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Transportation Related Challenges for Persons with Disabilities

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TRANSPORTATION RELATED CHALLENGES FOR PERSONS WITH DISABILITIES

by

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ABSTRACT

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by

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Utah State University, 2017

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Access to transportation is essential for obtaining employment, education, healthcare, and social interaction. Individuals who face difficulties in gaining this access are considered 'transportation disadvantaged' and include individuals of lower socioeconomic status, aging individuals, and persons with disabilities. In our auto-dependent society, individuals with disabilities face even fewer opportunities to interact within their communities. In order to better understand how individuals with disabilities are limited by their access to transportation, two studies were conducted.

The first study specifically sought to examine how individuals with disabilities gain access to transportation and the interpersonal relationships that affect opportunities for social participation in the community. A self-administered online questionnaire was disseminated to individuals with disabilities 18 years of age or older that reside in the Rocky Mountain region of the United States. There were 193 respondents that reported having a disability. Individuals with disabilities were found to have less access to private vehicles than previously understood. Respondents were also found to utilize public

transportation more than previously reported. The majority of individuals with disabilities feel that the level of their access to transportation has hindered their social life.

The second study, using the same survey as the first study, but including additional questions and addressing a larger sample size, sought to understand the needs of individuals with disabilities from a national perspective. There were 430 respondents who reported having a disability nationwide. Individuals were found to use fewer private vehicles and more public transportation than previous studies have shown. Individuals with more significant disabilities were more likely to face transportation-related exclusion. Almost half of the participants had to cancel an appointment because of a transportation-related conflict. The majority of participants felt that their social life was hindered by their level of access to transportation.

(74 pages)

PUBLIC ABSTRACT

Transportation Related Challenges for Persons with Disabilities

Graydon W. Bascom

Gaining access to transportation is essential for obtaining employment, education, healthcare, and social interaction. Individuals who face difficulties in gaining this access are considered 'transportation disadvantaged' and include individuals of lower socioeconomic status, aging individuals, and persons with disabilities. In our auto-dependent society, individuals with disabilities face even fewer opportunities to interact within their communities. In order to better understand how individuals with disabilities are limited by their access to transportation, two studies were conducted.

The first study specifically seeks to examine how individuals with disabilities gain access to transportation and the interpersonal relationships that affect opportunities for social participation in the community. A self-administered online questionnaire was disseminated to individuals residing in the Rocky Mountain region of the United States. Individuals with disabilities were found to have less access to private vehicles and to utilize public transportation more than previously reported. The majority of individuals with disabilities feel that their access level to transportation hindered their social life.

The second study, using the same survey as the first study with some variation of the questions and a larger sample size, sought to understand the needs of individuals with disabilities from a national perspective. Individuals were found to use private vehicles less and more public transportation than previous studies have shown. Individuals with more significant disabilities were more likely to face transportation-related exclusion.

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CHAPTER I

INTRODUCTION

Transportation accessibility is fundamental for individuals' need to engage with their community, for obtaining employment, goods and services, health, and education, and for socializing (Handy & Niemeier, 1992; US Department of Transportation, Bureau of Transportation Statistics [BTS], 2003; Wilkinson & Marmot, 2003). Individuals' characteristics or competencies impact both the need of the individual for transportation to access these 'rights,' and their ability to access the transportation system, itself (Cvitkovich & Wister, 2001). Individuals who face difficulty in accessing transportation are considered 'transportation disadvantaged', and include the elderly, the poor, and individuals with disabilities (Rajé, 2003; Levinson, Wasfi, & El-Geneidy, 2006; Yigitcanlar, Dodson, Gleeson, & Sipe, 2005). In an auto-dependent society, transportation disadvantaged individuals are socially excluded, being unable to fully participate with society or engage with their community (Dodson, Gleeson, & Sipe, 2004; Cass, Shove, & Urry, 2005; Casas, 2007), whereas individuals with increased access to transportation report greater quality of life and exhibit lower levels of social isolation (Cvitkovich & Wister, 2001). Further, social exclusion is intensified by the combination of less access to transportation and lower levels of sociability (Hine & Grieco, 2003; Duvarci & Yigitcanlar, 2007; Preston & Rajé 2007; Lucas & Currie, 2012), compounding its impact.

Individuals with disabilities have less access to varying transportation options (Levinson et al., 2006; BTS, 2003; Americans with Disabilities Act of 1990 [ADA],

amended 2008) and are often marginalized in the social, economic, and political environment of the community (Silverstein, 2000; Chenoweth & Stehlik, 2004; Ware, Hopper, Tugenberg, Dickey, & Fisher, 2007; Christensen, 2009). The lack of access to transportation contributes to the marginalization of individuals with disabilities (Carmien et al, 2005; Seekins, Enders, Pepper, & Sticka, 2007; Enders & Seekins, 2009). In addition, the lack of private transportation options may make individuals with disabilities more dependent on alternate forms of transportation, including ridesharing through their social network. While not well understood, the increased demand on individuals with disabilities' already degraded social network may further reduce their opportunities for socializing.

Transportation accessibility has been identified as one of the primary means to address individuals with disabilities' independence and self-determination in society (Levinson et al., 2006; Wehmeyer, Kelchner, & Richard, 1996; Shalock & Alonso, 2002; Frieden, 2005). Indeed, understanding the role of transportation access in the social exclusion of individuals with disabilities is necessary to best assure the full participation of individuals with disabilities in all aspects of society (Yigitcanlar et al., 2005; Lucas & Currie, 2012).

Research Questions and Hypotheses

The purpose of this study is to explore individuals with disabilities' access to transportation in relation to their opportunities for social participation in their community. To do so, three primary research questions and two relevant sub-questions were examined as follows:

1) How are individuals with disabilities meeting their transportation needs?
    a. Are individuals with disabilities less likely to have access to a personal automobile?
2) Are the modes by which individuals with disabilities meet their transportation needs associated with various demographic factors?
3) Are the modes by which individuals with disabilities meet their transportation needs associated with the strength or diversity of their social network?
    a. Are individuals with disabilities who have a stronger or more diverse social network better able to meet their transportation needs?

We hypothesized that individuals with disabilities are more likely to use alternative forms of transportation with more limited access to private transportation options. Further, we hypothesized that individuals with disabilities who have stronger, more diverse social networks are more likely to rideshare and have access to other forms of transportation assistance and individuals with disabilities who have weaker, less diverse social networks will be more likely to rely on public transportation options.

This study began with the goal to survey individuals in Federal Region 8. The survey was constructed in Qualtrics online survey software, and then distributed to individuals with disabilities through ADA centers and disability service providers. Due to the unanticipated distribution through these service organizations, the survey reached across the United States and even into U.S. territories. The survey was constructed to include different questions along with the different sample sizes from the geographic regions and the data set was separated and analyzed two stand-alone papers.

To address the research questions, 114 individuals 18 years of age or older,

possessing a physical disability and who resided in Cache County, Utah for more than12 months, participated in a written survey. The survey instrument was developed and administered in partnership with the Utah Transportation Center (UTC) and the Center for Persons with Disabilities (CPD) at Utah State University (USU). The survey was comprised of 9 questions regarding transportation needs and social networks, 14 questions regarding demographic information, and 6 questions regarding transportation use patterns. Examples of basic demographic questions include age, gender, race/ethnicity, education level, employment status, household income level, number of members in the household, private vehicle ownership, licensed driver status, and disability type. Examples of the transportation and social network questions include:

1) What mode of transportation do you use the most? (Drive your personal vehicle, ride with others, bus, paratransit, social and volunteer service, other)
2) How often do you get together to socialize with your... (daily, every few days, weekly, monthly, other)
    a. Family
    b. Friends
    c. Close Friends
3) During a typical month, how often do the following help you meet your transportation needs? (daily, every few days, weekly, monthly, other)
    a. Family
    b. Friends
    c. Close Friends
    d. Service Provider

e. Public Transportation

The survey was mailed to 370 potential participants through the CPD, Cache Employment Training Center (CETC), Cache Valley Transit District (CVTD), and Options for Independence, one of a national network of community-based independent living centers providing services and advocacy by and for individuals with disabilities residing in Cache County, Utah. The survey was available in Spanish. Eight $25 gift cards were offered to randomly selected respondents as an incentive. The response rate for the survey was approximately 38%.

The Utah State University Institutional Review Board approved the study design. In addition to descriptive statistics, analysis included a one-way analysis of variance (ANOVA), crosstabs and nonparametric test procedures using the Monte Carlo Method, Pearson R, and binary logistic regression, and was conducted using IBM SPSS Statistics version 20.

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CHAPTER II

TRANSPORTATION RELATED CHALLENGES FOR PERSONS WITH DISABILITIES IN RURAL AREAS[1]

Abstract

The purpose of this study is to examine individuals with disabilities' access to transportation and that access' relationship to opportunities for social participation in the community. A self-administered online questionnaire was disseminated to individuals with disabilities 18 years of age or older that reside in the Rocky Mountain region of the United States. Individuals with disabilities were found to have less access to private vehicles than previously understood. The majority of individuals with disabilities feel that their level of access to transportation has hindered their social life.

Introduction

Access to transportation is essential for an individual with disabilities, 18 years of age or older, that reside in rural areas. This access affects the availability of the services, education, and social interaction they need to lead healthy lives. Individuals encountering difficulties accessing transportation are considered 'transportation disadvantaged' and include aging individuals, individuals of a lower socioeconomic status, and individuals with disabilities. Transportation disadvantaged individuals may be socially excluded in

[1] Chapter 2 was coauthored by Graydon Bascom and Keith Christensen for submission to the Journal of Transportation Research.

auto-dependent societies. As a population, individuals with disabilities have fewer options for private transportation and are therefore not permitted to be full participants within their community. To participate more fully in their communities, individuals with disabilities may depend on their social network to mitigate barriers in transportation access. The resulting increased demand on individuals with disabilities' already limited social network may further reduce their opportunities for social involvement.

Understanding this relationship between transportation access and the social exclusion of individuals with disabilities is necessary to best support full community participation. The purpose of this study is to examine individuals with disabilities' access to transportation and its relationship with opportunities for social participation in the community.

Background

Access to transportation is essential for individuals to engage with their community; for obtaining employment, goods and services, healthcare, education, and social interaction (Casas, 2007; Preston and Rajé, 2008). For example, lack of transportation not only limits access to job opportunities, but can also escalate the difficulty finding employment based on limited access to employment center and interview locations (Department of the Environment, Transport and the Regions [DETR], 2000; Kenyon, et al., 2002). Likewise, healthcare and education are rarely equally distributed in a community, making access difficult for individuals not living near where these services are available (Martens, 2012).

In transportation planning, individuals encountering difficulties in accessing

transportation are considered ‘transportation disadvantaged’ and include aging individuals, individuals in a lower socioeconomic situation, and individuals with disabilities (Delbosc and Currie, 2011; Levinson et al., 2006; Rajé, 2003; Yigitcanlar et al., 2005). Transportation disadvantaged populations are less able to access employment opportunities, education services, health services, and other community resources associated with daily living (U.S. Department of Transportation, Bureau of Transportation Statistics [BTS], 2003). Further, transportation disadvantaged individuals are often socially excluded, ultimately limited from participating within their community (Casas, 2007; Cass et al., 2005; Dodson et al., 2004). “Households without a car, in a society in which household car ownership is the norm (peri-urban and rural areas), are ‘socially excluded’ within our definition of the term, since they cannot fully participate i.e. behave as the vast majority of society behaves” (Dodson et al., 2004). These individuals need to be carefully considered by transportation and community planners when new systems are planned and implemented or existing systems are managed for improvement, yet that is often not the case (Duvarci and Yigitcanlar, 2007).

Individuals with disabilities are less likely to have access to transportation and are often not full participants within their community (Lucas, 2012; Preston and Rajé, 2007; Schur, 2000). Compounding these issues, individuals who experience social exclusion are often disengaged from political and institutional structures in their community and are unlikely to be involved in transportation planning (Department of Transportation [DOT], 2012; Kenyon et al., 2002). These individuals may feel disempowered from the decision-making process in relation to where they are housed, the kind of job opportunities and services which are available to them, the quality of the services they receive and their

own ability to affect any changes in these aspects of their lives (Lucas and Currie, 2012). To more fully participate, individuals with disabilities have an increased dependence on alternate forms of transportation, which may include ridesharing through their social network (Schmöcker et al., 2008). The increased strain on individuals with disabilities' already-often marginal social network may further endanger their opportunities for future social interaction (Christensen et al., 2014).

Transportation access has long been seen as a primary way to address individuals with disabilities' independence and self-determination (Frieden, 2005; Levinson et al., 2006; Schalock and Alonso, 2002; Wehmeyer et al., 1996). Understanding the role of transportation access in the social exclusion of individuals with disabilities is necessary to best assure the full participation of individuals with disabilities in all aspects of society (Lucas and Currie, 2012; Yigitcanlar et al., 2005).

Research Questions and Hypotheses

To explore the issues of transportation access and opportunities for social participation from the perspective of individuals with disabilities, three research questions were investigated:

1) What transportation modes are individuals with disabilities using to meet their transportation needs?
2) Are the modes by which individuals with disabilities meet their transportation needs associated with demographic factors, such as age, gender, ethnicity, type of disability, education, employment, income, and/or other factors?
3) Are the modes by which individuals with disabilities meet their transportation

needs associated with the strength or diversity of their social network?

We hypothesized that individuals with disabilities are less likely to have access to personal transportation options, but that individuals with disabilities who are employed are more likely to have access to personal transportation opportunities. We also hypothesized that individuals with disabilities who have stronger or more diverse social networks are better able to meet their transportation needs through ridesharing and other transportation options.

Methods

This study is an expansion of a previous study by Jansuwan, Christensen, and Chen (2013). The previous study was limited by a small sample population of 171 individuals, of which 76 reported possessing disabilities. The small sample size required the researchers to use the *Monte Carlo Method*, which repeatedly samples a specified number of possible tables in order to obtain an unbiased estimate of the true *p* value. The Monte Carlo Method can give unwarranted credibility to smaller data output. This study makes use of a larger sample population of individuals with disabilities to address the weaknesses of the previous study.

The study setting encompasses six states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming, which represent U.S. Standard Federal Region 8. Federal Region 8 represents an area of 581,921 square miles with a total population of 11,031,800 people, of which 1,138,300 are individuals with disabilities.

In collaboration with the Rocky Mountain ADA Center, one of the National Network of ADA Centers providing information on the Americans with Disabilities Act

(ADA) to individuals and organizations in Region 8, a self-administered online questionnaire was disseminated to individuals with disabilities 18 years of age or older. The survey, available in both English and Spanish, was comprised of 11 questions regarding their demographic information, 6 questions regarding their transportation needs and social networks, and between 10 and 14 questions regarding their transportation use patterns (the number of questions was response dependent). Examples of basic demographic questions include age, gender, ethnicity, type of disability, education level, employment status, household income level, and place of residence. Examples of transportation and social network questions include:

1) During a typical day, what means of transportation do you use most? (drive your personal vehicle, ride with others, bus, walk, taxi or hired driver, bicycle, paratransit, social or volunteer service, or other; the response would reveal related follow-up questions to gather additional information about the selected transportation mode choice such as waiting time, riding time, number of transfers, etc.)
2) How often do you get together to socialize with your family/friends/close friends? (daily, every few days, weekly, monthly, other)
3) Do you feel that your social life is hindered by your transportation needs? (yes or no)
4) During a typical month, how often do the following help you meet your transportation needs? (family, friends, close friends, service provider, public transportation; daily, every few days, weekly, monthly, none)

The complete questionnaire is available in the appendix. Respondents had the

opportunity to enter a random drawing for one of twenty $25 gift cards as an incentive to increase participation. The Utah State University Institutional Review Board approved the study design.

Results

Although 693 individuals responded, only 261 respondents resided within the study setting of which 193 reported possessing a disability. The demographic characteristics of these respondents with disabilities are summarized as follows: The majority of the respondents are White/Caucasian (86.1%), followed by Hispanic (8.6%), Black/African American (3.2%), American Indian (1.6%), and Pacific Islander (0.5%). Fifty four percent (54.7%) of the respondents are female. The age range of the respondents was from 18 to 73 years with a mean age of 46.3 years. Roughly 62% have college degrees and 33.8% have a high school education or less. Almost half of the respondents (48.8%) earn less than $24,000 per year with 34.9% of the total surveyed earning less than $15,000 per year. In addition, some 34.7% are unemployed, 11.9% are volunteer workers, and 12.4% are retired. The responses indicate that only 39.4% are employed, either full-time (18.7%), part-time (14.5%), or self-employed (6.2%). This indicates very low employment, particularly when one considers the number of respondents who possess college degrees. The respondents' disabilities were self-reported as physical (58.4%), vision (15.3%), hearing (4.7%), intellectual (15.8%), psychological (1.6%), or emotional (1.6%) impairments.

Transportation Access

The U.S. Department of Transportation: Bureau of Transportation Statistics'

[BTS] national transportation survey, conducted in 2003, reported private vehicles as individuals with disabilities' major transportation mode (61%), followed by riding with others (6%), public transportation (6%), paratransit (1.5%), and social and volunteer services (0.6%) (BTS, 2003). While the BTS study found that private vehicles are individuals with disabilities' most used transportation mode, private vehicles only represent 33.5% in this study, much less than previously reported. Public transportation was reported as the next most used transportation mode (20.9%), followed by riding with others (16.2%), paratransit (13.6%), walking (3.1%), taxi or hired driver (1%), social or volunteer services (1%), and bicycles (.5%). These results show much less private vehicle use and a higher rate of public transportation, paratransit, and riding with others than previously reported. While less than the BTS national survey (61%), the results for private vehicle use (33.5%) was greater than those found in the smaller study referenced earlier in this chapter (15%) (Jansuwan et al., 2013).

Follow-up analysis found that respondents reported fewer vehicles available to households of individuals with disabilities compared with general households as determined by 2012 U.S. Census data and shown in Table 2-1. Study results also indicate that 23.4% of respondents do not have a licensed driver within their household. Reporting for the past month, 61.5% of respondents indicated that they had not driven a vehicle, being unable to drive primarily due to their disability (85.3%), not possessing a vehicle (5.5%), lack of a driver's license (3.7%), or having a spouse serving as the primary driver (2.8%). The indicated pattern of private vehicle use among individuals with disabilities is markedly different from that of individuals without disabilities, particularly the high percentage of individuals with disabilities who have no vehicles available in their

household, and the very high percentage who indicate that they are unable to drive a vehicle due to their disability.

Table 2-1
Number of Personal Automobiles Available in the Household; Intermountain Region

	General Population		Individuals with Disabilities
Number of Vehicles	National %*	Region 8%*	This Study
None	9.2	5.3	28.0
1	34.0	29.7	34.2
2	37.5	39.6	27.5
3 or more	19.4	25.3	6.7

* Source: U.S. Census Bureau, 2012 American Community Survey 3-year estimates.

Additional analysis of the data to examine response differences by self-reported disability type is presented in Table 2-2.

Table 2-2
Transportation Access (%) by Type of Disability; Intermountain Region

	Personal Vehicle	Ride with Others	Bus	Walk	Taxi/ Hired Driver	Bi-cycle	Para-transit	Social or Volunteer Service
All Impair-ments (193)	33.5	16.2	20.9	3.1	1.0	0.5	13.6	1.0
Physical (110)	37.3	15.4	17.3	-	-	-	15.5	-
Vision (28)	17.9	21.4	21.4	10.7	3.6	-	17.9	7.1
Hearing (9)	77.8	22.2	-	-	-	-	-	-
Intellectual (30)	16.7	13.3	40.0	6.7	-	3.3	10.0	-
Psycho-logical (3)	33.3	-	-	33.3	33.3	-	-	-
Emotional (3)	66.6	33.3	-	-	-	-	-	-

Table 2-3 presents the trip details associated with each transportation mode as appropriate. Due to an unfortunate error in the online questionnaire database, details for personal vehicle and social or volunteer service trips were not available. The data available indicates that the average trip when riding with others takes approximately 106 minutes, while using the bus takes 101 minutes, and paratransit services takes 71 minutes. The results suggest that riding with others, which takes more effort in order to make pre-

trip arrangements, is used more often for accessing destinations that are not served by other transportation options, as are paratransit services, to a lesser extent. The length of trips using public transportation may be due, in part, to indirect bus route configurations.

Table 2-3
Transportation Mode Trip Details; Intermountain Region (in Mean Minutes unless Noted)

	Time to Access*	Time Waiting**	Time Traveling	Trip Cost (Mean $)	Notes
Ride with Others	17.9	23.1	64.9	-	
Bus	3.6	17.6	80.1	-	Mean number of transfers per trip – 1.7
Walk	-	-	26.7	-	
Taxi or Hired Driver	15.0	5.0	20.0	$15	Figures are for 1 respondent only
Bicycle	-	-	30.0	-	Figures are for 1 respondent only
Paratransit	11.5	24.2	35.6	-	

*Time in mean minutes spent arranging transportation or traveling to access point.
**Time in mean minutes spent waiting at access point for transportation.

Difficulties with public transportation contributed to respondents' level of ability to reliably move through their community. Respondents reported not being able to get to a desired destination during the previous month 1-2 times (34.9%), 3-5 times (30.1%), and 6-10 times (7.5%) with 25.3% reporting no difficulties. The most common reason respondents reported that prevented their reaching their desired destination was weather (30.9%), followed by inadequate public transportation (23.0%), a lack of access to public transportation (10.8%), and a lack of specialized transportation (10.8%). The results indicate the importance of public transportation providing community access for individuals with disabilities.

Demographic Factors

One-way analyses of variance (ANOVA) were conducted to examine whether the

modes by which individuals with disabilities meet their transportation needs are associated with demographic factors. The demographic factors include age, gender, race/ethnicity, type of disability, education level, employment, and income level. Education level was reported according to five categories: less than high school, high school, junior college/technical school, 4-year college/university, and post graduate. Employment was reported according to six categories: unemployed, part-time employment, self-employed, retired, full-time employee, and volunteer but was coded as either employed for wages (part-time, self-employed, retired, and full-time) or not employed for wages (unemployed and volunteer) for these analyses. Income level was coded into eight consecutive income groups based on poverty threshold ($15,000/year) for the study area: less than $15,000, $15-24,999, $25-34,999, $35-49,999, $50-74,999, $75-99,999, $100-149,999, and $150,000 or more. The following factors were significantly correlated at the .05 level with individuals with disabilities' transportation mode choices: Age (F (5, 177) = 3.96, p = .002) accounting for 10.1% of the variance in transportation mode choices; Education Level (F (5, 178) = 3.15, p = .009) accounting for 8.1% of the variance in transportation mode choice; Employment (F (5, 177) = 1.23, p < .001) accounting for 13.5% of the variance in transportation mode choice; and Income Level (F (5, 159) = 10.53, p < .001) accounting for 24.9% of the variance in transportation mode choice.

Follow-up tests were conducted to evaluate pairwise differences among the means using the Dunnett's C test that does not assume equal variances among the groups. Due to the low number of responses for the bicycle, taxi or hired driver, and social or volunteer services transportation modes, these were eliminated from the follow-up tests. The

significant relationships are shown in Tables 2-4 through 2-7, respectively. There are significant differences in the mean age between those using personal vehicles and bus transportation, and between bus and paratransit services. Individuals with disabilities most commonly using public transportation are younger than those using personal vehicles or paratransit.

There are significant differences in the education level between those using personal vehicles and bus transportation; those who indicated using personal vehicles are more likely to possess a college/university degree. There are also significant differences in employment between those using personal vehicles and those riding with others or using public transportation; participants who indicated using personal vehicles were more likely to be employed for wages. Another significant difference was observed regarding income levels between those using personal vehicles, public transportation, or paratransit services. Participants using personal vehicles were more likely to have roughly twice the income of those who did not. As education, employment, and income level are significantly related, the reported associations are confounded, nevertheless telling, as those using personal vehicles are more likely to be educated, employed, and earning more.

Table 2-4
95% Confidence Intervals (CI) of Pairwise Differences in Mean Changes for Age; Intermountain Region

Transportation Mode	M (*years*)	*SD*	95% CI for Significant (0.05) Pairwise Differences
Personal Vehicle	49.6	13.6	Bus [2.4, 20.3]
Ride with Others	42.9	16.2	
Bus	38.2	15.5	Paratransit [-23.1, -2.8]
Walk	48.7	16.7	
Paratransit	51.2	11.1	

Table 2-5
95% CI of Pairwise Differences in Mean Changes for Education Level; Intermountain Region

Transportation Mode	M (*years*)	*SD*	95% CI for Significant (0.05) Pairwise Differences
Personal Vehicle	3.9	1.1	Bus [0.2, 1.7]
Ride with Others	3.3	1.4	
Bus	2.9	1.3	
Walk	2.7	1.6	
Paratransit	3.3	1.4	

Table 2-6
95% CI of Pairwise Differences in Mean Changes for Employment; Intermountain Region

Transportation Mode	M (*years*)	*SD*	95% CI for Significant (0.05) Pairwise Differences
Personal Vehicle	1.2	0.4	Ride with Others [-0.7, -0.1] Bus [-0.7, -0.2]
Ride with Others	1.7	0.5	
Bus	1.7	0.5	
Walk	1.5	0.5	
Paratransit	1.5	0.5	

Table 2-7
95% CI of Pairwise Differences in Mean Changes for Income Level; Intermountain Region

Transportation Mode	M (*years*)	*SD*	95% CI for Significant (0.05) Pairwise Differences
Personal Vehicle	4.2	1.9	Bus [0.6, 3.2] Paratransit [1.1, 3.6]
Ride with Others	3.4	2.2	
Bus	2.3	1.8	
Walk	2.7	1.9	
Paratransit	1.9	1.3	

Social Network Strength

Roughly sixty-seven percent (67.4%) of respondents reported their social life was hindered by their transportation needs. An ANOVA was conducted to examine whether the modes by which individuals with disabilities meet their transportation needs were associated with whether respondents felt their social life was hindered. This analysis showed significant correlation (F (5, 174) = 18.15, $p < .001$), accounting for 34.3% of

the variance in whether respondents felt their social life was hindered. Follow-up tests conducted to evaluate pairwise differences among the means using the Dunnett's *C* test indicated a significant relationship between all transportation modes as shown in Table 2-8. Individuals with disabilities reporting that their social life was unhindered by their transportation needs were most commonly using personal vehicles for transportation.

Table 2-8
95% CI of Pairwise Differences in Mean Changes for Social Life; Intermountain Region

Transportation Mode	M (*years*)	*SD*	95% CI for Significant (0.05) Pairwise Differences
Personal Vehicle	1.7	0.46	Ride with Others [0.4, 0.9] Bus [0.4, 0.8] Walk [0.1, 1.0] Paratransit [0.3, 0.8]
Ride with Others	1.0	0.18	Personal Vehicle [-0.9, -0.4]
Bus	1.1	0.32	Personal Vehicle [-0.8, -0.4]
Walk	1.2	0.41	Personal Vehicle [-1.0, -0.1]
Paratransit	1.2	0.40	Personal Vehicle [-0.8, -0.3]

ANOVA were conducted to examine whether the modes by which individuals with disabilities meet their transportation needs were associated with the strength or diversity of their social network. Respondents' social tie strength is based on their responses to the question: *How often do you get together to socialize with your family/friends/close friends?* Each group was reported according to four categories: daily, every few days, weekly, or monthly. No significant associations were found.

The relationship between the strength or diversity of respondents' social networks and whether the individuals in their social networks assisted in meeting their transportation needs was examined using Pearson's R to determine correlation coefficients using the Bonferroni approach to control for Type 1 error across the 12 correlations ($p < .004$ to be significant). The correlation between socializing with family

and whether family helps meet transportation needs was significant, $r(173) = .38$, $p < .001$. The correlation between socializing with close friends and whether close friends help meet transportation needs was also significant, $r(171) = .36$, $p < .001$. The correlation between socializing with friends and whether close friends help meet transportation needs was less significant, $r(172) = .27$, $p < .001$. In general, the results suggest that close friends and family help meet transportation needs for socializing, while friends do not.

Discussion

The purpose of this study is to examine individuals with disabilities' access to transportation and that access' relationship to opportunities for social participation in the community. To do so, individuals with disabilities' transportation opportunities and constraints were examined in connection with their social networks.

First, we examined the transportation modes individuals with disabilities are using to meet their transportation needs, hypothesizing that individuals with disabilities are less likely to have personal transportation options. The study findings show much less private vehicle use than previously reported. This could be because the study sample represented a more significantly disabled population than previously examined. Many of the respondents were unable to drive due to their disability and the majority of them indicating they had not driven recently, at all. Respondents reported having fewer vehicles available for use than individuals without disabilities, as well as having less access to licensed drivers within the same household. As a result, this study shows a higher rate of public transportation and paratransit utilization among individuals with

disabilities as well as a higher rate of riding with others than previously reported in national surveys. These results are surprising in the intermountain west where public transportation systems are usually localized and smaller in scale compared to more populous areas of the country. These public transportation numbers may be increasing as systems become more accessible and better adapted for individuals with disabilities.

The results also point to the susceptibility of individuals with more significant disabilities to transportation-related exclusion. The likelihood for transportation-related social exclusion may be compounded by the long average times for respondents to arrange a ride share, ride public transportation, or travel with paratransit systems. Individuals with disabilities may limit their ridesharing to trips that are not accessible through public or paratransit transportation systems due to the greater time commitment to arrange and travel. Public transportation times may be long due to poor route planning, unnecessary transfers, and difficulty accessing transit stops. Although costly to municipalities, paratransit services are the most time efficient, likely as a result of the convenience of door-to-door service. Transportation planners looking to reduce reliance on paratransit must consider the travel time associated with the alternative fixed route systems. The benefits of door-to-door service may also reflect the directness of the public transportation route from origin to destination. Planners and disability service providers should focus on route planning as well as travel times to improve individuals with disabilities' access within a community.

Second, we examined whether the modes by which individuals with disabilities meet their transportation needs are associated with various demographic factors, hypothesizing, for example, that employed individuals would be more likely to have

access to personal transportation. Personal vehicle use significantly correlated with employment, age, higher education, and higher income. Importantly, we are unable to suggest whether individuals with personal vehicles are better able to acquire employment or whether employed individuals are better able to acquire personal transportation. However, this study does suggest the relationship exists regardless of the significance of an individual's disability. While younger individuals were more likely to use public transportation, older individuals were more likely to drive personal vehicles or use paratransit services. Younger individuals might not be eligible for certain transportation services, which restricts access to employment or similar needs, and hence would rely more on public transportation, while older individuals may have little experience with public transportation prior to acquiring a disability, leading to less reliance on such systems.

The majority of individuals with disabilities reported not being able to reach a desired destination during the month prior to taking the survey, with almost half of the participants indicating the reason as transportation related problems, be it inadequate service, a lack of access to existing systems, or a lack of specialized service within a system. Existing transportation systems could be impacting these individuals socially by not providing service during evening hours, on weekends, or on holidays, which is often when people get together to socialize.

Weather was also a major limiting factor to participants concerning their ability to get to a desired destination. To reduce this impact, transportation planners need to ensure that transit stops are weather protected and large enough to accommodate an individual using a wheelchair within the protected area. Paving access points from sidewalks to

waiting areas should also be considered, with such areas cleared after storm events for safe access.

Lastly, we examined whether individuals with disabilities' social networks were associated with their transportation access, hypothesizing that individuals with stronger social networks were better able utilize them to meet their transportation needs. Participants reported being able to socialize with their friends, close friends, and family. However, the majority of individuals with disabilities felt that their social life was hindered by their transportation needs. Further study needs to address whether the quality of social interaction was hindered by the lack of transportation.

Close friends and family members assisted individuals in meeting their transportation needs, while friends generally did not, suggesting that individuals might rely on their stronger relationships for transportation assistance. The results seem to suggest that individuals with disabilities endeavor to be as independent as possible and experience greater discomfort asking more causal friends for assistance. Requesting transportation assistance requires the expenditure of significant social capital on the part of the individual. Individuals with disabilities may either not possess, or be unwilling to invest this necessary social capital with friends in order to meet their transportation needs. Participants who did not feel hindered indicated use of their own, private vehicles, suggesting that access to convenient transportation is an important factor in individuals with disabilities' social participation.

While the majority of individuals with disabilities have disproportionate needs that are not planned for in our communities and transportation systems, these needs can be better met through better planned, more flexible, accessible public transportation. This

study illustrated that a majority of individuals with disabilities have less access to private transportation than in previous studies, and that opportunities for social participation in the community are affected by transportation access. The percentage of individuals feeling socially hindered by transportation shows that further understanding is needed to address this issue in our communities for a more inclusive tomorrow.

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CHAPTER III

THE IMPACTS OF LIMITED TRANSPORTATION ACCESS ON PERSONS WITH DISABILITIES' SOCIAL PARTICIPATION[2]

Abstract

The purpose of this study is to examine individuals with disabilities' social and community participation in relation to their access to transportation. A self-administered online questionnaire was disseminated to individuals with disabilities throughout the United States. Individuals were found to use private vehicles less often and public transportation more often than previous studies have shown. Individuals with increasingly significant disabilities were more likely to face transportation-related exclusion. Almost half of the participants had to cancel an appointment because of a transportation-related conflict. The majority of participants felt that the level of access to transportation hindered their social life.

Background

In order for individuals to obtain employment, goods and services, healthcare, education, and interact socially, access to transportation is.[1,2] For example, lack of transportation not only limits access to job opportunities, but can also escalate the

[2] Chapter 3 was coauthored by Graydon Bascom and Keith Christensen for submission to the Journal of Disability Studies.

difficulty finding employment based on limited access to employment center and interview locations.[3,4] Similarly, healthcare and education are often not equally distributed in a community, making access difficult for individuals who do not live near these services.[5]

Individuals encountering social, financial, psychological, or physical barriers in accessing transportation are considered 'transportation disadvantaged'.[6,7,8,9] Transportation disadvantaged populations experience lower rates of access to employment opportunities, education services, health services, and other community resources associated with daily living.[10] Further, transportation disadvantaged individuals are often socially excluded, facing greater limitations that keep them from participating within their community.[1,11,12] "Households without a car, in a society in which household car ownership is the norm (peri-urban and rural areas), are 'socially excluded' within our definition of the term, since they cannot fully participate i.e. behave as the vast majority of society behaves."[11] These individuals need special consideration by communities when new systems are planned and implemented or existing systems are expanded, yet they are often forgotten.[13]

Further compounding these issues, individuals experiencing social exclusion are often not involved in political and institutional structures and are therefore less likely to be involved in transportation or community planning.[4,14] These individuals may feel disconnected from the decision-making process in relation to where they find housing, the kind of job opportunities and services which are available to them, the quality of the services they receive, and their own ability to affect changes in these aspects of their lives.[15]

Individuals with disabilities are often not full participants within their community, are politically marginalized,[16] and are less likely to have full access to transportation.[17,18] Individuals with disabilities that participate socially in their community have an increased dependence on alternate forms of transportation, which may include ridesharing through their social network.[19] The increased demand on individuals with disabilities' already marginal social networks may negatively impact their social networks and/or opportunities for social interaction.

Increasing transportation access is seen as a primary way to improve individuals with disabilities' independence and self-determination.[7,20,21,22,23] Understanding the role transportation access plays in the social exclusion of individuals with disabilities is necessary in order to make changes that facilitate their increased participation in all aspects of society.[9,15]

Research Questions and Hypotheses

The purpose of this study is to examine individuals with disabilities' social participation in their community in relation to their access to transportation. To address this purpose four research questions were investigated:

1) What modes of transportation are individuals with disabilities using to meet their transportation needs?
2) Are the modes by which individuals with disabilities meet their transportation needs associated with demographic factors, such as age, gender, ethnicity, type of disability, education, employment, income, etc.?
3) Are the modes by which individuals with disabilities meet their transportation

needs associated with the strength or diversity of their social network?

4) Are individuals with disabilities hindered by a lack of transportation service, or the conflict presented when late evening return trips for social events occur?

We hypothesized that individuals with disabilities are less likely to have access to personal transportation options, but that individuals with disabilities who are employed are more likely to have access to personal transportation opportunities. We also hypothesized that individuals with disabilities who have stronger or more diverse social networks are better able to meet their transportation needs through ridesharing and other transportation options.

Methods

This study is an expansion of a previous study by Jansuwan, Christensen, and Chen.[24] A small sample population of 171 individuals, of which 76 reported possessing disabilities, limited the previous study. The small sample size necessitated the use of the *Monte Carlo method,* which repeatedly samples a specified number of possible tables in order to obtain an unbiased estimate of the true *p* value and can give unwarranted credibility to smaller data output. This study makes use of a larger sample population of individuals with disabilities to address the weaknesses of the previous study. This study employed a self-administered online questionnaire disseminated electronically to disability service providers, and then disseminated further through providers' communication networks, within the United States to individuals with disabilities 18 years of age or older. The survey was sent out to the public in the fall of 2013.

The survey, available in both English and Spanish, was comprised of 11 questions regarding respondents' demographic information, 6 questions regarding their community participation and social networks, and between 10 and 14 questions regarding their transportation use patterns (the number of questions was response dependent). Examples of the basic demographic questions include age, gender, ethnicity, type of disability, education level, employment status, household income level, and place of residence. Examples of the transportation and social network questions include:

1) During a typical day, what means of transportation do you use most? (drive your personal vehicle, ride with others, bus, walk, taxi or hired driver, bicycle, paratransit, social or volunteer service, or other; the response to which would reveal related follow up questions to gather additional information about the selected transportation mode choice such as waiting time, riding time, number of transfers, etc.)
2) How often do you get together to socialize with your family/friends/close friends? (daily, every few days, weekly, monthly, other)
3) Do you feel that your social life is hindered by your transportation needs? (yes or no)
4) During a typical month, how often do the following help you meet your transportation needs? (family, friends, close friends, service provider, public transportation; daily, every few days, weekly, monthly, none)

The complete questionnaire is available in the appendix. Respondents were randomly selected to receive one of twenty $25 gift cards as a participation incentive. The Utah State University institutional review board approved the study design.

Results

Responses were received from forty states and one US territory. Although 693 individuals responded, only 420 respondents were both 18 years of age or older and reported possessing a disability. The demographic characteristics of these respondents with disabilities are presented in Table 3-1. The majority of the respondents are White/Caucasian (84.3%), followed by Hispanic (6.5%), Black/African American (5.1%), American Indian (1.9%), Asian (1.7%), and Pacific Islander (0.5%). Fifty seven percent (57.4%) of the respondents are female. The age range of the respondents was from 18 to 85 years with a mean age of 47.84 years old. Roughly 58.1% have college degrees and 22.8% have a high school education or less. Forty three percent of the respondents (43.9%) earn less than $24,000 per year with 28.4% of the total earning less than $15,000 per year. In addition, some 25.5% are unemployed, 11.7% are volunteer workers, and 13.8% are retired. 47.6% of respondents are employed full-time (27.4%), part-time (14.5%), or self-employed (5.7%). This signifies very low employment particularly when one considers the number of participants who possess college degrees. The respondents' disabilities were self-reported as physical (56.8%), vision (22.8%), hearing (3.1%), intellectual (8.4%), psychological (2.2%), or emotional (1.0%) impairments.

Table 3-1
Demographic Data

		Current Study N=420		2014 National Census Percentage [25]
Race	White/Caucasian	349	83%	77.4%
	Hispanic	27	6%	17.4%
	Black/African American	21	5%	13.2%
	American Indian	8	1.9%	1.2%
	Asian	7	1.6%	5.4%
	Pacific Islander	2	0.4%	0.2%
Gender	Female	240	57.1%	50.8%
	Male	178	42.4%	49.2%
Age	Minimum	19		
	Median	47.84		
	Maximum	85		
Education	Less than High School	14	3.3%	
	High School	80	19%	
	Junior/Technical College	62	14.8%	
	4-Year College	116	27.6%	
	Post Graduate	124	29.5%	
	College Degrees			32%
Income	Less than $15,000	112	26.7%	
	$15,000-$24,999	61	14.5%	
	$25,000-$34,999	56	13.3%	
	$35,000-$49,999	37	8.8%	
	$50,000-$74,999	49	11.7%	
	$75,000-$99,999	33	7.9%	
	$100,000-$149,999	35	8.3%	
	$150,000 or more	11	2.6%	
Employment Status	Unemployed	107	25.5%	
	Part-Time Employed	61	14.5%	
	Self-Employed	24	5.7%	
	Retired	58	13.8%	
	Full-Time Employed	115	27.4%	
	Volunteer	49	11.7%	
Disability Type	Physical	237	56.4%	
	Vision	95	22.6%	
	Hearing	13	3.1%	
	Intellectual	35	8.3%	
	Psychological	9	2.1%	
	Emotional	4	0.95%	

Transportation Access

The U.S. Department of Transportation: Bureau of Transportation Statistics' [BTS] national transportation survey, conducted in 2003, reported private vehicles as individuals with disabilities' major transportation mode (61%), followed by riding with

others (6%), public transportation (6%), paratransit (1.5%), and social and volunteer services (0.6%) (BTS, 2003).[10] While the BTS study found that private vehicles are individuals with disabilities' most used transportation mode, private vehicle use only represents 32.9% of the population in this study, which is much less than was reported in the earlier, smaller-scale study. Public transportation was reported as the next most used transportation mode (18.7%), followed by paratransit (16.5%), riding with others (14.2%), walking (3.3%), taxi or hired driver (1.5%), and social or volunteer services (.8%). These results show much lower rates of private vehicle use and much higher rates of public transportation and paratransit utilization, as well as riding with others, than previously reported. While the rates for private vehicle use were considerably less than the BTS national survey (61%), in this study they were higher (32.9%) than that found in the previous, smaller-scale study (15%).[24]

In follow-up analysis, respondents reported fewer available vehicles to households of individuals with disabilities compared with general households as determined by U.S. Census 5-year estimates and as illustrated in Table 3-2.[25] The results also indicate that 28.4% of respondents do not have a licensed driver within their household. Respondents who reported, for the month prior to taking the survey, that they had not driven a vehicle, indicated the reason for being unable to drive was primarily due to their disability (85.3%), not possessing a vehicle (5.5%), having no driver's license (3.7%), or that their spouse served as the primary driver (2.8%). The indicated pattern of private vehicle use among individuals with disabilities is markedly different from that of individuals without disabilities, demonstrated particularly by the high percentage of individuals with disabilities who have no vehicles available in their household and the

very high percentage that report they are unable to drive a vehicle due to their disability.

Table 3-2
Number of Personal Automobiles Available in the Household; Nationwide

Number of Vehicles	National %*	This Study %
None	4.5	30.7
1	21.4	35.0
2	42.0	22.9
3 or More	32.1	7.4

**Source: U.S. Census Bureau, 2014 American Community Survey 5-year estimate*[25]

Additional analysis of the data to examine response variations by self-reported disability type is presented in Table 3-3. The number of individuals who own no vehicles in this study was dramatically higher than the national numbers. While the number of individuals owning one vehicle was slightly higher than the national study, the number of individuals owning two and three vehicles was lower.

Table 3-3
Transportation Access (%) by Type of Disability; Nationwide

	Personal Vehicle	Ride with Others	Bus	Walk	Taxi/Hired Driver	Bi-cycle	Para-transit	Social or Volunteer Service
All Impair-ments (392)	32.9	14.3	18.6	3.3	1.5	-	16.3	0.8
Physical (234)	40.1	12.3	14.5	0.4	0.9	-	15.8	0.9
Vision (90)	8.9	21.1	22.2	10.0	4.4	-	24.4	1.1
Hearing (13)	69.2	15.4	7.7	-	-	-	7.7	-
Intellectual (34)	20.6	11.8	35.3	5.9	-	-	11.8	-
Psychological (8)	50.0	-	25.0	12.5	-	-	-	-
Emotional (4)	75.0	25.0	-	-	-	-	-	-

Table 3-4 presents the trip details associated with each transportation mode as appropriate. Due to an unfortunate error in the online questionnaire database, details for personal vehicle and social or volunteer service trips is not available. The data which is available indicates that the average trip when riding with others takes approximately

116.1 minutes, while using the bus takes 80.5 minutes, and paratransit services takes 88.2 minutes. The bus, when accessible, takes less time overall, which is most likely connected to lack of time spent on the necessity of arranging the ride. Paratransit could take more time due to longer load times for individuals with mobility-related disabilities. The length of trips using paratransit may also involve stops for other patrons of the service. The results suggest that riding with others, which takes more effort to make pre-trip arrangements, is used for accessing destinations that are not served by other transportation options and that paratransit services serve the same purpose to a lesser extent.

When bus service is accessible, it requires less time to reach destinations than other modes, however, bus service limits access based on its hours of operation and the locations it reaches.

Table 3-4
Transportation Mode Trip Details; Nationwide (in Mean Minutes unless Noted)

	Time to Access*	Time Waiting**	Time Traveling	Trip Cost (Mean$)	Notes
Ride with Others	45.9	21.3	48.9	-	-
Bus	5.0	11.6	63.9	-	Mean number of transfers per trip- 1.5
Walk	-	-	20.5	-	-
Taxi or Hired driver	82.0	39.0	43.0	$14.17	Figures are for 1 respondent only
Bicycle	-	-	30.0	-	Figures are for 1 respondent only
Paratransit	12.1	24.3	51.8	-	-

*Time in mean minutes spent arranging transportation or traveling to access point.
**Time in mean minutes spent waiting at access point for transportation.

Difficulties with transportation contributed to respondents' ability to reliably move throughout their community as is illustrated in Table 3-5. Respondents reported not being able to access a desired destination during the month prior to taking the survey 1-2

times (32.8%), 3-5 times (29.4%), and 6-10 times (8.6%), and had no difficulties 26.6% of the time. The most common reasons respondents reported being inhibited from reaching their desired destination was weather (32.0%), followed by inadequate public transportation (24.6%), a lack of specialized transportation (15.2%), and a lack of access to public transportation (8.8%).

Table 3-5
Frequency and Most Common Reasons Respondents Reported Not Being Able to Reach a Desired Destination

Times Unable to Reach Desired Location	# Respondents	% Respondents
1-2	126	32.8
3-5	113	29.4
6-10	33	8.6
Reasons for Not Reaching Destination		
Weather	95	32.0
Inadequate Public Transportation	73	24.6
Lack of Access to Public Transportation	26	8.8
Lack of Specialized Transportation	45	15.2

The results indicate the important role public transportation plays in providing community access for individuals with disabilities. Over a third of respondents identified either inadequate public transportation, no public transportation, or a lack of specialized transportation as the biggest obstacles to reaching a desired destination. Improving on these areas of concern also improves the system for the entire public, not just individuals with disabilities and other socially excluded populations.

Demographic Factors

One-way analyses of variance (ANOVA) were conducted to examine whether the modes by which individuals with disabilities meet their transportation needs are associated with demographic factors. The demographic factors include age, gender, race/ethnicity, type of disability, education level, employment, and income level.

Education level was reported according to five categories: less than high school, high school, junior college/technical school, 4-year college/university, and post graduate. Employment was reported according to six categories: unemployed, part-time employment, self-employed, retired, full-time employment, and volunteer but was coded as either employed for wages (part-time, self-employed, retired, and full-time) or not employed for wages (unemployed and volunteer) for this analysis. Income level was coded into eight consecutive income groups based on the poverty threshold ($15,000/year): less than $15,000, $15-24,999, $25-34,999, $35-49,999, $50-74,999, $75-99,999, $100-149,999, and $150,000 or more. Income level was significantly correlated with individuals with disabilities' transportation mode choices ($F(7, 363) = 7.74$, $p < .001$) accounting for 10.0% of the variance in transportation mode choice. Disability type was also significantly correlated with individuals with disabilities' transportation mode choices ($F(5, 377) = 2.71$, $p = .02$) accounting for 3.5% of the variance in transportation mode choice. The remaining factors were not significantly correlated: Education Level ($F(5, 385) = 1.97$, $p = .083$), Age ($F(57, 337) = 0.81$, $p = .83$), and Employment ($F(6, 388) = 1.31$, $p = .25$).

Follow-up tests were conducted to evaluate pairwise differences among the means using the Dunnett's *C* test that does not assume equal variance among the groups. The significant relationships are shown in Tables 3-6 and 3-7. Individuals with disabilities who use public transportation most often had significantly less income than those driving personal vehicles. Individuals with physical disabilities most frequently used public transportation options while those with hearing or emotional impairments were more likely to drive a personal vehicle.

The average number of individuals in the top income bracket was less than the national average, which is roughly 51.2% (U.S. Census Bureau, 2014). There are also significant differences in income level between those using personal vehicles and those using public transportation or paratransit services. Those using personal vehicles more likely have a higher income, roughly $10,000/year more than those using public transportation (bus, paratransit). Individuals with emotional or hearing impairments most often relied on personal vehicles or riding with others, whereas individuals with physical impairments relied on bus and paratransit options.

Table 3-6
95% CI of Pairwise Differences in Mean Changes for Disability Type; Nationwide

Disability Type	M (*transportation mode*)	*SD*	95% CI for Significant (0.05) Pairwise Differences
Physical	3.67	3.08	Hearing [0.22, 3.57] Emotional [0.95, 3.89]
Vision	4.30	2.49	Hearing [0.78, 4.28] Emotional [1.52, 4.58]
Hearing	1.77	1.69	
Intellectual	3.88	2.76	Emotional [0.7, 4.56]
Psychological	2.88	2.75	
Emotional	1.25	0.5	

Table 3-7
95% CI of Pairwise Differences in Mean Changes for Income Level; Nationwide

Transportation Mode	M (*income level*)	*SD*	95% CI for Significant (0.05) Pairwise Differences
Personal Vehicle	4.15	2.0	Bus [0.54, 2.44] Paratransit [0.57, 2.42]
Ride with Others	3.61	2.26	
Bus	2.66	1.89	
Walk	3.23	2.2	
Paratransit	2.65	1.41	

Social Network Strength

Sixty-seven (66.8%) of respondents reported that their social life was hindered by a lack of access to needed transportation. An ANOVA, conducted to examine correlation between methods to meet transportation needs and whether respondents felt their social life was hindered, found those two factors were significantly correlated (F (7, 367) = 17.09, $p < .001$), accounting for 24.5% of the variance in whether respondents felt their social life was hindered. Follow-up tests conducted to evaluate pairwise differences among the means using the Dunnett's C test indicated significant relationship between all transportation modes as shown in Table 3-8. Individuals with disabilities who reported their social life was unhindered by their transportation needs were most commonly using personal vehicles for transportation.

Table 3-8
95% CI of Pairwise Differences in Mean Changes for Social Life; Nationwide

Transportation Mode	M (*social hindrance*)	*SD*	95% CI for Significant (0.05) Pairwise Differences
Personal Vehicle	1.66	0.48	Ride with Others [0.36, 0.74] Bus [0.31, 0.69] Walk [0.11, 0.91] Taxi [0.53, 0.79] Paratransit [0.23, 0.66] Social/Volunteer [0.53, 0.79]
Ride with Others	1.11	0.32	
Bus	1.16	0.37	
Walk	1.15	0.38	
Taxi or Hired Driver	1.0	0.00	
Paratransit	1.22	0.42	
Social or Volunteer Service	1.0	0.00	

A MANOVA was conducted to analyze whether the modes by which individuals with disabilities meet their transportation needs were associated with the strength or diversity of their social network. Respondents' social tie strength is based on their

responses to the question: How often do you get together to socialize with your family/friends/close friends? Each group reported according to four categories: daily, every few days, weekly, or monthly.

Significant differences were found among the transportation mode choices, Wilks' λ W .86, $F(21, 999) = 2.48$, $p < .001$. The multivariate partial eta squared based on Wilks' λ. The multivariate part 7 contains the means and the standard deviations on the dependent variables for the transportation modes.

ANOVA on the dependent variables were conducted as follow-up tests to the MANOVA. Using the Bonferonni method, each ANOVA was tested at the .017 level, to control for Type 1 error across the correlations. Socializing with family was correlated with transportation mode choices (F (7, 350) = 3.74, p = .001), accounting for 7.0%. Socializing with friends was similarly correlated with transportation mode choices (F (7, 350) = 2.94, p = .005), accounting for 5.6%. These correlations can be directly tied to individuals with disabilities accessing transportation through their family and friend networks.

Post hoc analysis to the univariate ANOVA for socializing with family consisted of conducting pairwise comparisons to find which mode was affected most strongly. Those socializing often with family were more likely to ride with others than use paratransit. Socializing more often with friends or close friends was not significantly associated with specific transportation mode choices. In general, the results suggest that family helps meet transportation needs for socializing, while friends and close friends do not.

Discussion

The purpose of this study is to examine individuals with disabilities' social and community participation in relation to the level of their access to transportation. To do so, individuals with disabilities' transportation opportunities and constraints were examined in connection with their social networks. First, we looked at what transportation modes individuals with disabilities are using to meet their transportation needs, hypothesizing that individuals with disabilities are less likely to use personal transportation options.

In 2003 the US Department of Transportation: Bureau of Transportation Statistics [BTS] reported that 61% of individuals with disabilities use private vehicles as their major transportation mode. In comparison, this study found about half of that, 32.9%, utilized private vehicles. The number of participants in this study who used public transportation was triple the amount reported in the BTS study. The amount of respondents who indicated they made use of paratransit as well as those who indicated riding with others were both greater than what was represented in the BTS study. There is a possibility that the individuals who participated in this survey could rely more on public transportation due to the nature of their disabilities.

Eighty five percent of participants in this study stated they were unable to operate a vehicle due to their disability. About a third of individuals in this study had no access to a vehicle. This is very surprising compared to 9.1% of households without access to a vehicle represented in the 2014 U.S. Census. Individuals who participated in this study experienced greater limitation concerning their abilities to operate and/or have access to a personal vehicle compared to other national reports.

Answers to travel time detail questions signified that bus service was the most time effective way to travel. With the time required to arrange for the trip, wait for the service, and spend traveling, riding the bus took an hour and twenty minutes total. Riding with others took almost two hours and hiring a taxi or private driver took almost three hours.

Respondents were asked what their reasons for not meeting a desired destination were, and their responses pointed to weather, inadequate public transportation, a lack of access to public transportation, and a lack of specialized public transportation. Participants identified improvements to public transportation access and public transportation, itself, as areas that can be improved upon to facilitate better accessible communities.

Income level and disability type were significantly correlated with an individual's transportation mode choices. Individuals with disabilities who utilized public transportation most often earned significantly lower incomes than those who chose to drive personal vehicles, by about $10,000. Individuals with physical disabilities relied on public transportation more than those with other disability types. Persons with hearing or emotional disabilities drove personal vehicles more frequently.

Almost seventy percent reported that their social life was hindered by their transportation needs. It is important that this is understood by anyone planning for communities. Even after all that has been done to make our communities more accessible, we are still not finished helping the majority of individuals with disabilities. There is still much to be done to become aware of all abilities, and to design and plan to meet the needs of each of these different abilities.

A MANOVA was conducted to examine the strength of participants' social networks and the effect these social networks had on participants' transportation mode choices. Socializing with family and friends were correlated with transportation mode choices, while socializing with close friends was not. Socializing with family was correlated with ride sharing with others, however, while socializing with friends was correlated with transportation mode choices, it was not specifically correlated to riding with others. In general, the results of this survey suggest that family helps meet transportation needs for socializing, while friends and close friends do not.

In conclusion, in order for our society to be inclusive to all, we must consider all abilities and continue to develop and utilize the principles of universal design in our transportation networks, our infrastructure, and our public buildings. Further research will need to be done to better understand ways in which community members and leadership can arrange for social inclusion in all aspects of their community.

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CHAPTER IV

RESULTS AND CONCLUSION

The purpose of this thesis was to examine the relationship between transportation and social participation of individuals with disabilities. In order to do so, one survey was conducted and two separate analysis were conducted; one focusing on people residing within Federal Region 8, and one analysis including data from individuals across the country. The individual and combined results of these studies are discussed in this chapter along with thesis conclusions.

Relationship Between Transportation and Social Participation

Both studies' findings show a much lower rate of private vehicle use than has been previously reported. The results may represent a more significantly disabled population than was previously examined as many of the respondents were unable to drive due to their disability, with the majority of them having not driven recently. Respondents reported having fewer vehicles available for use, as well as lower availability of licensed drivers within the same household. As a result, this study shows much more public transportation, paratransit, and riding with others than previously reported in national surveys. These results are surprising in the intermountain west, where public transportation systems are usually localized and smaller in scale compared to more populous areas of the country, which would suggest that there are significant

transportation disparities. These public transportation numbers may be increasing as systems become more accessible and better adapted for individuals with disabilities. The results also point to the susceptibility of individuals with more significant disabilities to transportation-related exclusion.

In the second study almost seventy percent of respondents reported that their social life was hindered by their transportation needs. It is important that this is understood by anyone responsible for planning communities. Even after all that has been done to make our communities more accessible, we are not finished helping the majority of individuals with disabilities. There is still much to be done to become consistently aware of all abilities, and to design and plan for these different abilities.

Limitations

In the survey, there was an unfortunate error where the travel times were not collected for walking, bicycling, and driving personal vehicles. Due to not getting this data, we were unable to compare these times with public transportation, paratransit, taxi or hired driver. This does not reduce the significance of this study's findings, but we might have been able prove that personal vehicle use was more convenient or took less time due to not having to spend time arranging trips.

While the online survey reached more individuals with disabilities than previous in-person surveys, the online survey does not allow the interviewer to clarify any misunderstanding. This was made apparent during a phone interview with a visually impaired individual who was having problems with their screen reader. In-person interviews would reach fewer individuals, but would ensure that the questions and

answers were clearly understood.

Another limitation to this research is the nature of research; this type of information needs to be developed into a resource for policy makers and planners to utilize in their planning efforts in order to be of greater value. These entities need to have reference materials that are easier to understand and less statistical in format. This was not possible to complete in the time frame of this research, nor are the decision makers readily available to receive this information. It is possible that a nonprofit disability service organization could further this work, but it would need to be a well connected organization that could arrange for visits with high level politicians.

Conclusion

Considering the findings of these two studies, this thesis concludes that there are still significant improvements that can be made in the development of transportation systems. Transportation providers should consider flexibility in the services that they provide, so that individuals of varied abilities can attend evening functions that are not normally serviced by public transportation services.

While the majority of individuals with disabilities have disproportionate needs that are not addressed in our communities and transportation systems, these needs can be better met through continued development of more flexible and better planned public transportation with greater focus on accessibility. This study illustrated that a majority of individuals with disabilities have less access to private transportation than previous studies indicated and that opportunities for social participation in the community are

affected by transportation access. This could be addressed in rural areas by a paratransit service operating late hours for individuals to participate in community, social, and entertainment events that often continue into the late evening hours. In larger urban environments trains and buses run later into the evening, but should be examined and streamlined to service the best times and locations for these activities. Both studies found that the majority of participants felt that their social lives were hindered by their limited access to transportation. This signifies that we are missing the mark even with the legislation that we have passed to make our world more accessible. We need to find ways to improve access through policy, clear legislation, and improved community transit networks. Individuals with disabilities represent the largest minority in the United States, and as aging populations continue to grow, the potential for more individuals to encounter disabilities will rise. Similar to how difficult it often is to identify with or understand the circumstances of different minorities, it is impossible to say that we have perfect understanding of disabled populations. For example: A mother with a mobility disability can be disadvantaged in her opportunities to be there for her children due to limited transportation options. Parent teacher conferences, soccer games, scouting activities, campouts, all of these events are easy for private vehicles to access, but are they readily available for everyone? How can we provide this access in a flexible way? Could we better plan land use to provide all of these opportunities in more accessible locations? Or is it the transportation systems that are easier to change? Utilizing planning and universal design we need to address these social issues while we can, before they become more difficult to manage. We need to plan now for funding opportunities that

may come because these issues will only increase in demand as they apply to more individuals and families.

Transportation planners need to identify ways to be flexible with the services they provide. It is advisable to extend service to cover evening hours and work closely with disability service organizations to identify the areas in their combined networks where services best connect individuals to their communities. Collaborating with neighboring networks would fill gaps in the existing systems and allow for better utilization of resources and funding. Partnerships would create stronger proposals for grant funding opportunities, and would develop and foster great ideas from different perspectives. Universities can also contribute greatly through future research and test programs. For example: University Shuttle systems could employ students to provide a paratransit-type service for individuals with disabilities. Students are more affordable to employ for all hours of the day, and the shuttle system would be a great opportunity to test flexible network strategies. Further research is required to better understand the differences between rural and urban transportation challenges.

In order for individuals to be a part of their community, communities need to plan for all individuals and all abilities to ensure there are no holes in the system. By committing to better planning and design we invest in the future of our communities for all abilities, moving forward.

APPENDICES

Survey
(Interview Packet)

Transportation Needs Survey

You do not have to answer any question you do not want to, and you can quit this survey at any time.

Any information you give us will be confidential.

Please mark (O or X) for each of the following questions

I. Transportation Needs

1. What mode of transportation do you use the most?

Drive your personal vehicle

Bicycle

Ride with others (e.g., friend)

Paratransit, (e.g., Call-a-Ride)

Bus

Walk

Taxi or Hired Driver

Social or Volunteer service

(e.g., senior citizen center shuttle)

Other:_____

2. During the past month, approximately how many times were you not able to get to a desired destination? or had to cancel your trip ?

None (Skip to No.4) 1-2 times 3-5 times 6-10 times

Other:_____times

3. From question 2, what are the reasons? (check all that apply)

Lack of private vehicle

No longer driving

No access to public transportation

Cannot ask someone for rides

Not adequate public transportation

Weather (e.g., snow, rain)

Lack of specialized transportation (e.g., Call-A-Ride, Life Line)

Medical conditions

Driving ability limitations (e.g. only drive in the daylight)

No suitable parking space

Gas prices

Other:_____

4. During the past month, have you driven a motorized vehicle (e.g., car, van, truck)?

Yes No

If no, what are the reasons? (Check all that apply)

Do not possess a car

Unable to drive due to disabilities

No driver's license or expired license

Unable to drive due to illness/injury

Spouse drives

Other: _____

Ride with others (e.g., friend) _____

5. How far from your residence is the nearest bus stop or transit center? (about 500 feet per block)

Less than 500 feet

500-1,000 feet

1,000-1,500 feet

1,500-2,500 feet

There are no bus stops/transit centers around my residenc

6. If you want to ride a CVTD bus, how do you get to the nearest bus stop or the transit center?

Walk

Wheelchair/Walker

Electric wheelchair

Scooter

Ride with others

Drive and park

Guide dog

Other: _____

7. How often do you get together to socialize with your…

Family

Daily

Every few days

Weekly

Monthly

Other:_____

Friends

Daily

Every few days

Weekly

Monthly

Other:_____

(Friend=someone you feel at ease with, whom you might call to go out to dinner, or turn to for small favors)

Close Friends

Daily

Every few days

Weekly

Monthly

Other:_____

(Close Friend=someone you can confide in, or discuss a difficult decision or private matter)

8. During a typical month, how often do the following help you meet your transportation needs?

Family

Daily

Every few days

Weekly

Monthly

None

Friends

Daily

Every few days

Weekly

Monthly

None

Close Friends

Daily

Every few days

Weekly

Monthly

None

Service Provider

Daily

Every few days

Weekly

Monthly

None

Public Transportation

Daily

Every few days

Weekly

Monthly

None

II About Yourself

1. Are you ?

Male Female

2. What is your age group?

0-20 years

21-30 years

31-40 years

41-50 years

51-64 years

65-75 years

76 years or more

3. Do you consider yourself?

White/Caucasian

Asian

Black or

African American

Pacific Islander

American Indian

Alaska Native

Hispanic,

Latino, or

Spanish origin

Native Hawiian

Other:_____

4. What is the highest level of education you have obtained?

Less than high school

High school

Junior college

4-year college/university

Post graduate

Other:_____

5. What is your employment status?

Unemployed

Self-employed

Full time employee

Part time employee

Retired

Volunteer

6. What is your yearly household income level from all sources?

Less than $15,000

From $15,000-24,999

From $25,000-34,999

From $35,000-49,999

From $50,000-74,999

From $75,000-99,999

From $100,00-149,999

$150,000 or more

7. How many members are there in your household including yourself?

1 person

2 persons

3 persons

Other:_____ persons

8. How many children under the age of 5 are there in your household?

None

1 person

2 persons

Other:_____ persons

9. How many people in your household are 65 or older are there including yourself?

None

1 person

2 persons

3 persons

Other: _____ persons

10. Do you have a disability?

Yes No

If yes, what type of disability? (Check all that apply)

Physical impairment

Vision impairment

Hearing impairment

Cognitive impairment

Psychological impairment

Emotional impairment

Other:_____

11. How many motor vehicles are available in your household (e.g., car, van, SUV, pickup truck)?

None

1 vehicle

2 vehicles

3 vehicles

Other: _____ vehicles

12. How many people are licensed to drive in your household including yourself?

None

1 person

2 persons

Other:_____

13. Where do you reside? please indicate the nearest intersection address (e.g., 1000N 600W)

_____ City_____

Zip Code_____

III. Transportation Patterns

1. During the past month, which of the following destinations you visited the most?

Work

Friends or Family Homes

School/educational

Religious

Grocery/Shopping

Restaurants

Medical Care/Pharmacies

Business/Bank

Social/Recreation

Other (please specify)_____

2. From question 1, please indicate the place name or intersection nearest to your most frequently visited destination _____

City_____Zip Code_____

3. From question 1, do most trips start from home?

Yes No

If no, please provide place name or nearest cross street_____

_____Zip Code_____

4. How often do you make trips to your most frequently visited destination?

More than once a day

Once a day

Once every 2 to 3 days

Once every 4-6 days

Once a week

Once every 2 to 4 weeks

Once a month

Less than once a month

5. What time do you most commonly leave for your most frequently visited destination?

AM (6 am. - 9 am.)

Mid Day (9 am. -3 pm.)

PM (3 pm.- 6 pm.)

Late Evening (6 pm.- 6 am.)

6. Please select only one mode of transportation you use most often to get to your most frequently visited destination. Then answer the questions related to that mode.

Bus

Time to walk to bus stop (if you walk)

Min

Time to drive to bus stop (if you drive)

Min

Time waiting at bus stop

Min

First Bus

What is the bus no. of the first bus?

Time traveling in bus

Min Transfer (Leave blank if none)

Time waiting at stop or transit center

Min Second Bus (Leave blank if none)

What is the bus no. of the second bus?

Time traveling in bus

Min

Car, Van, Pick up Truck

1. Time to walk to parked vehicle

Less than 5 Min

Other_____Min

2. Time traveling in car

Min

3. Cost to park vehicle

Dollar

4. Number of all passengers

Persons Paratransit /Service Provider (Call-a-Ride, Senior Citizen Center Shuttle)

Time to make an arrangement

Days

Time waiting and getting on board

Min

Time traveling in vehicle

Min

Walk or Bicycle

Time to walk to destination

Min

Time to bike to destination

Min

Date: 4/1/2011

Survey Serial No: ONLINEPage

Do you have any other comments that you would like to make concerning transportation in Cache County? (e.g., congestion, public transit, paratransit, parking policy, transportation plan)

**********END**********