census block group (darker color represents higher percentage).

respectively) data from Census 2000 Summary File 3 were used to determine the percentage of individuals between the ages of 18 and 64 years whose 1999 income was below the poverty level within each census block group as shown in Appendix A and Figure 6. The measure was selected to best represent the effects of education and employment factors, which contribute to individual income levels, as well as best representing the age range of the population's disability status measure (16 to 64 years).

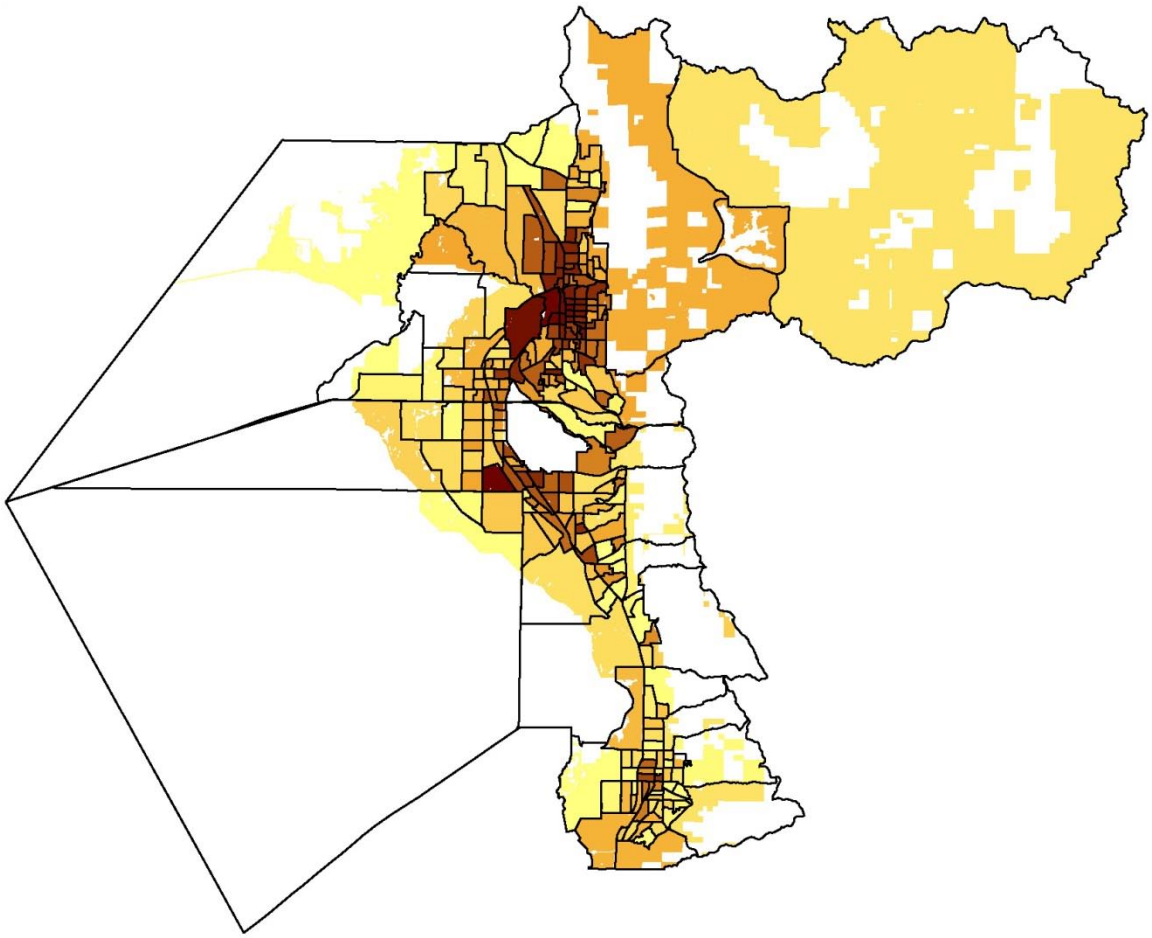

Figure 6. Percentage of population below the poverty level by census block group (darker color represents higher percentage).

Alternative socioeconomic factor measures were explored, including the overall percentage of individuals whose 1999 income was below the poverty level within each census block group, below 125% of the poverty level, and employing principal component analysis using multiple factors to create a socioeconomic index. In addition to being more appropriate due to the closer correlation between the predictor and criterion variables, the 18 to 64 years measure was better correlated with place of

residence than the overall measure of poverty level and 125% of poverty measures, as described in Appendix D.

Mixed-Land Use

Mixed-land use community environments describe the composition of land uses within a given geographic area. The descriptive measure of mixed-land use is an entropy score describing the diversity of the distribution of the four land use categories for each block group area.

To calculate the entropy score, land use geospatial data was developed from geographic information system (GIS) databases spatially describing individual parcels and linked by parcel id number with property type descriptions taken from property tax records for Weber and Davis counties.

The property type descriptions were coded to reflect four land use types; single family residential, multi-family residential, retail and services, and institutional land use (see Appendix B for coding of property types). These land use types, and their description by entropy score, have been found to be a significant predictor of pedestrian-oriented community environments (Brown et al., 2009; Frank et al., 2006). Frank, Schmid, Sallis, Chapman, and Saelens (2005) found that an entropy scores for land use types were a better predictor of pedestrian-oriented community environments than measures for street connectivity. Additional land use types were identified, including industrial/manufacturing, agricultural, and vacant land, as shown in Figure 7. These uses were not included in this study as entropy scores which include these types of land use

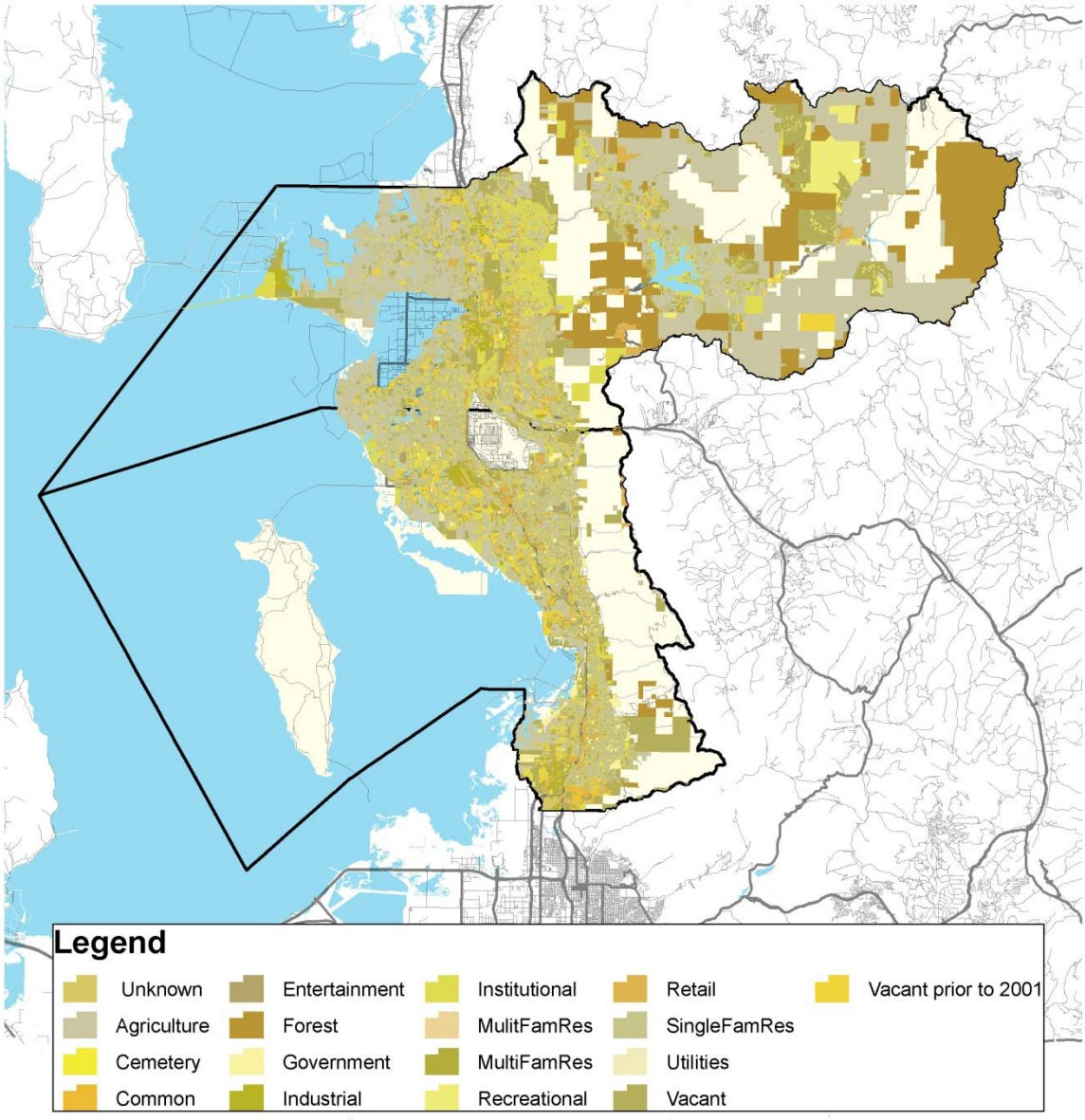

Figure 7. Land uses in the study area.

are not associated with pedestrian-oriented community environments (Brown et al., 2009).

Previous work has also shown entropy scores derived from six land use types, which also included office and entertainment land uses, to be a significant predictor as well (Brown et al., 2009). However, the property type codes necessary to determine the additional

land uses was not available from the Weber county property tax records. Where the additional land use types were available for Davis county, exploratory analysis conducted to determine how well the four-land use category entropy score correlated with the six-land use category entropy score. The results of this analysis, as described in Appendix E, suggest that the correlation between the four-category and six-category entropy score measures was very strong ($r(126) = .965$, $p < .001$), suggesting the four-category entropy score adequately represents the diversity of the distribution of the land use types for each block group area.

Given the comparison of the land use measures with Census 2000 demographic data, land developed after 2000 was identified and excluded using information from the property tax records indicating the year the property was developed (Table 2).

The individual parcels by land use type were spatially merged with the census block group geographic areas, which resulted in the land use data being associated with the appropriate census block groups. For each block group the total area of each land use type was then calculated, as is necessary to determine the land use entropy score.

The entropy score is determined according to the following equation;

$$entropy = -\{\sum_{k}[(p_i)(\ln p_i)]\} / (\ln k)$$

where p_i is the percentage of each of the land uses and k is the number of land uses. The equation results in a normalized value between 0 and 1 (where each land use is $1/4^{th}$ of the total), the larger value representing greater diversity of land use. The entropy score for each census block group are found in Appendix A and shown in Figure 8.

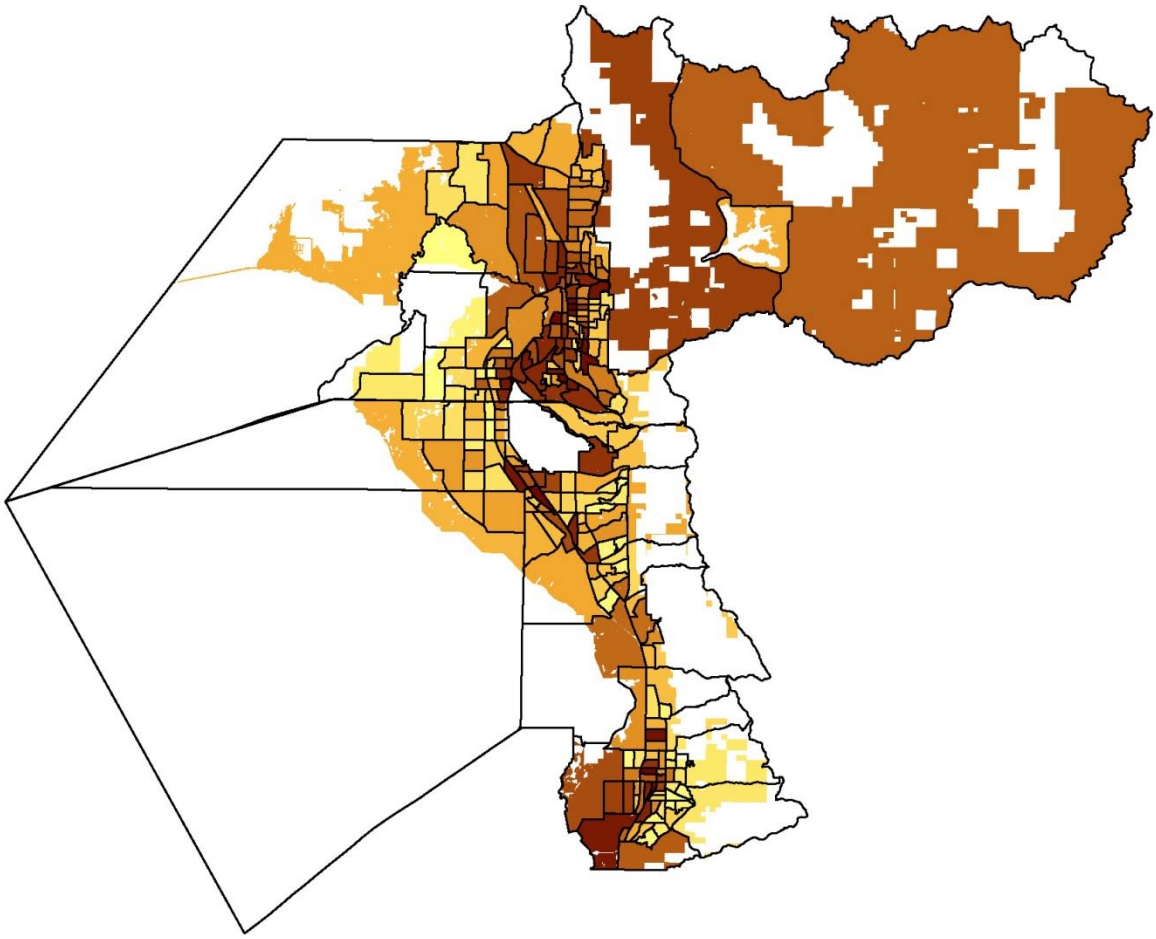

Figure 8. Land use entropy score by census block group (darker represents higher score).

Common Space

For the purposes of this study, community common space is defined as outdoor areas managed for public use such as parks, plazas, boulevards, and greenways. The descriptive measure of community common space is the percentage of individual block group areas which are within a quarter-mile walking distance of community common spaces. The quarter-mile walking distance (apprx. 5 minute) is the accepted distance convenient to pedestrian behavior and public park use, which also falls within the six minute walking distance test commonly used to estimate functional capacity in elderly

individuals and those with chronic diseases (no similar test exists specifically for individuals with disabilities) (Troosters, Gosselink, & Decramer, 1999).

Measuring community common space as the percentage of public parks for individual block group areas was explored and found to neither be an appropriate measure conceptually or to be significantly correlated with the criterion variable, as described in Appendix F.

The location and spatial configuration of common spaces for Weber and Davis counties were developed manually in a GIS system using each municipality's and county's addresses for public parks (see Appendix C). The public parks data were spatially merged with the census block group geographic areas, which resulted in the public parks data being associated with the appropriate census block groups. Subsequently, the area of each census block group within a quarter-mile walking distance of the public parks was identified. The percentage of each census block group within walking distance of community common space is found in Appendix A and shown in Figure 9.

Limitations of the Study Measures

The purpose of this study is to determine to what extent individuals with disabilities reside in physical environments that contribute to opportunities for social integration in community. The primary limitation of this study is that it is unlikely that a single set of data can fully elucidate the complexities of an individual's social integration in community and the ways in which they are constrained by social, cultural, and economic environments (Baum et al., 2000). In particular, socioeconomic factors are powerful

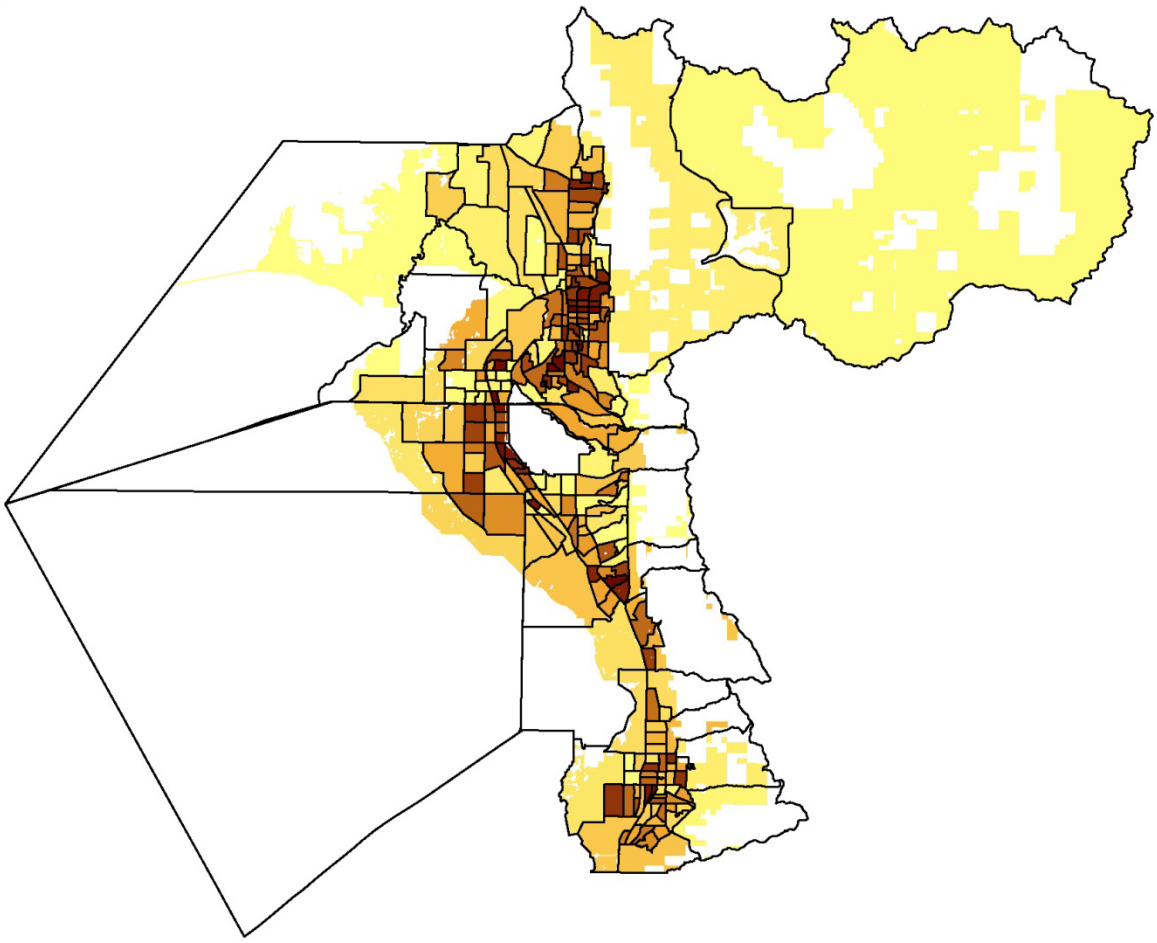

Figure 9. Percentage of each census block group within .25 miles of community common space (darker color represents higher percentage).

contextual determinants of residential choices in community, and hence opportunities for social integration. This study assumes that disability itself is a macro- and micro-social factor in social integration. Further, disability itself is a significant determinant of socioeconomic factors. As socioeconomic factors are the most significant threat to the validity of the study they are controlled using the measure of the percentage of individuals between the ages of 18 and 64 years whose 1999 income was below the poverty level within each census block group and the regression process as described.

An additional limitation of the study is the temporal discrepancy between the population and spatial data sets. The disability and poverty measures were determined using Census 2000 Summary File 3 data. Census 2000, made available in 2003, was the most recent decennial census in which population counts were taken of the entire U.S. population for all households. However the mixed-land use community environments and community common spaces measures were determined from 2009 Davis and Weber county property tax records and 2007 parcel boundary descriptions. These spatial data sets are not available for earlier periods, nor are the population data sets available for later periods. Therefore, properties developed after 2000 were eliminated from the data set using property tax records indicating the year the property was developed. This information is generally only available for residential property and does not address the previous land use. However, residential use is the most prevalent type of land use and the rate of change in developed land use (i.e., redevelopment) is relatively slow, typically occurring over decades. Although imperfect, it is reasonable to assume that the patterns of land use are stable enough to compare with recent historical population patterns.

CHAPTER IV

RESULTS

The purpose of this study was to determine to what extent individuals with disabilities reside in physical environments that contribute to opportunities for social integration in community. This study addressed the following research questions:

1. In relation to the total population to what extent are adults with disabilities' places of residence correlated with mixed-land use community environments?
2. In relation to the total population to what extent are adults with disabilities' place of residence correlated with community common space?

Given the sample size, distribution, variance, and continuous measures; linear regression was conducted to determine the magnitude of the relationship between census block groups' percent of population with disabilities (criterion), percent of population below poverty level (predictor to be controlled for), and the spatial predictors accounting for the remaining portion of the relationship; land use diversity (predictor) and the presence of community common space (predictor). Statistical significance was determined at $\alpha = .05$. Data analysis was conducted using SPSS version 17. Geospatial analysis was conducted using ESRI ArcInfo 9.3.

First, the descriptive data for each measure is presented. Figures 10-14 are histograms for each measure. Thereafter, the results for each research question are presented.

Place of Residence

The population's place of residence was determined by Census 2000 block groups. Figure 10 shows the total population density for each block group; the total population divided by the effective land area. Table 4 includes the ranges, means, and standard deviation for the census block groups' total population, effective land area, and total population density. Given that the U.S. Census Bureau defines urban areas as having greater than 2,000 persons per square mile, rural areas as having less than 500 persons per square mile, and suburban areas as those in between; 22 of the census block groups may be considered rural, 48 may be considered suburban, and the remaining 189 may be considered urban. Approximately 50% of the U.S. population resides in urban areas, with 25% residing in suburban and rural areas, respectively. A chi-square test of goodness-of-fit was performed to determine whether the population densities distributions between census block groups in the study setting were similar to the expected distribution. Population density for the census block groups was significantly different from the expected distribution, χ^2 (2, N = 259) = 59.9, p < .001, as depicted in Figure 10. Population density for the study setting was significantly more urban and less rural than the U.S. in general. However, given the use of a metropolitan/micropolitan statistical area for the study setting, the more urban distribution is not unexpected.

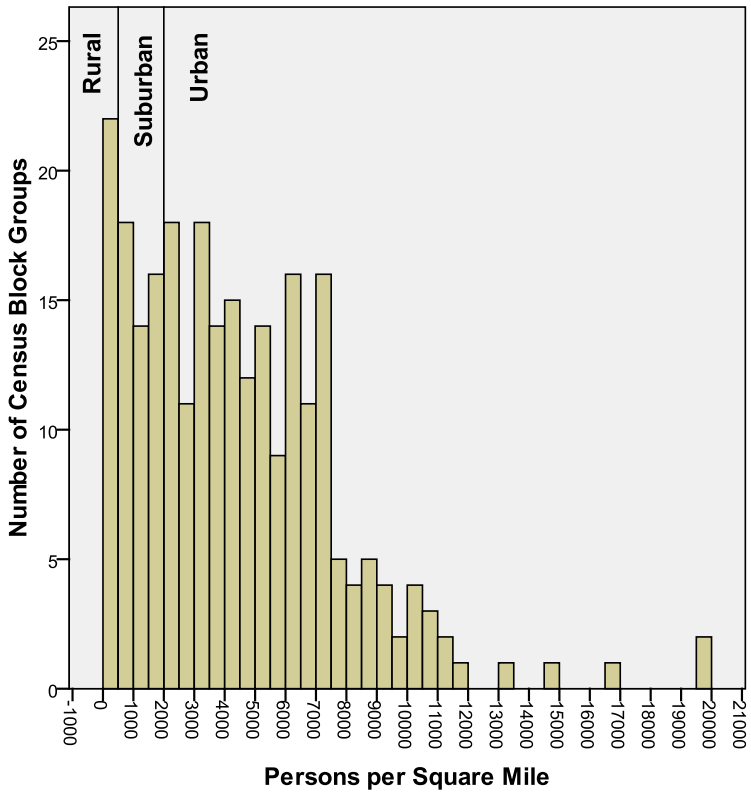

Figure 10. Census block group effective population density.

Table 4

Census 2000 Block Group Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation
Effective Land Area (square mile)	.079	189.733	1.967	12.313
Total Population	324	6826	1663.1	863.621
Population Density (persons/square mile)	14.94	19763.97	4416.667	3339.842

Disability

The percentage of individuals with disabilities between 16 and 64 years was determined for each census block group, shown in Figure 11 and Appendix A. For the census block groups the minimum percentage of individuals with disabilities in the total population was 0%, the maximum was 70.13%, the mean was 25.51%, with a standard deviation of 12.55%. In comparison, 18.6% (0.1 margin of error) of the total U.S. population between 16 and 64 years were individuals with disabilities (U.S. Census, 2003a). The distribution of disability between census block groups in the study area is positively skewed, as shown in Figure 11.

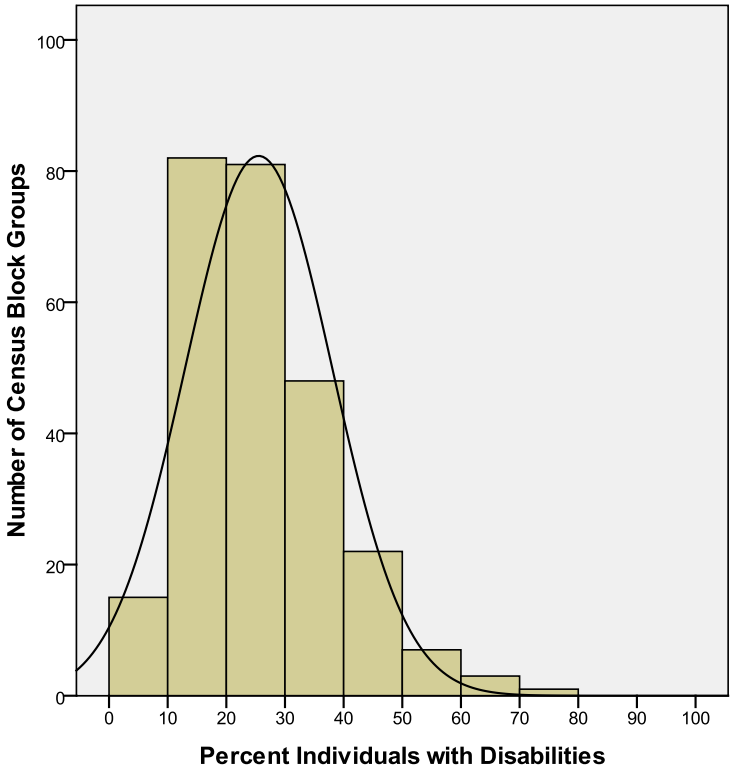

Figure 11. Percentage of individuals with disabilities in the census block group total population.

Poverty

The percentage of individuals between 18 and 64 years whose 1999 income was below the poverty level was determined for each census block group, shown in Figure 12 and Appendix A. For the census block groups the minimum percentage of individuals below the poverty level was 0%, the maximum was 43.40%, the mean was 4.26%, with a standard deviation of 5.47%. In comparison, the mean percentage of individuals below the poverty level in Utah was 9.1% and 11.1% in the United States (U.S. Census, 2003b).

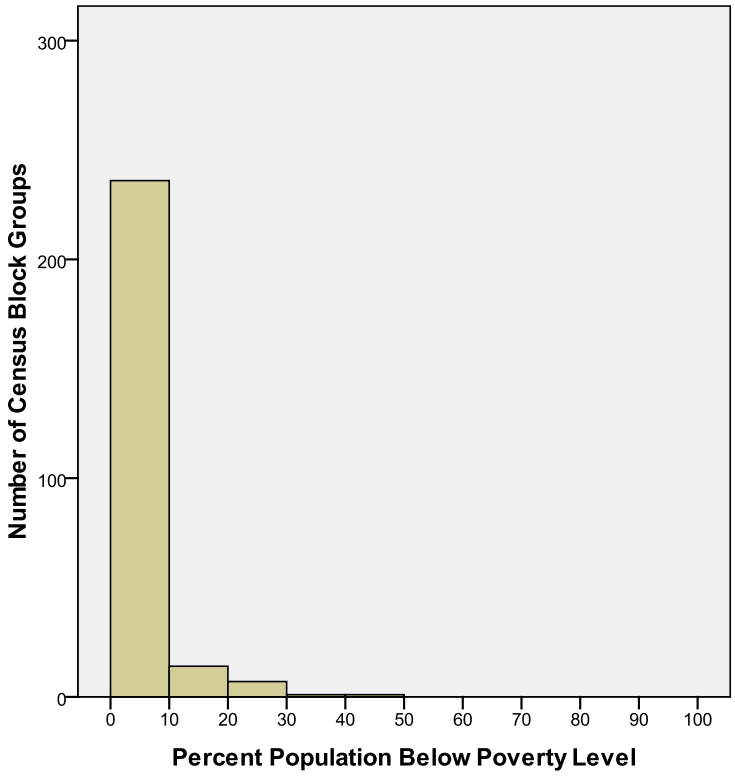

Figure 12. Percentage of the census block group population between 18 and 64 years whose 1999 income was below the poverty level.

Mixed-Land Use

Mixed-land use community environments were measured using a four-category entropy score describing the diversity of the distribution of land use for each block group area, shown in Figure 13 and Appendix A. For the census block groups the minimum four-category entropy score was 0.072, the maximum was 0.97, the mean was 0.54, with a standard deviation of 0.22.

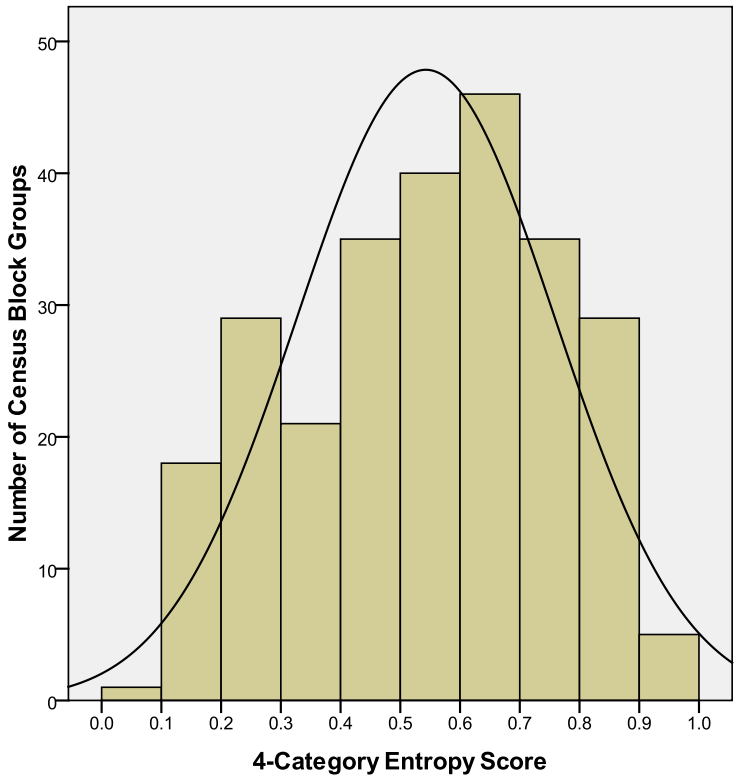

Figure 13. Four-category entropy score for the census block groups.

Common Space

Community common space was determined as the percentage of the census block group area within a quarter-mile walking distance of public parks, shown in Figure 14 and Appendix A. For the census block groups the minimum percentage within walking distance of public parks was 0%, the maximum was 100%, the mean was 38.36%, with a standard deviation of 29.0%.

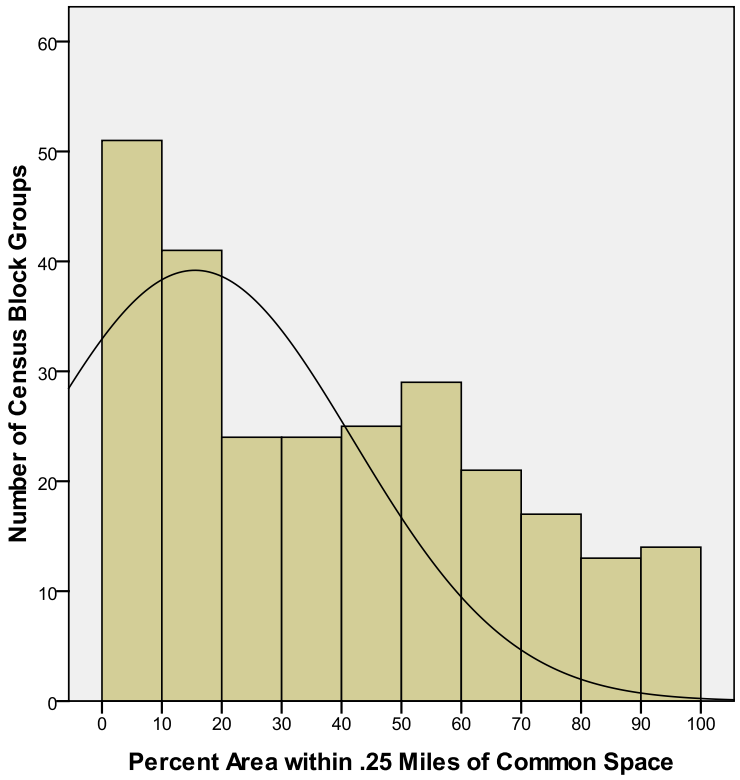

Figure 14. Percentage of the census block groups within .25 miles of a public park.

Results for Research Question 1

A multiple regression analysis was conducted to evaluate how well the poverty measure predicted the percentage of individuals with disabilities residing in the census block groups. The results of this analysis indicated that the socioeconomic factor, poverty, measured by percentage of individuals between 18 and 64 years whose 1999 income was below the poverty level, accounted for a significant amount of the disability measure's variability, R^2 = .367 (R^2_{adj} = .365), $F(1, 257) = 149.27$, $p < .001$, indicating that census block groups where the population's income is lower tended to have higher numbers of individuals with disabilities in their population.

A second analysis was conducted to evaluate whether the mixed-land use community environments measure predicted the percentage of individuals with disabilities residing in the census block groups over and above the socioeconomic measure. The mixed-land use community environments measure, by four-category entropy score, accounted for a significant proportion of the disability measure's variability, R^2 change = .025 ($R^2 = .393$, R^2_{adj} = .393), $F(1, 256) = 10.648$, $p = .001$. These results suggest that census block groups with greater mixed-land uses tended to have higher numbers of individuals with disabilities in their population independent from socioeconomic factors.

Table 5 presents indices to indicate the relative strength of the individual predictors. On the basis of the correlation analysis, the socioeconomic measure is the most useful predictor, a large correlation accounting for 31% ($.544^2 = .31$) of the variance of the disability measure. The mixed-land use measure contributed only an additional 4%

Table 5

The Bivariate and Partial Correlations of the Predictors with Disability Measure

Predictors	Correlation with disability measure	Correlation with disability measure controlling for other predictor
Poverty	.606**	.554**
Mixed-land use	.352*	.200*

* p = .001, ** p < .001

($.2^2 = .04$) of the variance. However, judgments about the relative importance of these predictors are difficult because they are moderately correlated $r(257) = .333$, $p < .001$.

Results for Research Question 2

A second analysis was conducted to evaluate whether the community common space measure, the percentage of the census block group area within a quarter-mile walking distance of public parks, predicted the percentage of individuals with disabilities residing in the census block groups over and above the socioeconomic measure. The community common space measure, accounted for a significant proportion of the disability measure's variability, R^2 change = .015 ($R^2 = .382, R^2_{adj} = .377$), $F(1, 256) = 6.058$, $p = .015$. Although less significant, these results suggest that census block groups with greater pedestrian access to public parks tended to have higher numbers of individuals with disabilities in their population independent from socioeconomic factors.

Table 6 presents indices to indicate the relative strength of the individual predictors. On the basis of the correlation analysis, the socioeconomic measure is the most useful predictor, a large correlation accounting for 35% ($.591^2 = .349$) of the variance of the disability measure. The community common space measure contributed only an additional 2% ($.152^2 = .023$) of the variance. However, judgments about the relative importance of these predictors are difficult because they are somewhat correlated $r(257) = .175$, $p = .002$.

Exploratory Analysis

Follow-up analyses were conducted to explore the relationship between all of the measures, while continuing to control for the socioeconomic measure. The environmental indices, both the mixed-land use and common space measures, accounted for a significant proportion of the variability in the disability measure, R^2 change = .035 ($R^2 = .403, R^2_{adj} = .396$), $F(1, 255) = 7.551$, $p = .001$. These results suggest that the

Table 6

The Bivariate and Partial Correlations of the Predictors with Disability Measure

Predictors	Correlation with disability measure	Correlation with disability measure controlling for other predictor
Poverty	.606**	.591**
Common Space	.225*	.152*

* $p < .05$, ** $p < .001$

census block group environmental indices tended to be associated with higher numbers of individuals with disabilities in their population independent from socioeconomic factors. Table 7 presents indices to indicate the relative strength of the individual predictors. On the basis of this correlation analysis, the socioeconomic measure is the most useful predictor, a large correlation accounting for 30% ($.545^2 = .297$) of the variance of the disability measure. While, the mixed-land use measure contributed only an additional 3% ($.183^2 = .033$) and the common space measure contributed only an additional 1.7% ($.129^2 = .017$) of the variance. However, determining the relative importance of the mixed-land use and common space environment measures are difficult because they are somewhat correlated $r(257) = .183$, $p = .002$. Correlations between the study measures are depicted in Figure 15 with the corresponding zero-order correlations in Table 8.

Table 7

The Bivariate and Partial Correlations of the Predictors with Disability Measure

Predictors	Correlation with disability measure	Correlation with disability measure controlling for other predictor
Poverty	.606**	.545**
Mixed-land use	.352*	.183*
Common Space	.225*	.129*

* $p < .05$, ** $p < .001$

Table 8

The Zero-order Correlations Between the Measures

	Disability	Poverty	Mixed-land Use
Poverty	.606*		
Mixed-land use	.352*	.333*	
Common Space	.225*	.175*	.183*

* $p < .01$ (.05/4 = 0.0125)

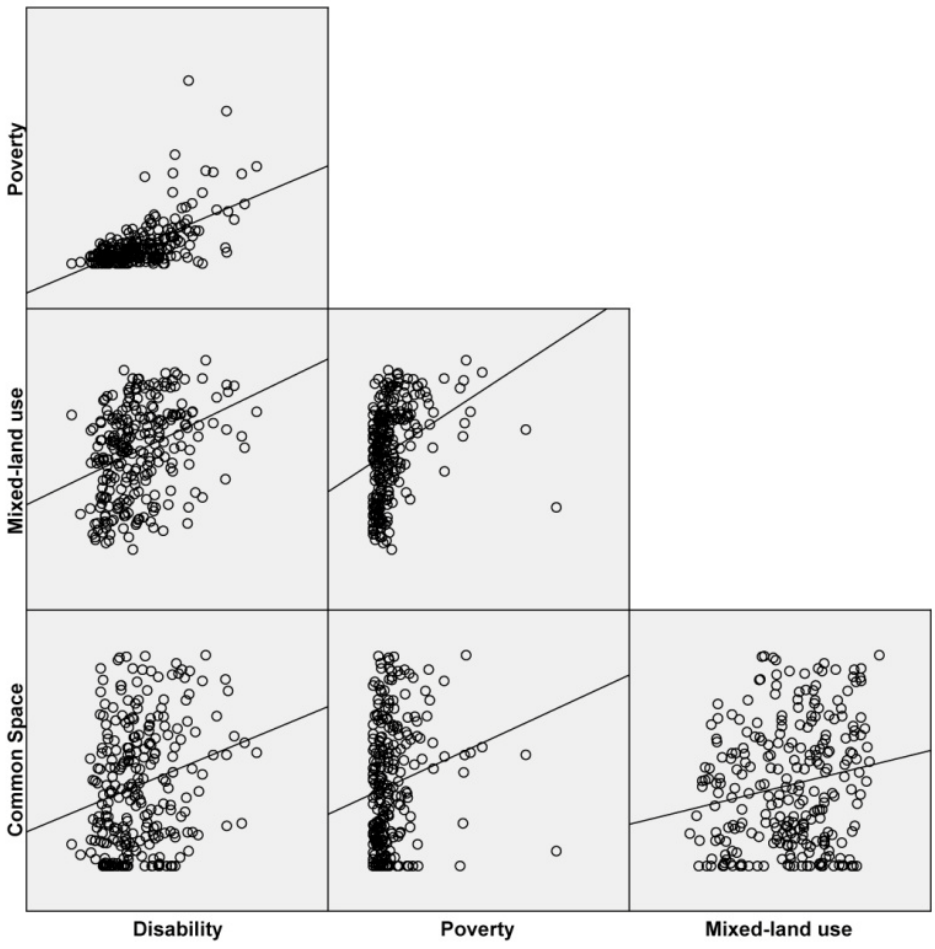

Figure 15. Scatterplot of study measures depicting correlations.

CHAPTER V

DISCUSSION

The purpose of this study was to determine to what extent individuals with disabilities reside in physical environments that contribute to opportunities for social integration in community. This study addressed the following research questions:

1. In relation to the total population to what extent are adults with disabilities' places of residence correlated with mixed-land use community environments?
2. In relation to the total population to what extent are adults with disabilities' place of residence correlated with community common space?

The expectation, as supported by the literature, was that a lower percentage of adults with disabilities would reside in mixed-land use community environments or in areas where there is greater community common space.

However, this study indicates that independent of socioeconomic factors, a higher percentage of adults with disabilities reside in mixed-land use community environments and areas where there is greater access to community common space. Why the difference?

Socioeconomic Associations

The most significant association with individuals with disabilities places of residence are socioeconomic. This study indicates that the percent of the population below poverty level predicts 30-35% of the variance in individuals with disabilities places of residence. Given, the very modest association with mixed-land use (4%) and common environments

(2%), poverty level is the most useful predictor of an individual with disabilities place of residence.

This relationship was expected, as shown by the efforts to control for socioeconomic factors in evaluating the other predictors. Individuals with disabilities are more likely to have incomes below the poverty level than the general population, as a result of structural and political barriers to education and employment. As a result, areas where there are more individuals living below the poverty level, should likely contain a disproportionate number of individuals with disabilities. This strong association may explain much of the associations with other factors. Particularly given that poverty level is correlated with mixed-land use (r = .333) and community common space (r = .175), as depicted in Figure 16. Therefore, the usefulness of mixed-land use and community common space as predictors of individuals with disabilities' place of residence is rather inconclusive. Still, there is a significant association, albeit small, which further reflection suggests should be expected.

Mixed-Land Use

This study indicates that a higher percentage of adults with disabilities reside in mixed-land use community environments. This finding may be attributed to mixed-land use community environments being correlated with poverty level. While the empirical evidence is mixed, the general public prefers to reside in single-use residential areas, the perception being that such areas are more affluent with mixed-land use areas being less so (Glaeser & Kahn, 2003; Song & Knaap, 2004). In essence, while community planning professionals promote mixed-land use as an antidote to single-use suburban sprawl, the

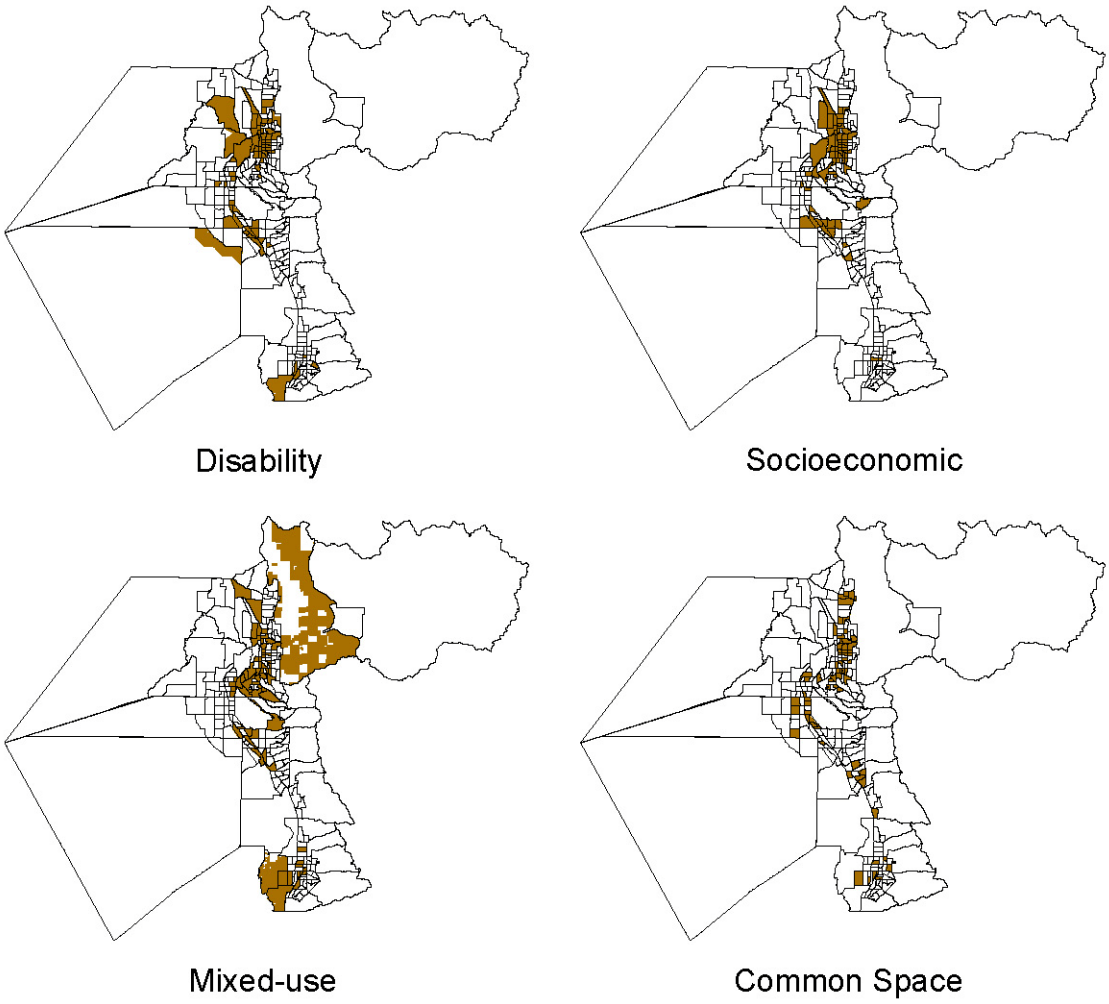

Figure 16. Location of the upper quartile of each study measure.

market demand is high for single-use residential development, a condition particularly true in Utah (a state not recognized for progressive community planning and development patterns). With fewer socioeconomic resources at their disposal, individuals with disabilities then find themselves residing in the less preferred, mixed-land use community environments, as the study findings suggest.

The dilemma then, is that the less socially preferred environment is the more socially conducive, and that individuals with disabilities would then experience increased social opportunities. Neither seems likely.

It seems more likely that mixed-land use is not an appropriate operational measure of the construct, community environments that contribute to increased social interaction and integration, particularly for individuals with disabilities. This conclusion is supported by additional analysis of the relationship between individuals with disabilities' place of residence and mixed-land use, measured using a six-category entropy score, which found an increased correlation (8% of the variance) (see Appendix E). The more mixed an area's land use the more likely individuals with disabilities are to reside in the area.

Further reflection suggests that opportunities for social interaction are likely associated with pedestrian-oriented environments, not mixed-land use. Previous studies have found mixed-land use, and its description by entropy score, to be a significant predictor of pedestrian-oriented community environments that facilitate physical activity (Brown et al., 2009; Frank et al., 2005, 2006). However, the previous literature on social interaction, although it suggests an association with mixed-land use, represents studies measuring walkability, street characteristics, and traffic patterns; all of which affect whether the environment is pedestrian-oriented. Pedestrian-oriented community environments support community members to perform activities of daily living without the use of an automobile, in part by both being comfortable and safe for pedestrians and by mixed-land uses. Essentially, both design and destinations (Forsyth, Hearst, Oakes, & Schmitz, 2008). However, while pedestrian-oriented community environments are generally mixed-use, mixed-land use environments may not be pedestrian-oriented. As a

result, community environments that foster social interaction (the construct) should not be operationalized as mixed-land use environments, but rather pedestrian-oriented environments.

Further, individuals with disabilities should be disproportionately affected by neighborhood and community-scale pedestrian comfort and safety. Many of the structural barriers to individuals with disabilities participation are not intentional, but the result of the failure to considered the interests and needs of individuals with disabilities in the design of the environment.

It seems likely that whether or not the community environment is pedestrian-oriented would be a meaningful operational predictor of whether the environment supports opportunities for social interaction and integration (construct). The focus on mixed-land use to represent pedestrian-oriented constructs found in the literature is due to its being a measure of relative convenience. Mixed-land use is quantifiable with data which, if not already available, can be developed relatively easily. Whether an environment is safe and comfortable for pedestrians is subjective and more difficult to measure, but may be a more appropriate measure of the whether the environment supports opportunities for social interaction and integration.

This study suggests that individuals with disabilities may be more likely to reside in areas with mixed-land use characterized by low socioeconomic status. Whether these areas are pedestrian-oriented is likely to be associated with opportunities for social interaction. Otherwise, mixed-land use areas may both be lacking opportunities for positive social interaction and be stigmatizing.

Community Common Space

If we accept the very modest association, this study indicates that a higher percentage of adults with disabilities reside in environments with greater access to community common space. These findings would suggest that individuals with disabilities would then experience increased social opportunities, which does not seem likely. It seems more likely that community common space is not an appropriate operational measure of the construct, community environments that contribute to increased social interaction and integration, particularly for individuals with disabilities.

This study's community common space measure is operationalized as proximity to public park spaces. Public parks can be seen as community-level destinations. There is a significant association, albeit small, with one's proximity to these destinations. They are beneficial. However, community common space associated with opportunities for social interaction is more likely to be residence or neighborhood-level common space. While previous research suggests that social interactions may be associated with a range of common spaces, from small intimate spaces, group spaces, and larger public spaces (Zimring, 1982); this study would suggest that social interactions are more associated with convenient common spaces, at the residence or neighborhood-level.

These spaces are varied and more difficult to identify, but are by definition convenient to an individual's place of residence. The public street is a key residence/neighborhood-level common space, the quality of which is closely tied to its being pedestrian-oriented. The literature on the association between common space and social interaction supports the assertion that residential and neighborhood-level common

spaces are an important venue for social contact. A great deal of study has been conducted regarding residential-level common space and the quality of social interactions because of the strong link between the two.

Additionally, further review of the previously identified research indicates that the studies addressed neighborhood-level common space operational measures, including that at the building-scale. Less study, of greater variation, has been focused solely on community-level parks and civic spaces.

This study's findings for whether individuals with disabilities are more likely than the general population to reside in areas with community-level common space are inconclusive. However, these destination spaces are less associated with opportunities for social interaction than convenient residential and neighborhood-level common space. Whether an environment possesses convenient residential and neighborhood-level common space is subjective and more difficult to measure, but may be a more appropriate measure of the whether the environment supports opportunities for social interaction and integration.

Individuals with Disabilities' Social Interaction

The purpose of this study was to determine to what extent individuals with disabilities reside in physical environments that contribute to opportunities for social integration in community. Excepting the previous discussion regarding the appropriateness of the study's measures, the evidence suggests that individuals with disabilities are more likely to live in environments which support social interaction and thereby integration, although

not conclusively. Why then are individuals with disabilities socially isolated within the community?

Perhaps social exclusion is due more too socioeconomic factors than environmental factors. The study findings do suggest a very strong link with socioeconomic factors. Or perhaps the environmental factors are independent, but are not powerful enough to overcome the socioeconomic disparities. Similarly, individuals with disabilities may not be able to access the social benefits of the environment due to the differential affects of structural and political barriers to participation in the environment. That is, there may be aspects of the environment that reduce opportunities for individuals with disabilities' social interactions, but do not negatively impact the social opportunities of others. Additionally, the evidence supporting the association between physical environment and social interaction may not be appropriate to individuals with disabilities. There is a limited body of evidence, which does not specifically address individuals with disabilities. Disability itself may be a significant factor in social interaction and integration.

Regardless, excepting the previous discussion, this study indicates that independent of socioeconomic factors, a higher percentage of adults with disabilities reside in mixed-land use community environments and areas where there is greater access to community common space. In light of the previous discussion, the study's findings are inconclusive with the exception of a higher percentage of individuals with disabilities reside in areas of lower socioeconomic level, or higher poverty.

Practically, community areas of lower socioeconomic level will have less access to community resources. Community members who are underserved by community

resources are vulnerable to numerous disparities, including social disparities. As such, individuals with disabilities are vulnerable to social disparities.

Limitations of the Study

This study is hampered by the limited body of supporting evidence regarding the impact of the community environment on social integration. Summarizing and categorizing this limited and disparate body of evidence unavoidably results in the loss of some of the contextual details of the measures. This limitation contributed to the use of less appropriate approaches to operationalize the constructs as discussed previously. These measures, mixed-land use and public parks, are the most important limitation of this study.

Regardless of whether each measure appropriately represented the construct, each measure was subject to some error. As the community common space measure was determined from the best available data, which represented public parks, many common spaces were not addressed. In particular, formal private common spaces, such as those associated with neighborhood homeowner associations, were only included if they could be identified using satellite imagery. Additionally, the use of satellite imagery, with limited resolution, makes it difficult to determine smaller common spaces, which often represent informal common spaces.

The mixed-land use measure was limited by the sometimes imprecise categorization of property types. Essentially, the property type descriptions represent the aggregation of the land uses. Aggregation of the measures limits the significance of the study. Numerous categorizations of the predictor and criterion measures were explored while

attempting to conduct logistic regression analysis techniques. Any categorization of the measures resulted in no significant association, excepting the socioeconomic measure. The mixed-land use and community common space associations with individuals with disabilities' places of residence are weak enough to require the full continuous data set to find significant interactions.

It is also evident from reviewing Figure 15 and Figure 12 that the poverty measure has a restricted range, the majority of the values are under 10%. This restricted range likely reduces the correlation between the poverty measure and the remaining measures. Interestingly, the greatest correlation was observed between poverty and individuals with disabilities' places of residence. An increased sample size, resulting in a greater range of poverty values, may show a clearer correlation between poverty level and individuals with disabilities places of residence. It may also be possible that the strength of the correlation between individuals with disabilities' places of residence and the mixed-land use and community common space measures, although already very modest, are overestimated given a greater correlation with poverty.

Clear measures are critical given that the complexity of the associated factors, which also limit the study. It is unlikely that a single set of data can fully elucidate the complexities of an individual's social integration in community given the micro and macro social, cultural, and environmental determinants. Additionally, disability itself may be a determining factor in social integration.

Suggestions for Future Study

Future research should explore more appropriate measures of community common space, at the residence and neighborhood level, and the pedestrian-orientation of the community environment. For example, measures of the comfort and safety of the street-scale environment may better elucidate the pedestrian-orientation of the community environment. This same measure may be a more appropriate measure of the community common space at the residential level as well.

Future research should also explore the strong association between socioeconomic factors and individuals with disabilities places of residence. When individuals with disabilities' income increases, do they move to different environments? Or is there a stronger association to place, and the access to resources that locations may facilitate? In this study, this association is somewhat suggested by the increased proportion of individuals with disabilities residing in urban areas, as compared to less populated rural areas. Or is the association between individuals with disabilities and urban areas more the result of the economics of urban areas (cheaper housing, less reliance on private transportation options, etc.)?

This study only addressed whether individuals with disabilities were disproportionately represented in areas associated with fewer opportunities for social integration. Future research should address whether individuals with disabilities residing in environments which support fewer social opportunities experience fewer social opportunities, and are less integrated in the community than individuals with disabilities living in socially supportive environments. An individual-level, qualitative approach

may be preferable to explore these complex associations. Understanding better how the physical environment affects the social integration of individuals with disabilities in communities is a critical topic for future research. There is significant potential for researchers, public policy professionals, community planners and designers to participate with individuals with disabilities and advocates to ensure the rights of individuals with disabilities and their families to enjoy fully participating in the mainstream of society.

Implications

The purpose of this study was to determine to what extent individuals with disabilities reside in physical environments that contribute to opportunities for social integration in community. Social integration in community is important for individuals with disabilities, who are often marginalized in the social environment. The social environment takes place in the physical environment, and the two interact in very important ways. Previous research suggests that community environments which are pedestrian-oriented possess appropriate common spaces, and fewer neighborhood incivilities, are likely to promote social integration.

This study suggests that individuals with disabilities places of residence are associated, although weakly, with mixed-land use areas, as a result of socioeconomic pressures, and with areas within walking distance of community common space; environments which support social interaction and thereby integration.

However, this study also strongly suggests that the most significant associations with individuals with disabilities places of residence are socioeconomic. This strong association may explain much of the associations with other factors. Therefore, the

usefulness of mixed-land use and community common space as predictors of individuals with disabilities' opportunities for social interaction is rather inconclusive.

Perhaps social interaction is due more to socioeconomic factors than environmental factors. Or perhaps the environmental factors are important, but are not powerful enough to overcome the socioeconomic disparities. Similarly, individuals with disabilities may not be able to access the social benefits of the environment due to the differential affects of structural and political barriers to participation in the environment. That is, there may be aspects of the environment that reduce opportunities for individuals with disabilities' social interactions, but do not negatively impact the social opportunities of others. Disability itself may be a significant factor in social interaction and integration.

Future research should explore more appropriate measures of community common space, at the residence and neighborhood level, and the pedestrian-orientation of the community environment. Future research should also explore the strong association between socioeconomic factors and individuals with disabilities places of residence. There is significant potential for researchers, public policy professionals, community planners and designers to participate with individuals with disabilities and advocates to ensure the rights of individuals with disabilities and their families to enjoy fully participating in the mainstream of society.

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APPENDICES

Appendix A

Research Dataset

Table A.

Research Dataset.

Census Block Group ID	Percent Census Block Group that is Park Space	Percent Census Block Group within .25 miles of Park Space	Four-category Land Use Entropy Score	Six-category Land Use Entropy Score*	Total Pop.	Pop. between 16 and 64 years	Pop. with Dis-abilities between 16 and 64 years	Percent Pop. with Dis-abilities	Percent Total Pop. with Income below 125% of Poverty Level	Percent Pop between 18 and 64 years with Income below Poverty Level
490111251021	0.000	0.000	0.566	0.460	1709	1099	208	18.930	3.000	0.650
490111251022	0.650	20.422	0.320	0.229	2275	1456	159	10.920	1.400	0.610
490111251031	1.430	38.887	0.425	0.320	1605	969	220	22.700	0.450	0.450
490111251032	0.000	3.635	0.785	0.609	1569	962	121	12.580	10.290	4.140
490111251041	1.770	33.170	0.445	0.307	1617	1099	265	24.110	15.060	5.390
490111251042	0.160	18.194	0.481	0.348	3060	1765	169	9.580	3.280	0.870
490111253011	3.220	92.443	0.699	0.571	1235	711	214	30.100	13.430	5.850
490111253012	0.070	66.980	0.595	0.493	1527	873	258	29.550	11.700	4.600
490111253013	4.770	58.373	0.491	0.457	1270	785	233	29.680	7.370	3.410
490111253014	2.910	78.951	0.583	0.450	1163	696	243	34.910	4.910	1.170
490111253034	0.940	19.358	0.277	0.217	2774	1759	249	14.160	2.970	0.330
490111253035	0.300	15.660	0.365	0.282	1993	1151	134	11.640	5.170	1.330
490111253041	6.740	58.801	0.201	0.155	2634	1608	398	24.750	5.710	1.570
490111253042	12.490	71.291	0.509	0.403	1863	1167	140	12.000	9.330	2.100
490111253051	5.780	67.919	0.391	0.311	1783	1098	225	20.490	4.220	1.940

490111253052	0.000	37.679	0.131	0.100	2488	1525	330	21.640	4.760	2.080
490111254011	1.880	35.672	0.587	0.576	3921	2445	363	14.850	5.630	1.310
490111254012	0.710	9.583	0.537	0.548	1689	1006	188	18.690	6.140	1.520
490111254031	2.220	56.078	0.541	0.300	3130	1894	400	21.120	2.010	0.290
490111254033	2.650	15.645	0.512	0.409	1041	636	224	35.220	0.000	0.000
490111254042	2.800	46.717	0.579	0.347	6826	3847	630	16.380	8.600	1.830
490111255013	1.690	51.529	0.225	0.158	2261	1401	383	27.340	10.220	3.410
490111255014	0.040	17.450	0.594	0.451	2598	1601	324	20.240	3.980	1.430
490111255021	1.510	92.458	0.545	0.441	1602	918	411	44.770	23.270	4.370
490111255022	5.940	59.445	0.413	0.300	3249	2030	329	16.210	7.870	1.460
490111255035	5.960	69.474	0.307	0.186	2937	1753	382	21.790	8.860	3.250
490111256001	0.000	7.101	0.273	0.213	1265	1198	531	44.320	75.090	43.400
490111257001	3.910	90.757	0.483	0.391	1681	1018	388	38.110	16.420	6.500
490111257002	11.390	75.205	0.586	0.474	1304	739	116	15.700	8.210	2.820
490111257003	3.030	78.558	0.773	0.616	913	463	99	21.380	19.700	4.750
490111257004	15.120	57.868	0.702	0.542	1387	876	257	29.340	17.560	7.790
490111257005	0.120	29.542	0.865	0.745	2072	1199	417	34.780	17.520	5.990
490111258011	0.790	40.136	0.909	0.851	2307	1488	530	35.620	23.420	5.960
490111258012	7.390	88.545	0.406	0.314	888	573	334	58.290	15.980	3.780
490111258013	0.000	10.073	0.533	0.421	1650	1175	240	20.430	3.250	0.870
490111258014	0.000	0.000	0.628	0.525	1744	936	311	33.230	11.930	3.510
490111258041	1.030	21.235	0.540	0.414	3039	1844	390	21.150	3.060	1.150
490111258042	0.000	15.398	0.072	0.056	914	638	148	23.200	5.690	4.400
490111258043	2.460	50.929	0.267	0.205	2406	1377	97	7.040	6.620	1.630
490111258054	0.000	14.088	0.488	0.539	1253	732	241	32.920	27.980	5.970
490111258055	2.910	47.084	0.359	0.258	4033	2592	488	18.830	4.490	1.930
490111258061	0.000	0.000	0.393	0.275	2568	1660	245	14.760	10.640	6.120
490111258062	0.000	4.105	0.717	0.590	3003	1991	819	41.140	12.850	5.130

490111258063	0.000	0.000	0.754	0.734	2424	1630	495	30.370	15.450	9.390
490111259041	0.000	0.856	0.317	0.245	2224	1384	171	12.360	2.770	1.470
490111259042	0.510	23.820	0.104	0.076	2620	1618	210	12.980	9.430	2.410
490111259043	0.000	0.000	0.228	0.164	2064	1305	166	12.720	3.150	0.550
490111259051	0.560	9.958	0.556	0.661	2932	1832	382	20.850	2.140	1.190
490111259052	0.000	24.550	0.432	0.349	1236	747	215	28.780	8.930	3.550
490111259053	0.000	23.480	0.564	0.436	1771	887	368	41.490	29.410	8.870
490111259061	2.120	41.401	0.531	0.395	3955	2285	621	27.180	5.620	1.790
490111259062	0.000	0.000	0.603	0.483	2465	1567	246	15.700	6.090	3.100
490111260001	7.510	53.352	0.843	0.704	674	374	83	22.190	6.010	3.730
490111260002	0.010	36.918	0.285	0.241	1647	969	355	36.640	8.770	3.370
490111260003	0.040	13.677	0.711	0.609	2589	1618	635	39.250	14.950	4.810
490111260004	0.020	23.326	0.500	0.397	1616	959	133	13.870	7.210	2.190
490111260005	6.540	18.669	0.535	0.519	1453	817	160	19.580	2.680	1.740
490111261011	0.990	33.199	0.757	0.646	2034	1082	258	23.840	20.850	6.650
490111261012	2.610	60.309	0.198	0.140	1329	822	113	13.750	0.000	0.000
490111261013	0.000	6.352	0.295	0.217	1379	823	172	20.900	1.620	0.000
490111261014	0.000	0.000	0.152	0.109	1357	849	101	11.900	8.710	3.800
490111261021	0.360	67.081	0.174	0.123	1658	1097	143	13.040	1.570	0.000
490111261022	18.430	98.772	0.468	0.342	1084	563	102	18.120	8.480	3.660
490111261023	0.740	46.495	0.456	0.351	1693	980	239	24.390	14.240	3.550
490111261024	2.730	82.590	0.591	0.475	1649	947	104	10.980	7.390	1.940
490111261041	1.820	20.714	0.561	0.371	3704	2104	208	9.890	3.360	1.250
490111261051	0.600	40.730	0.145	0.096	3131	1695	136	8.020	1.090	0.000
490111261052	3.460	38.313	0.406	0.306	3162	1786	236	13.210	7.460	1.360
490111261061	10.150	85.610	0.669	0.693	985	618	115	18.610	0.510	0.000
490111262021	0.460	11.722	0.673	0.569	3055	1452	161	11.090	4.930	1.340
490111262031	0.340	33.711	0.497	0.358	1589	1005	120	11.940	0.530	0.530

490111262032	2.320	54.908	0.665	0.475	1974	1157	195	16.850	0.600	0.000
490111262041	0.350	20.547	0.432	0.318	1707	1118	154	13.770	4.290	1.630
490111262042	0.030	31.093	0.608	0.467	913	548	122	22.260	8.570	3.750
490111262043	7.560	69.061	0.507	0.405	1648	952	159	16.700	5.480	1.190
490111263031	0.560	12.454	0.484	0.390	2377	1329	98	7.370	1.410	0.320
490111263032	0.000	12.011	0.194	0.141	1697	1210	107	8.840	2.830	1.950
490111263041	0.720	12.473	0.605	0.448	1528	1009	209	20.710	5.040	2.320
490111263042	6.650	53.557	0.290	0.219	4110	2348	269	11.460	2.690	0.660
490111263052	1.140	26.876	0.319	0.245	2286	1336	176	13.170	3.480	0.980
490111263061	0.000	18.995	0.528	0.441	2143	1460	472	32.330	5.580	1.950
490111263062	0.830	33.904	0.881	0.734	1672	1027	258	25.120	3.630	1.230
490111263063	0.000	19.498	0.612	0.461	1718	999	142	14.210	2.150	0.000
490111264021	0.320	5.323	0.241	0.186	1411	929	31	3.340	3.860	0.360
490111264022	0.320	2.967	0.245	0.190	1975	1311	281	21.430	5.680	1.160
490111264031	0.000	36.532	0.558	0.441	2234	1349	256	18.980	9.040	1.270
490111264032	3.080	52.573	0.455	0.347	2119	1294	275	21.250	9.620	2.430
490111264033	3.640	39.193	0.218	0.161	1585	1008	258	25.600	1.620	1.200
490111264034	0.600	46.341	0.166	0.313	1962	1121	112	9.990	0.670	0.000
490111264041	3.840	22.727	0.690	0.603	3140	2114	441	20.860	5.490	2.630
490111265001	3.740	39.290	0.198	0.145	1116	634	62	9.780	6.540	2.470
490111265002	1.960	76.845	0.205	0.157	1263	752	95	12.630	4.610	1.250
490111265003	0.000	32.512	0.271	0.206	908	543	97	17.860	0.540	0.000
490111265004	0.000	22.162	0.647	0.511	1328	613	50	8.160	4.960	1.850
490111265005	8.300	71.860	0.272	0.209	1716	972	105	10.800	2.830	0.900
490111266001	0.000	10.884	0.468	0.376	1653	938	125	13.330	2.460	0.680
490111266002	1.160	56.077	0.598	0.475	1797	949	206	21.710	11.400	2.040
490111266003	8.160	74.694	0.789	0.644	1666	1088	272	25.000	8.250	4.990
490111267001	0.920	49.481	0.923	0.831	1359	807	160	19.830	12.610	3.600

490111267002	0.950	55.488	0.689	0.661	810	544	150	27.570	15.800	6.530
490111267003	0.000	14.713	0.608	0.489	846	486	233	47.940	10.480	0.490
490111267004	0.000	34.513	0.747	0.602	801	395	82	20.760	26.480	8.030
490111268011	0.120	41.380	0.161	0.119	1044	510	177	34.710	0.610	0.000
490111268012	0.000	1.554	0.237	0.181	924	658	84	12.770	2.020	0.000
490111268013	4.880	46.798	0.145	0.104	1222	734	107	14.580	1.880	0.600
490111268021	0.000	12.795	0.213	0.164	1750	1083	171	15.790	1.690	0.580
490111268022	0.040	40.373	0.131	0.101	1271	718	64	8.910	4.760	1.610
490111268023	0.000	13.880	0.399	0.297	2158	1410	396	28.090	1.260	0.470
490111269011	0.000	7.198	0.732	0.582	1128	637	156	24.490	6.300	3.990
490111269012	0.000	43.479	0.320	0.247	755	456	226	49.560	0.000	0.000
490111269013	9.960	61.309	0.381	0.297	1158	657	158	24.050	5.870	2.070
490111269014	0.120	93.712	0.884	0.778	794	492	114	23.170	5.020	3.830
490111269015	11.350	89.711	0.847	0.710	1382	938	308	32.840	13.490	4.450
490111269016	0.070	25.715	0.662	0.720	735	477	205	42.980	5.100	2.470
490111269021	6.130	53.536	0.272	0.195	1091	662	210	31.720	4.400	1.330
490111269022	0.000	18.184	0.612	0.473	1106	643	104	16.170	6.470	1.200
490111269023	0.000	16.395	0.842	0.672	2237	1289	483	37.470	11.290	4.170
490111269024	0.000	28.536	0.191	0.139	1359	808	197	24.380	7.700	2.940
490111270021	0.970	19.051	0.854	0.827	1424	922	542	58.790	7.190	2.670
490111270022	8.620	49.596	0.675	0.547	1287	781	167	21.380	8.110	1.690
490111270031	0.000	18.239	0.255	0.187	1442	916	285	31.110	3.050	1.200
490111270032	0.000	0.000	0.172	0.131	917	556	109	19.600	4.240	1.150
490111270033	0.430	10.310	0.711	0.580	324	227		0.000	0.000	0.000
490111270034	0.000	0.000	0.641	0.508	415	261	55	21.070	7.590	0.000
490111270041	4.070	71.403	0.732	0.563	1807	1156	222	19.200	3.800	0.430
490111270042	0.540	54.479	0.733	0.539	1402	853	114	13.360	5.520	2.330
490111270043	0.000	29.409	0.592	0.520	906	548	63	11.500	9.390	0.000

490111270044	5.090	61.040	0.404	0.315	984	688	162	23.550	6.330	1.710
490572001001	0.000	31.357	0.540		1803	1087	283	26.030	4.880	1.640
490572001002	0.000	0.631	0.536		1324	779	258	33.120	13.180	3.240
490572001003	6.170	74.900	0.683		1096	688	234	34.010	16.300	3.570
490572002011	1.080	26.558	0.677		2958	1812	595	32.840	9.700	2.400
490572002012	2.230	66.281	0.508		1405	879	257	29.240	17.130	5.000
490572002013	0.900	70.861	0.667		2833	1661	579	34.860	23.440	9.880
490572002021	0.000	10.318	0.625		1501	1030	304	29.510	25.240	10.530
490572002022	0.000	32.428	0.709		1684	925	402	43.460	24.010	8.180
490572003001	0.000	0.000	0.694		722	464	80	17.240	13.730	5.690
490572003002	0.000	16.103	0.727		2324	1453	666	45.840	18.640	6.490
490572003003	6.910	61.574	0.849		1605	946	583	61.630	31.940	10.440
490572004001	0.000	0.000	0.847		931	607	238	39.210	20.870	10.650
490572004002	0.000	0.000	0.702		982	598	228	38.130	25.550	8.410
490572005001	0.000	35.415	0.661		904	533	257	48.220	26.130	7.780
490572005002	2.670	60.592	0.811		1027	592	188	31.760	28.920	11.150
490572005003	6.890	66.375	0.846		2124	1366	482	35.290	11.540	5.720
490572005004	21.810	77.108	0.662		760	493	119	24.140	11.830	3.860
490572005005	0.000	44.521	0.714		948	724	278	38.400	10.670	6.460
490572006001	0.000	26.837	0.700		892	545	164	30.090	11.360	3.750
490572006002	0.000	23.833	0.623		1032	609	169	27.750	11.880	3.730
490572006003	0.000	9.245	0.644		944	438	103	23.520	9.330	2.360
490572006004	1.960	83.280	0.657		1322	883	253	28.650	9.270	2.660
490572007001	25.170	89.288	0.880		1140	737	316	42.880	19.530	9.500
490572007002	0.850	45.751	0.295		1192	719	131	18.220	11.630	4.550
490572007003	6.560	88.259	0.401		1041	638	76	11.910	10.340	4.410
490572008001	15.560	91.272	0.616		1877	1090	442	40.550	22.640	8.590
490572008002	0.250	78.617	0.666		1620	944	409	43.330	38.530	13.410

490572008003	0.280	93.191	0.763	1304	833	348	41.780	26.770	13.160
490572009001	5.010	71.103	0.794	1835	1255	690	54.980	33.220	12.760
490572009002	0.350	87.783	0.884	1948	1146	568	49.560	44.490	16.820
490572009003	16.980	100.000	0.970	1113	724	368	50.830	46.270	22.030
490572011001	3.460	52.745	0.641	690	523	307	58.700	60.180	36.170
490572011002	3.900	52.665	0.672	640	259	139	53.670	43.920	21.690
490572012001	4.120	56.395	0.913	1487	965	378	39.170	51.900	25.850
490572012002	0.700	53.755	0.726	1136	636	446	70.130	45.290	23.050
490572013001	0.000	44.398	0.875	1816	1274	489	38.380	44.220	21.460
490572013002	0.000	58.448	0.555	1677	1150	754	65.570	32.850	14.130
490572013003	14.120	68.607	0.650	1252	752	330	43.880	27.320	10.390
490572013004	0.000	46.169	0.723	876	506	231	45.650	29.510	14.290
490572013005	0.000	51.941	0.443	1443	841	322	38.290	34.990	16.910
490572014001	8.060	99.284	0.414	1124	722	150	20.780	10.240	4.940
490572014002	0.770	55.982	0.326	852	449	52	11.580	14.270	3.720
490572014003	0.000	29.944	0.490	1483	915	241	26.340	11.110	3.370
490572015001	0.000	63.570	0.343	1002	614	288	46.910	15.740	7.820
490572015002	16.600	57.435	0.445	1420	780	235	30.130	7.250	4.830
490572015003	0.090	37.478	0.528	1097	789	181	22.940	11.270	4.760
490572015004	6.100	45.937	0.490	544	335	36	10.750	9.720	4.770
490572016001	0.000	18.450	0.310	711	420	119	28.330	22.440	8.770
490572016002	0.000	0.037	0.838	1140	808	224	27.720	35.750	20.600
490572016003	0.100	62.149	0.882	1286	710	181	25.490	16.070	6.080
490572016004	7.780	93.116	0.851	598	350	94	26.860	19.320	7.460
490572017001	3.500	81.533	0.477	1727	1033	460	44.530	17.640	7.580
490572017002	3.260	59.995	0.714	1414	846	350	41.370	25.260	8.910
490572018001	0.000	26.626	0.688	1042	617	232	37.600	25.260	7.340
490572018002	6.570	83.057	0.820	1132	752	446	59.310	31.790	12.390

490572019001	4.400	20.267	0.609	1300	687	443	64.480	44.060	21.280
490572020001	3.240	70.459	0.883	1632	1074	248	23.090	13.360	8.190
490572020002	0.000	6.383	0.637	2899	1832	134	7.310	2.200	1.820
490572101001	0.130	0.547	0.687	2835	1807	277	15.330	3.770	1.110
490572101002	0.240	5.026	0.547	1131	682	146	21.410	9.370	3.010
490572101003	1.340	4.679	0.733	1911	1352	359	26.550	5.970	2.710
490572102011	0.620	23.443	0.500	2011	1323	136	10.280	6.940	2.280
490572102012	0.000	10.958	0.500	1076	533	65	12.200	9.620	3.300
490572102013	2.710	85.660	0.482	1143	755	142	18.810	3.420	1.400
490572102021	2.710	83.531	0.622	1268	650	122	18.770	5.810	1.720
490572102022	1.380	62.651	0.500	1438	996	135	13.550	0.470	0.000
490572102023	8.130	65.753	0.630	2062	1164	252	21.650	8.120	3.780
490572102024	2.860	45.989	0.615	2216	1419	367	25.860	3.410	0.390
490572103011	0.020	3.237	0.510	1302	795	72	9.060	0.000	0.000
490572103012	1.100	16.557	0.550	5044	3077	498	16.180	0.850	0.180
490572103013	1.810	50.238	0.567	956	576	88	15.280	8.150	4.870
490572103014	0.380	14.776	0.746	1086	675	209	30.960	6.260	0.000
490572103021	0.000	15.466	0.552	1154	686	267	38.920	15.630	6.340
490572103022	2.220	30.129	0.709	3317	2064	286	13.860	6.330	1.450
490572104011	0.000	0.000	0.547	1221	791	169	21.370	7.230	0.000
490572104012	0.000	1.278	0.266	880	490	85	17.350	4.040	0.590
490572104013	0.120	4.141	0.605	2337	1368	456	33.330	6.130	2.290
490572104014	0.000	0.000	0.114	1103	691	98	14.180	7.990	3.140
490572104015	1.400	17.700	0.286	2523	1562	271	17.350	3.110	1.350
490572104021	0.390	13.032	0.572	1180	722	228	31.580	10.860	0.890
490572104022	0.600	11.923	0.702	1433	869	225	25.890	7.570	2.240
490572105011	0.000	3.069	0.829	1176	755	162	21.460	6.350	2.960
490572105012	0.700	54.011	0.833	1351	844	208	24.640	12.990	5.410

490572105013	0.000	0.433	0.780	856	538	65	12.080	7.350	3.550
490572105014	2.200	48.110	0.806	965	688	206	29.940	14.000	9.760
490572105015	5.210	64.220	0.853	1205	744	218	29.300	18.790	4.700
490572105016	0.000	11.724	0.711	2141	1523	265	17.400	4.860	3.030
490572105041	0.000	0.000	0.232	1849	1137	226	19.880	4.200	0.000
490572105042	0.530	12.086	0.119	1308	799	72	9.010	0.500	0.500
490572105043	0.620	11.633	0.244	1600	1004	200	19.920	3.210	0.580
490572105051	2.430	34.714	0.207	3535	2289	346	15.120	5.740	1.600
490572105052	0.000	1.105	0.687	928	541	180	33.270	4.300	1.250
490572105061	3.530	49.144	0.335	2083	1285	305	23.740	3.070	0.830
490572105062	2.550	14.356	0.533	4113	2429	498	20.500	5.380	2.650
490572105071	0.000	0.000	0.318	5244	3244	425	13.100	6.440	2.340
490572105072	0.000	0.451	0.233	2895	1813	370	20.410	3.540	1.410
490572106001	0.000	15.994	0.196	1481	717	315	43.930	10.870	1.440
490572106002	3.630	71.199	0.648	1392	825	270	32.730	2.760	1.080
490572106003	0.000	0.334	0.800	1622	1090	147	13.490	4.800	2.500
490572106004	12.190	93.742	0.680	1136	727	80	11.000	11.120	1.940
490572106005	0.000	34.467	0.352	989	669	96	14.350	8.700	3.660
490572107011	0.000	0.074	0.793	1757	1087	357	32.840	17.220	8.050
490572107012	0.000	0.000	0.863	537	328	118	35.980	11.820	3.450
490572107013	0.000	3.594	0.551	1483	944	186	19.700	12.620	2.230
490572107014	0.000	3.380	0.176	1404	771	239	31.000	6.770	1.770
490572107031	0.000	41.668	0.214	1341	743	187	25.170	4.470	2.160
490572107032	0.000	1.470	0.696	1260	768	121	15.760	7.730	2.120
490572107041	0.000	36.332	0.838	1007	529	128	24.200	13.340	3.990
490572107042	12.180	97.673	0.480	985	689	121	17.560	8.700	3.840
490572107043	0.000	28.946	0.459	1352	829	311	37.520	25.730	6.430
490572107044	0.000	0.000	0.311	1646	1080	215	19.910	6.890	3.120

490572107045	0.000	0.000	0.351	1108	679	255	37.560	1.850	1.850
490572108001	5.220	50.148	0.817	1062	600	130	21.670	19.600	7.290
490572108002	5.850	62.137	0.717	1038	614	224	36.480	19.120	8.140
490572108003	0.000	70.030	0.205	1039	655	196	29.920	14.490	3.390
490572109001	1.970	69.719	0.757	1325	671	158	23.550	15.780	2.290
490572109002	0.000	53.201	0.331	1458	826	260	31.480	13.430	3.710
490572109003	1.610	49.787	0.640	3537	2319	497	21.430	2.330	0.200
490572110001	6.570	96.143	0.709	1707	981	389	39.650	7.500	1.770
490572110002	2.570	99.571	0.425	1422	825	230	27.880	7.870	1.250
490572111001	0.320	50.749	0.861	1665	1085	339	31.240	29.120	11.600
490572111002	0.060	65.184	0.902	621	272	109	40.070	15.800	5.680
490572111003	0.030	11.056	0.792	764	492	108	21.950	3.450	1.460
490572111004	0.660	38.351	0.591	1144	710	117	16.480	7.320	3.320
490572111005	25.670	78.662	0.347	1149	675	171	25.330	7.890	3.690
490572112011	0.000	0.000	0.423	844	489	73	14.930	6.450	3.280
490572112012	0.000	0.074	0.275	1108	707	217	30.690	3.460	0.580
490572112013	0.860	48.315	0.686	2418	1578	305	19.330	13.210	4.890
490572112021	10.430	87.339	0.860	767	488	121	24.800	2.260	0.400
490572112022	4.280	42.364	0.805	2479	1260	195	15.480	4.920	1.820
490572112023	0.460	20.507	0.472	999	648	186	28.700	4.410	1.100
490111252009	Census block group for Davis county portion of Hill Air Force Base.								
490572105019	Census block group for Weber county portion of Hill Air Force Base.								

Note. Six-category Land Use Entropy Scores are only available for Davis County.

Appendix B

Land Use Designation from Property Type Codes

LAND USE DESIGNATION & PROPERTY TYPE CODES

WEBER & DAVIS counties	DAVIS county only
Single Family Residential: 111, 118, 119	121, 131, 160, 205, 510, 888
Multi Family Residential: 112, 113, 114, 115, 116	120, 122, 150, 199, 512, 540, 576,
Retail & Services: 500, 511	503, 505, 507, 513, 515, 516, 518, 523, 528, 529, 530, 536, 537, 549, 551, 553, 559, 561, 562, 564, 571, 573, 574, 575, 578, 581, 582, 583, 584, 585, 591, 596, 597, 675
Office: Weber/combined with Retail & Services	506, 509, 560, 566, 590, 660,
Entertainment: Weber/no codes	517, 539, 572, 960
Institutional: 951, 952	524, 527, 535, 547, 570, 577, 594, 957
Common Space: 919(only for Weber Co. PUDs)	700, 701, 711, 749, 795,
Industrial: 200	203, 501, 538, 542, 550, 592, 593, 594, 595, 695, 904
Vacant: 901, 902, 903, 911, 912, 917, 918, 922, 999	905, 913
Agriculture: 811, 812, 816, 817, ~~830~~, 850	
Forest: 830	
Recreational: 117	
Utilities: Weber/no codes	722, 731, 732, 733, 734,
Government: Weber/no codes	953, 955,
Cemetery: Weber/no codes	961

ADDITIONAL PROPERTY TYPE CODES FOR DAVIS COUNTY

120 20-49 apartment, 121 2 houses, 122 attached PUD, 131 3 houses, 150 50-98 apartment, 160 trailer park, 1875 (must be an error, only one entry), 199 99+ apartment, 203 mixed industrial, 205 resident on multi-housing, 501 salvage building, 503 mixed retail, 505 conversion commercial, 506 conversion office, 507 conversion retail, 509 mixed office, 510 residential zoned commercial, 512 duplex on commercial property, 513 auto service center, 515 bank, 516 auto dealership used, 517 bowling alley, 518 car wash, 523 convenience store, 524 hospital nursing, 527 day care center, 528 store department, 529 store discount, 530 laundromat, 535 fraternal building, 536 auto lube, 537 garage service, 538 garage storage, 539 lounge, 540 group care home, 542 airport hanger, 547 hospital, 549 hotel, 550 industrial research & development, 551 auto dealer, 553 health club, 554 industrial heavy, 555 industrial light shell, 556 cold storage, 557 industrial loft, 558 flex building, 559 market, 560 medical office, 561 mortuary, 562 motel, 564 bed & breakfast, 566 office, 570 post office, 571 reception center, 572 clubhouse, 573 restaurant, 574 restaurant fast food, 575 retail store, 576 retirement home, 577 school private, 578 service station, 581 shopping center neighborhood, 582 mall community, 583 mall regional, 584 retail service, 585 retail shopping strip, 590 warehouse/office, 591 theater, 592 warehouse distribution, 593 warehouse mini, 594 warehouse storage, 595 warehouse transit, 596 warehouse discount, 597 retail condo, 660 office condo, 675 retail condo, 695 industrial condo, 700 common area, 701 PUD common area, 711 commercial common area, 722 road, 731 electric, 732 telephone, 733 water conservancy, 734 sewer, 749 hotel condo common area, 795 industrial condo common area, 888 residential NRE, 904 RV parking, 905 vacant commercial, 913 vacant multi-housing land, 953 government, 954 school, 955 other-exempt, 957 related-parcel(to Church?), 960 golf course, 961 cemetery

Appendix C

Municipal Parks for Davis and Weber Counties

MUNICIPAL PARKS FOR DAVIS AND WEBER COUNTIES

WEBER COUNTY

Weber Memorial, Fort Buenaventura, North Fork

Farr West

Farr West Farm (undeveloped), Farr West, City Hall, Moutain View, 3300 North, City Land (undeveloped)

Harrisville

Independence, Harrisville, Millenium

Huntsville

Main, Aldous Cabin

Hooper

None

Marriott-Slaterville

None

North Ogden

Moutain View, Lomond View, McGriff, North Ogden, Oak Lawn, Orton, Barker, Bi-centennial Equestrian, Wadmann Soccer

Ogden

4th Street, 9th Street, Beus Pond, Big Dee Sports, Bonneville, College Heights, Courtyard, Dee Memorial, Eccles, Forest Green, Fort Buenaventura, Francis, Glassman Pond, Grandview, Jaycee, Jefferson, Kayak, Lester, Liberty, Lion's Club, Lorin Farr, Marquardt, Marshall White, Miles Goodyear, Monroe, Mount Eyrie, Mount Ogden, MTC Learning, Municipal Gardens, Orchard, Pioneer Stadium, Rolling Hills, Romrell, Ron Claire, Sullivan's Hollow, Thomas, West Ogden, West Stadium

Plain City

Town Square, Lions, Lee Olsen

Pleasant View

Pleasant View, Barker, Shady Lane

Riverdale

Riverdale, Golden Spike, East

Roy

Municipal, Sandridge, West, George Wahlen North

South Ogden

Friendship, 40th Street, Club Heights, Madison Avenue, Glasmann Way, Meadows, Nature

Uintah

Uintah

Washington Terrace

Rohmer, Wright, Lion's, George Van-Leeuwen, Victory, Senior Center

West Haven

Country, Stonefield, Country Haven, Fair Grove, Windsor Farms, Recreation Complex

DAVIS COUNTY

None

Bountiful

Eggett, Lewis, North Canyon Large, North Canyon Small, City, Brick Yard, Fire Fighters, Golf Course, Hannah Holbrook, West Mueller, Tolman Memorial, Twin Hollow, Washington, Five Points, Zesiger

Centerville

Community, Island View, Smoot, Founders

Clearfield

Bernard Fisher, Barlow, Becentennial, Fox Hollow, Hoggens, Island View, Jacobsen, Kiwanis, Splash Pad, Steed, Thornack Memorial, Train Watch, Central

Clinton

Kestrel, Clinton City Pond, West Clinton, Heritage, Powerline, Meadows, Clinton City, Veterans

Farmington

Farmington Pond, Heritage Park, Main Park, Moon Park, Mountain View, Point of View, Preserve Park, Shepard Park, South/Skater Park, Woodland Park

Fruit Heights

Nicholls, Harvey, Creekview, Ellison Farms

Kaysville

Angel Street Soccer, Barnes, City, DATC, Gailey, Hess Farms, Hods Hollow, Mountain, Ponds Park, Ponds Park South, Bishop's Field, East Mountain

Layton

Andy Adams, Camelot, Chapel, Chelsie Meadows, Ellison, Skate, Kays Creek, Layton Commons, Legacy, Oak Forrest, Sandridge, Vae View, Veterans, Woodward

North Salt Lake

Deer Hollow, Fox Hollow, Hatch, Mathis, Palmquist, Trailhead, Foxboro North

South Weber

Cedar Cove, Central, Cherry Farms, Nathan Loock Memorial, Posse Grounds, Veterans, Canyon Meadows, Silverleaf, Cedar Loop

Sunset

John G. White Memorial North, Central, South

Syracuse

Bluff Ridge, Jensen Nature, Canterbury, Centennial, Founders, Fremont, Legacy, Linda Vista, Ranchettes, Rock Creek (under construction), Stoker

West Bountiful

1600 N 550 W, 2350 N 700 W

West Point

Lay F. Blake, Arnold T. Bingham, East, 2 pocket parks identified from orthoimagery (150 N 1900 W, 350 N 1875 W)

Woods Cross

Hogan, Mills, 1 pocket park identified from orthoimagery

Appendix D

Exploration of Socioeconomic Factor Measures

EXPLORATION OF SOCIOECONOMIC FACTOR MEASURES

The process of determining the most appropriate socioeconomic measure involved exploring the use of principal component analysis to reduce Census 2000 measures of education (the percent of the census block group population 25 years and over with less than a high school education, high school education, some college education, undergraduate degree, and graduate degree), employment (the percent of the census block group civilian population 16 years and over unemployed), and income (median household income for the census block group) to a single indices representing the socioeconomic status of individuals residing within the census block group. This approach was soon abandoned.

The basis for principal component analysis rests on whether the composite indicator can predict socioeconomic status, which is dependent on the relationships between the components (Vyas & Kumaranayake, 2006). Education, employment, and income are highly related, with income considered the general result of the affects of education and employment. In effect, each of the socioeconomic components ultimately affect income level. Given the relationship between education, employment, and income; it becomes difficult to attribute correlation between individual components of the composite predictor indicator and the criterion variable, effectively rendering the composite indicator a nuisance factor to be disregarded. If the predictor variable is of interest however, the use of a single variable indicator, such as income is favored. Therefore, poverty level was selected as the socioeconomic predictor variable for the study.

While the percentage of individuals between 18 and 64 years whose 1999 income was below the poverty level for the socioeconomic predictor variable appears to be the most

appropriate measure, given the close correlation between the age range of the predictor and that of the criterion (individuals with disabilities between 16 and 64 years), alternative socioeconomic measures were explored. Namely, the overall percentage of individuals whose 1999 income was below the poverty level within each census block group (total poverty) and the overall percentage of individuals whose 1999 income was below 125% of the poverty level (125% of poverty, a common measure of poverty level).

A multiple regression analysis was conducted to evaluate how well the between 18 and 64 years socioeconomic measure predicted the percentage of individuals with disabilities residing in the census block groups. The results of this analysis indicated that the poverty measure, by percentage of individuals between 18 and 64 years whose 1999 income was below the poverty level, accounted for a significant amount of the disability measure's variability, R^2 = .367 (R^2_{adj} = .365), $F(1, 257) = 149.27$, $p < .001$. The correlation between the variables was .61 accounting for 37% of the variance.

A second analysis was conducted to evaluate whether the mixed-land use community environments measure predicted the percentage of individuals with disabilities residing in the census block groups over and above the between 18 and 64 years socioeconomic measure. The mixed-land use community environments measure, by four-category entropy score, accounted for a significant proportion of the disability measure's variability, R^2 change = .025 ($R^2 = .393, R^2_{adj}$ = .393), $F(1, 256) = 10.648$, $p = .001$. These results suggest that census block groups with greater mixed-land uses tended to have higher numbers of individuals with disabilities in their population independent from poverty level.

Table D1 presents indices to indicate the relative strength of the individual predictors. On the basis of the correlation analysis, the between 18 and 64 years below poverty measure is the most useful predictor, a large correlation accounting for 31% ($.544^2 = .31$) of the variance of the disability measure. The mixed-land use measure contributed only an additional 4% ($.2^2 = .04$) of the variance. However, judgments about the relative importance of these predictors are difficult because they are moderately correlated $r(257) = .333$, $p < .001$.

A second multiple regression analysis was conducted to evaluate how well the total poverty socioeconomic measure predicted the percentage of individuals with disabilities residing in the census block groups. The results of this analysis indicated that total poverty measure, by the overall percentage of individuals whose 1999 income was below the poverty level, accounted for a significant amount of the disability measure's variability, $R^2 = .389$ ($R^2_{adj} = .386$), $F(1, 257) = 163.48$, $p < .001$. The correlation between variables was .62 accounting for 39% of the variability.

Table D1

The Bivariate and Partial Correlations of the Predictors with Disability Measure

Predictors	Correlation with disability measure	Correlation with disability measure controlling for other predictor
Poverty	.606**	.554**
Mixed-land use	.352*	.200*

* $p = .001$, ** $p < .001$

Follow-up analysis was conducted to evaluate whether the mixed-land use community environments measure predicted the percentage of individuals with disabilities residing in the census block groups over and above the total poverty measure. The mixed-land use community environments measure, by four-category entropy score, accounted for a significant proportion of the disability measure's variability, R^2 change = .019 ($R^2 = .408, R^2_{adj}$ = .403), $F(1, 256) = 8.219$, $p = .004$. These results suggest that census block groups with greater mixed-land uses tended to have higher numbers of individuals with disabilities in their population independent from total poverty level.

Table D2 presents indices to indicate the relative strength of the individual predictors. On the basis of the correlation analysis, the total poverty socioeconomic measure is the most useful predictor of the variance of the disability measure, a large correlation accounting for 32% ($.569^2 = .32$) of the variance of the disability measure. The mixed-land use measure contributed only an additional 3% ($.18^2 = .03$) of the variance.

Table D2

The Bivariate and Partial Correlations of the Predictors with Disability Measure

Predictors	Correlation with disability measure	Correlation with disability measure controlling for other predictor
Total poverty	.624**	.569**
Mixed-land use	.352*	.176*

* $p = .004$, ** $p < .001$

A third multiple regression analysis was conducted to evaluate how well the 125% of poverty level socioeconomic measure predicted the percentage of individuals with disabilities residing in the census block groups. The results of this analysis indicated that the 125% of poverty measure, by percentage of individuals whose 1999 income was below 125% of poverty level, accounted for a significant amount of the disability measure's variability, R^2 = .449 (R^2_{adj} = .447), $F(1, 257) = 209.31$, $p < .001$. The correlation between variables was .67 accounting for 45% of the variability.

Follow-up analysis was conducted to evaluate whether the mixed-land use community environments measure predicted the percentage of individuals with disabilities residing in the census block groups over and above the125% of poverty level socioeconomic measure. The mixed-land use community environments measure, by four-category entropy score, accounted for a significant proportion of the disability measure's variability, R^2 change = .010 ($R^2 = .459, R^2_{adj}$ = .455), $F(1, 256) = 4.969$, p = .027. These results suggest that census block groups with greater mixed-land uses tended to have higher numbers of individuals with disabilities in their population independent from 125% of poverty level.

Table D3 presents indices to indicate the relative strength of the individual predictors. On the basis of the correlation analysis, the 125% of poverty level socioeconomic measure is the most useful predictor of the variance of the disability measure, a large correlation accounting for 38% ($.619^2 = .38$) of the variance of the disability measure. The mixed-land use measure contributed only an additional 2% ($.14^2 = .02$) of the variance.

Table D3

The Bivariate and Partial Correlations of the Predictors with Disability Measure

Predictors	Correlation with disability measure	Correlation with disability measure controlling for other predictor
125% of poverty	.670**	.619**
Mixed-land use	.352*	.138*

* $p = .027$, ** $p < .001$

The exploratory analysis indicate that the mixed-land use measure's contribution to the variance of the disability measure was greatest when socioeconomic factors were controlled for using the percentage of individuals between 18 and 64 years whose 1999 income was below the poverty level (mixed-land use measure contributed 4% of the variance), as opposed to the overall percentage of individuals whose 1999 income was below the poverty level (mixed-land use measure contributed 3% of the variance) or the percentage of individuals whose 1999 income was below 125% of the poverty level (mixed-land use measure contributed 2% of the variance). Given the increased correlation with the criterion variable, and the face-validity of using a predictor age-correlated with criterion, the percentage of individuals between 18 and 64 years whose 1999 income was below the poverty level was selected for use as the socioeconomic predictor variable.

REFERENCES

Vyas, S., & Kumaranayake, L. (2006). Constructing socio-economic status indices: How to use principal components analysis. *Health Policy and Planning, 21*(6), 459-468.

Appendix E

Exploration of Mixed-Land Use Measures

EXPLORATION OF MIXED-LAND USE MEASURES

To determine the descriptive measure of the diversity of the distribution of land uses for each census block group area, an entropy score was calculated from land use geospatial data describing individual parcels and linked by parcel id number with property type descriptions taken from property tax records for Weber and Davis counties. The land use types, and their description by entropy score, have been found to be a significant predictor of pedestrian physical activity, itself related to pedestrian-oriented community environments (Frank, Sallis, Conway, Chapman, Saelens & Bachman, 2006; Brown et al, 2009). Both Frank et al. (2005; 2006) and Brown et al. (2009) employed four-category and six-category entropy scores, although the six-category entropy score was found by Brown et al. (2009) to be a slightly better predictor of physical activity.

The four-category entropy score reflects four land use types; single family residential, multi family residential, retail and services, and institutional land use (see Appendix B for coding of property types). The six-category entropy score includes office and entertainment land uses. However, the property type codes necessary to determine the additional land uses was not available from the Weber county property tax records.

Where the data was available for Davis county, a four-category and six-category entropy score was calculated, the values for which are shown in Appendix A. A Pearson correlation coefficient, calculated between the four-category and six-category entropy scores for Davis county, was significant, $r(126) = .965$, $p < .001$. The correlation between the two measures was very strong, as shown in Figure E1, suggesting the four-category entropy score adequately represents the diversity of the distribution of the land use types for each block group area.

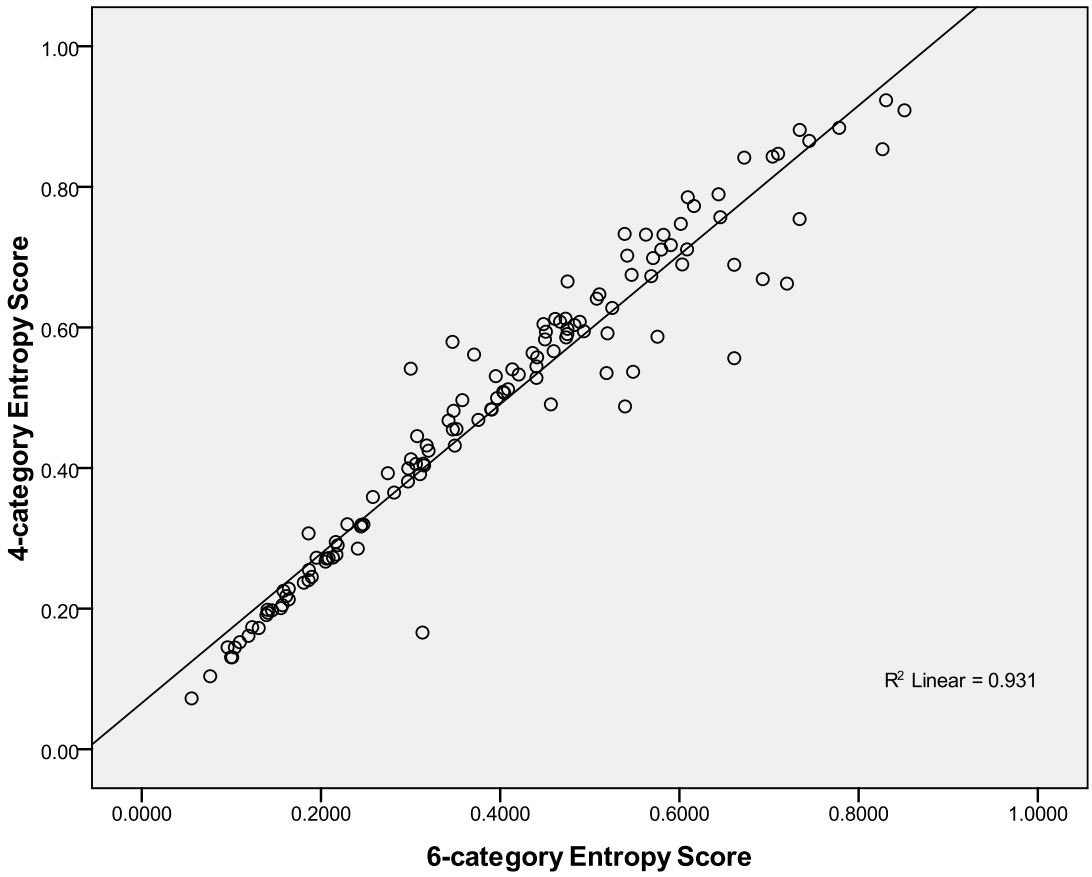

Figure E1. Scatterplot of entropy scores.

Further, multiple regression analysis were conducted for Davis county with both the four-category and six-category entropy score measure to evaluate the relative difference in whether each mixed-land use measure predicted the percentage of individuals with disabilities residing in the census block groups over and above the between 18 and 64 years socioeconomic measure.

For the four-category entropy score measure, a multiple regression analysis was conducted to evaluate how well the between 18 and 64 years socioeconomic measure predicted the percentage of individuals with disabilities residing in the census block groups for Davis county only. The results of this analysis indicated that the

socioeconomic factor, measure by percentage of individuals between 18 and 64 years whose 1999 income was below the poverty level, accounted for a significant amount of the disability measure's variability, R^2 = .134 (R^2_{adj} = .127), $F(1, 126) = 19.43$, $p < .001$.

A second analysis was conducted to evaluate whether the four-category entropy score as the mixed-land use community environments measure predicted the percentage of individuals with disabilities residing in the census block groups over and above the between 18 and 64 years socioeconomic measure. The mixed-land use community environments measure, by four-category entropy score, accounted for a significant proportion of the disability measure's variability, R^2 change = .05 ($R^2 = .185, R^2_{adj}$ = .172), $F(1, 125) = 7.83$, $p = .006$. These results suggest that census block groups with greater mixed-land uses tended to have higher numbers of individuals with disabilities in their population independent from socioeconomic factors.

Table E1 presents indices to indicate the relative strength of the individual predictors. On the basis of the correlation analysis, the between 18 and 64 years socioeconomic measure is the most useful predictor, a moderate correlation accounting for 12% ($.347^2 = .12$) of the variance of the disability measure. The four-category mixed-land use measure contributed only an additional 6% ($.24^2 = .06$) of the variance.

Table E1
The Bivariate and Partial Correlations of the Predictors with Disability Measure

Predictors	Correlation with disability measure	Correlation with disability measure controlling for other predictor
Socioeconomic	.366**	.347**
Four-category Entropy	.270*	.243*

* p = .006, ** p < .001

For the six-category entropy score measure, a multiple regression analysis was conducted to evaluate how well the between 18 and 64 years socioeconomic measure predicted the percentage of individuals with disabilities residing in the census block groups for Davis county only. The results of this analysis indicated that the socioeconomic factor, measure by percentage of individuals between 18 and 64 years whose 1999 income was below the poverty level, accounted for a significant amount of the disability measure's variability, R^2 = .134 (R^2_{adj} = .127), F(1, 126) = 19.43, p < .001.

A second analysis was conducted to evaluate whether the 6-category entropy score as the mixed-land use community environments measure predicted the percentage of individuals with disabilities residing in the census block groups over and above the between 18 and 64 years socioeconomic measure. The mixed-land use community environments measure, by six-category entropy score, accounted for a significant proportion of the disability measure's variability, R^2 change = .07 ($R^2 = .2, R^2_{adj}$ = .188), F(1, 125) = 10.45, p = .002. These results suggest that census block groups with

greater mixed-land uses tended to have higher numbers of individuals with disabilities in their population independent from socioeconomic factors.

Table E2 presents indices to indicate the relative strength of the individual predictors. On the basis of the correlation analysis, the between 18 and 64 years socioeconomic measure is the most useful predictor, a moderate correlation accounting for 12% ($.344^2 = .12$) of the variance of the disability measure. The six-category mixed-land use measure contributed only an additional 8% ($.28^2 = .08$) of the variance.

The results for the socioeconomic predictor were the same for both the four-category and six-category entropy score. While the six-category entropy score measure indicated a slightly stronger correlation with the disability measure (8%) than the four-category entropy score measure (6%). The difference suggests that the six-category entropy score is a slightly better measure of the diversity of the distribution of land uses. This is likely due to the increased diversity of land uses measured by the six-category entropy score, essentially 2 more types of land uses shown to be related to pedestrian-oriented activity

Table E2
The Bivariate and Partial Correlations of the Predictors with Disability Measure

Predictors	Correlation with disability measure	Correlation with disability measure controlling for other predictor
Socioeconomic	.366**	.344**
Six-category Entropy	.306*	.278*

* $p = .002$, ** $p < .001$

are included. However, for this study the slight difference suggests that the four-category entropy score is an acceptable alternative.

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Appendix F

Exploration of Community Common Space Measures

EXPLORATION OF COMMUNITY COMMON SPACE MEASURES

Two measures of community common space were evaluated; the percentage of individual block group areas which are within a quarter-mile walking distance of community common space and the percentage of individual block group areas which are community common space. Community common space is defined as public parks for the purposes of this study.

The preferred measure reflects the percentage of individual block group areas within walking distance of public park space. Conceptually, cases of individuals residing in one census block group near public park space in another census block group would not be adequately accounted for by the measure of the percentage of public park space for each block group area, as shown in Figure F1.

Further, large public parks may represent significant portions of a census block group, but a lower percentage of public park space within walking distance within the block group area. While a number of smaller public parks distributed throughout a census block group may represent a low percentage of the area of the block group, but a higher percentage of park space within walking distance within the block group area, as shown in Figure F1. It is access to public parks, commonly measured by walking distance, which has been shown to be critical in the use of public park space.

However, both measures were calculated and evaluated, the values for which are shown in Appendix A.

Figure F1. Public parks and walking distance for census block groups.

A Pearson correlation coefficient, calculated between each census block groups' percentage of park space and percentage of park space within walking distance, was significant, $r(257) = .603$, $p < .001$. The correlation between the two measures was strong, as shown in Figure F2. Although Figures F1 and F2 do indicate the variability between the two measures. Particularly, Figure F2 indicates the number of census block groups with no public park space but significant areas within walking distance of public park space, up to 75%.

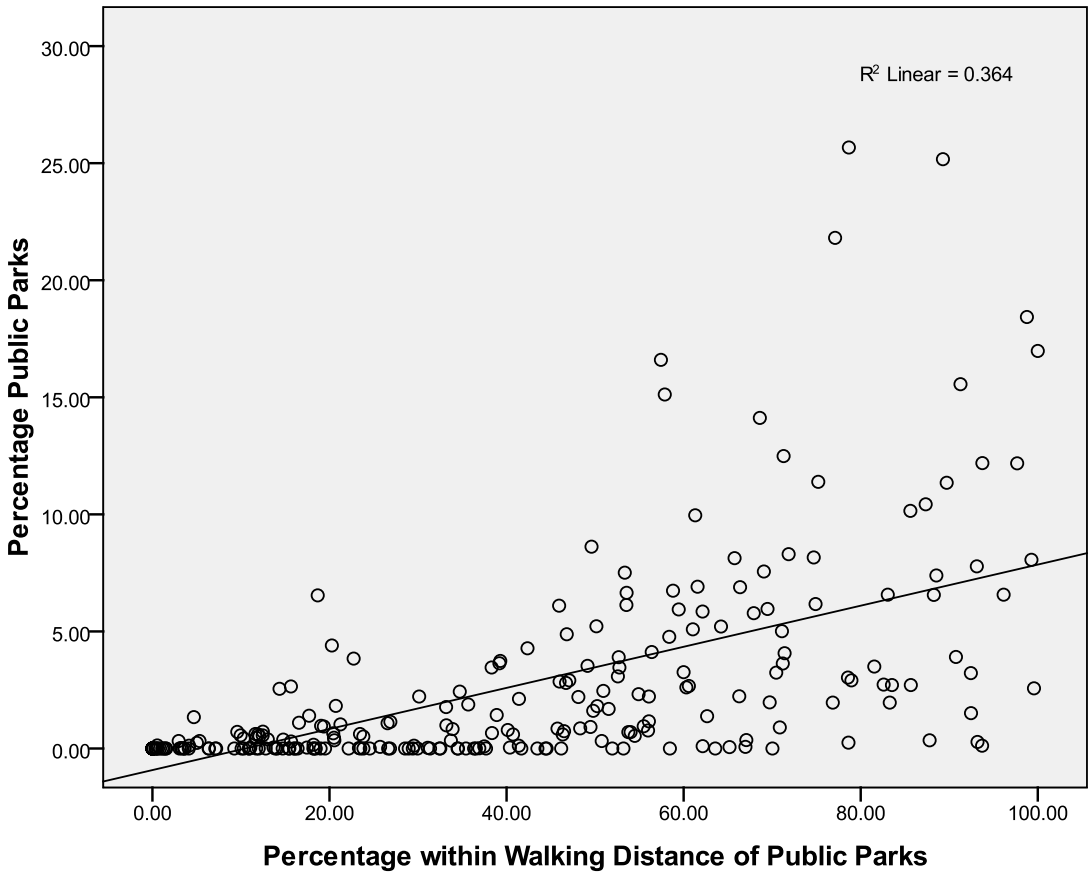

Figure F2. Scatterplot of the community common space measures.

Further, multiple regression analysis were conducted with both the percentage of park space and percentage of park space within walking distance for each census block group to evaluate the relative difference in whether each community common space measure predicted the percentage of individuals with disabilities residing in the census block groups over and above the between 18 and 64 years socioeconomic measure.

First, a multiple regression was conducted to evaluate whether the percentage of individual census block group areas within a quarter-mile walking distance of public parks, predicted the percentage of individuals with disabilities residing in the census block groups over and above the socioeconomic measure. The walking distance

community common space measure, accounted for a significant proportion of the disability measure's variability, R^2 change = .015 ($R^2 = .382, R^2_{adj}$ = .377), $F(1, 256)$ = 6.058, p = .015.

Table F1 presents indices to indicate the relative strength of the individual predictors. On the basis of the correlation analysis, the socioeconomic measure is the most useful predictor, a large correlation accounting for 35% ($.591^2 = .349$) of the variance of the disability measure. The community common space measure contributed only an additional 2% ($.152^2 = .023$) of the variance.

Second, a multiple regression was conducted to evaluate whether the percentage of public parks of individual census block group areas, predicted the percentage of individuals with disabilities residing in the census block groups over and above the socioeconomic measure. The public parks community common space measure, did not account for a significant proportion of the disability measure's variability, R^2 change =

Table F1

The Bivariate and Partial Correlations of the Predictors with Disability Measure

Predictors	Correlation with disability measure	Correlation with disability measure controlling for other predictor
Socioeconomic	.606**	.591**
% within Walking Distance	.225*	.152*

* $p < .05$, ** $p < .001$

.001 ($R^2 = .368, R^2_{adj}$ = .364), F(1, 256) = 0.441, p = .507. The not significant (p = .507) partial correlation between the public parks community common space measure and the disability measure was .04, representing 0.2% of the variance of the disability measure.

Given the lack of a significant correlation with measuring community common space by the percentage of census block groups in public parks, in addition to the reasons previously described, this study measures community common space as the percentage of individual census block group areas within a quarter-mile walking distance of public parks.

CURRICULUM VITAE

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Education

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July 2002-Present — Principal Landscape Architect
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July 2001-July 2009 — Assistant Extension Landscape Architect
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Peer-Reviewed Publications

1. 2010 **Christensen, K.M.**, Holt, J.M., & Wilson, J.F. Effects of Perceived Neighborhood Characteristics and Use of Community Facilities on the Physical Activity of Adults with and without Disabilities. *Preventing Chronic Disease; Public Health Research, Practice, and Policy, 7*(5) <http:www.cdc.gov/pcd/issues/2010/sep/09_0179>.
2. 2009 **Christensen, K.M.** Socially Equitable Community Planning; including individuals with disabilities in the democratic association of place. *Review of Disability Studies, 5*(3): 49-52.
3. 2008 **Christensen, K.M.**, & Sasaki, Y. Agent-Based Emergency Evacuation Simulation with Individuals with Disabilities in the Population. *Journal of Artificial Societies and Social Simulation 11*(3)9 <http://jasss.soc.surrey.ac.uk/11/3/9.html>.
4. 2007 **Christensen, K.M.**, & Salmi, P. The Impact of Building Design on Evacuation of Persons with Disabilities. *Impact*, 20(1); 20-21.

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6. 2006 **Christensen, K.M.** & Jeon, T.K. Creating Inclusive Outdoor Play Environments; Designing for Ability Rather than Disability. *The Journal of Eyewitness in Special Education*, 910(Sept-Oct); 48-55.
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8. 2003 **Christensen, K.M.** & Morgan, J. When Child's Play is Anything But; to help children with disabilities, design by types of activities, not types of equipment. *Parks and Recreation, 38*(4); 50-53. NRPA, Ashburn, VA.

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2. 2008 Christensen, K.M. *Inclusive Play; universal design for all*. Play & Park Structures, PlayCore, Inc., Chattanooga, TN.
3. 2008 Christensen, K.M. *EveryBODY Plays!* GameTime, PlayCore, Inc., Chattanooga, TN.
4. 2004 Christensen, K.M. *Inclusive Outdoor Learning Environments; an introductory guide.* Center for Persons with Disabilities, Utah State University; Logan, UT.
5. 2004 Christensen, K.M. *www.beyondaccess.org*. Center for Persons with Disabilities, Utah State University; Logan, UT.
6. 2010 Christensen, K.M., & Morgan, J. *EHS/HS Inclusive Outdoor Learning Environments; an introductory guide.* The Administration for Children and Families; Head Start Bureau; D.C.

Professional History

- Bottom-Up Modeling of Evacuation Methodologies; Implications for the Egress of Individuals with Disabilities during Health Safety Events (BUMEM). Co-Principal Investigator. Centers for Disease Control and Prevention; Health Protection Research Initiative. October 2004 – September 2008
- Bottom-Up Modeling of Mass Pedestrian Flows; Implications for the Effective Egress of Individuals with Disabilities (BUMMPEE). Project Director. The National Institute on Disability and Rehabilitation Research; Field Initiated Research. November 2003 – October 2006
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Eagle Scout, 1988
Full-time missionary for LDS Church in Ventura California, 1992 – 1994