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Public Transportation Accessibility: Perceptions of Riders with Disabilities in Utah

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PUBLIC TRANSPORTATION ACCESSIBILITY: PERCEPTIONS OF RIDERS WITH DISABILITIES IN UTAH

by

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ABSTRACT

Public Transportation Accessibility: Perceptions of Riders with Disabilities in Utah

by

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Transportation plays an essential role in social inclusion and participation, subjective well-being, and overall quality of life. A lack of private transportation options may make individuals with disabilities more dependent on public transportation systems. Despite increased use, people with disabilities continue to report barriers accessing public transportation services. Interestingly, little is known about these barriers at the regional transportation district level. The purpose of this study was to better understand the barriers and perceived accessibility of the Utah Transit Authority's (UTA) public transportation system for individuals with disabilities living within the UTA service area.

Using an online survey, data were collected from 327 individuals with disabilities, family members of individuals with disabilities, or others who work with individuals with disabilities. This study found that individuals with disabilities generally have neutral to somewhat positive (accessible) views of UTA's transportation services though there are differences based on disability type, modes of services used in general and specifically

regarding fixed route service modes, and frequency of ridership are considered; that despite these neutral to somewhat accessible perceptions, barriers to accessing UTA's fixed route and paratransit services exist, though there are differences based on disability type, modes of fixed route services used, and ridership frequency; and local and national policy changes may be necessary to resolve these barriers. The findings of this study have implications for UTA, other regional transportation districts, local and national transportation policy stakeholders, and the research community. For example, additional research is necessary to fully understand the specific system components which make UTA's public transportation more accessible than has been indicated in previous studies, including an understanding of how these accessible practices could be generalized to other public transportation providers. Findings from future research could, in turn, be used to improve access to public transportation for individuals with disabilities. It is recognized that this study's focus on electronic data collection and the potential influence of small subsamples underscores the need for additional research on the topics of perceived accessibility of public transportation and barriers to using public transportation services for individuals with disabilities.

(217 pages)

PUBLIC ABSTRACT

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Using an online survey, data were collected from 327 individuals with disabilities, family members of individuals with disabilities, or others who work with individuals with disabilities. This study found that individuals with disabilities generally have neutral to somewhat positive (accessible) views of UTA's transportation services though there are differences based on disability type, modes of services used in general and specifically regarding fixed route service modes, and frequency of ridership are considered; that despite these neutral to somewhat accessible perceptions, barriers to accessing UTA's fixed route and paratransit services exist, though there are differences based on disability type, modes of fixed route services used, and ridership frequency; and local and national policy changes may be necessary to resolve these barriers. The findings of this study have

implications for UTA, other regional transportation districts, local and national transportation policy stakeholders, and the research community. For example, additional research is necessary to fully understand the specific system components which make UTA's public transportation more accessible than has been indicated in previous studies, including an understanding of how these accessible practices could be generalized to other public transportation providers. Findings from future research could, in turn, be used to improve access to public transportation for individuals with disabilities. It is recognized that this study's focus on electronic data collection and the potential influence of small subsamples underscores the need for additional research on the topics of perceived accessibility of public transportation and barriers to using public transportation services for individuals with disabilities.

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CHAPTER I

INTRODUCTION

Transportation plays an essential role in accessing education, healthcare, work, shopping, and other aspects of full community inclusion. A lack of private transportation options may make some groups, including individuals with disabilities, more dependent on public transportation systems. Despite increased use of public transportation, people with disabilities continue to report barriers accessing public transportation services. It continues to be imperative to identify public transportation system barriers to individuals with disabilities, who represent a significant population in the U.S. (13.1% of the total U.S. population; U.S. Census Bureau, 2015). For example, while there have been some national studies few local studies have been conducted, such as the barriers that individuals with disabilities living within the Utah Transit Authority's (UTA) service area face when accessing UTA's public transportation services. Therefore, the purpose of this study is to better understand the barriers and perceived accessibility of UTA's public transportation system for individuals with disabilities living within the UTA service area.

Importance of the Problem

Transportation plays an essential role in accessing education, healthcare, work, shopping, and other aspects of full social inclusion (Casas, 2008; Rajé, 2003) and social participation (Delbosc & Currie, 2011; Samuel, Lacey, Giertz, Hobden, & LeRoy, 2013) as well as subjective well-being (Delbosc & Currie, 2011; Ma, Kent, & Mulley, 2018) and overall quality of life (Samuel et al., 2013). Research has found that social

participation increases as access to transportation increases (Bascom & Christensen, 2017; Samuel et al., 2013). Access to transportation may also contribute to the development of social networks and social capital (Currie & Stanley, 2008). Furthermore, although the relationship between transportation and employment is complex, access to transportation can positively influence employment (Christensen, 2014). Beyond employment, it has been hypothesized that, because goods such as education and healthcare are not equally distributed in the community, transportation access is important to ensure that access to these types of services can be distributed to all community members (Martens, 2012). Samuel et al. found that access to transportation made participating in activities such as medical appointments more feasible. In fact, transportation has been identified as a key element to a high standard of living (National Planning Commission, 2012). On the other hand, a lack of transportation has been shown to decrease social participation. For example, people with disabilities report that transportation is among the most significant barriers they face in obtaining employment (U.S. Bureau of Labor Statistics [BLS], 2012). A systematic review of the literature on various transportation barriers as related to healthcare access found that lack of transportation lead to lower health care utilization, especially among individuals with lower socioeconomic status, members of ethnic minority groups, children, and the elderly (Syed, Gerber, & Sharp, 2013). Social exclusion due to limited transportation may also result in a lack of political involvement, including reduced involvement in transportation or community planning (Bascom & Christensen, 2017). Individuals who encounter barriers in accessing transportation, including individuals with disabilities, are considered

"transportation disadvantaged" (Delbosc & Currie, 2011; Rajé, 2003; Wasfi, Levinson, & El-Geneidy, 2007). In sum, access to transportation is critical to full participation and inclusion in all aspects of the community (Frieden, 2005).

A lack of private transportation options may make some groups, including individuals with disabilities, more dependent on public transportation systems. Reasons for this dependence among individuals with disabilities range from the expense of owning a car to barriers resulting from their own disability. Although as much as 39% of people with disabilities use private cars as their primary mode of transportation (Wasfi et al., 2007) with some studies finding that certain disability subpopulations identify car access as fundamental to accessing the community (Penfold, Cleghorn, Creegan, Neil, & Webster, 2008), the remaining majority of persons with disabilities expressed an interested in private transportation but noted that they could not afford this travel mode (Wasfi et al., 2007). Still other individuals with disabilities indicate that they cannot use private transportation due to their disability. In a January 2007 publication, the Department of Transport (DfT) in the United Kingdom reported that adults with mobility impairments made a third fewer trips than those without a mobility impairment. The authors attributed this difference to an overall lower rate of driving a vehicle among those with mobility impairments which, in turn, may explain the increased public transportation ridership among people with mobility impairments. In fact, individuals with mobility impairments made more trips by public bus than those without mobility impairments (Clery, Kiss, Taylor, & Gill, 2017). This reliance on public transportation by people with disabilities may be higher than identified in previous studies (Bascom & Christensen,

2017; Jansuwan, Christensen, & Chen, 2013). For example, while the Bureau of Transportation Statistics (BTS) found that for the general population private vehicles were the primary mode of transportation for 61% of respondents with only 6% using public transportation (U. S. Department of Transportation, BTS, 2003a), Bascom and Christensen (2017) found that only 32.9% of individuals with disabilities relied primarily on private vehicles while 18.7% of people with disabilities used public transportation as their primary mode of transportation. Furthermore, nearly half of respondents indicated that inadequate public transportation, no public transportation, or a lack of specialized transportation as significant barriers to full participation in their community (Bascom & Christensen, 2017). Similarly, Jansuwan et al. (2013) found that individuals with disabilities were more likely to travel using transportation modes other than private vehicles, with 30% of respondents using public transportation, which was higher than study participants who were elderly, as well as those who were low income. While the specific factors influencing increased reliance on public transportation seem to vary based on disability and income, the recent literature supports the idea that people with disabilities are relying on public transportation to meet their transportation needs (Bezyak, Sabella, & Gattis, 2017).

Context and Significance of the Problem

Despite increased use of public transportation, people with disabilities continue to report barriers accessing public transportation services. National studies conducted in the U.S. by Bezyak et al. (2017) and Thatcher et al. (2013) found that many individuals with

disabilities who were interested in using public transportation were unable to do so due to barriers in the pedestrian environment, as well as at the transit facility and transit vehicles levels. In fact, only 12.1% of respondents indicated that they did not experience any barriers when accessing fixed route public transportation services while 13.6% percent found no barriers when accessing complementary paratransit services (Bezyak et al., 2017). Research indicates that individuals with disabilities experience transportation barriers outside of the U.S. as well (Penfold, Cleghorn, Creegan, Neil, & Webster, 2008). Common among these studies is the finding that barriers in the pedestrian environment are one of the primary obstacles that individuals with disabilities face when using public transportation. Furthermore, barriers in the physical environment appears to be an obstacle regardless of geographic location with respondents throughout the U.S. and the United Kingdom reporting this as a significant concern. Another barrier of note is driver attitudes towards individuals with disabilities which was identified in two of the studies (Bezyak, Sabella, & Gattis, 2017; Penfold et al., 2008). In the U.S., it appears that the adequacy or frequency of service also present a significant barrier for individuals with disabilities interested in using public transportation service. The findings of these studies suggest that people with disabilities continue to face many barriers when accessing public transportation.

It continues to be imperative to identify public transportation system barriers to individuals with disabilities, who represent a significant population in the U.S. (13.1% of the total U.S. population; U.S. Census Bureau, 2015). As was noted by Bascom and Christensen (2017), “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" (p. 2). Authors of the national studies previously referenced also noted the continued need for research in this area. For example, noting that the data used in their study was collected in 2009, Bezyak et al. (2017) recommended that more current data be collected to uncover any changes or improvements in accessibility made since the data of their data collection efforts. More specifically, there appear to be no studies of individual regional transportation systems, which would have less variability in conditions compared to national studies. While national studies have been conducted, there is likely a great deal of variability between regional conditions and transportation provider policies and procedures. No studies have been conducted to identify the barriers that individuals with disabilities living within the UTA service area face when accessing UTA's public transportation system.

Purpose and Research Questions

The purpose of this study was to better understand the barriers and perceived accessibility of UTA's public transportation system for individuals with disabilities living within the UTA service area. In support of this purpose, the following research questions guided this study.

1. To what extent do individuals with disabilities living within the UTA service area perceive the UTA system to be accessible to and usable by people with disabilities?
2. What barriers, if any, do people with disabilities face when accessing UTA's transportation services?

These research questions were further examined to determine whether perceptions

and/or barriers vary by disability type, mode(s) of transportation used, or frequency of transportation use. The results of this study may be used to information policy regarding transportation accessibility for individuals with disabilities. The general importance of the role that social science research may play policy development and implementation has been noted (Blewden, Carroll, & Witten, 2010). Similarly, publications specifically addressing transportation accessibility for people with disabilities have used research to promulgate policy recommendations (National Council on Disability [NCD], 2005, 2015). Because of the potentially important contributions around transportation policy that may result from this study, policy related information of relevance is included through the remainder of this document. Any potential policy implications will be discussed in Chapter V of this dissertation.

Definition of Key Terms

Accessible: In transit planning, accessibility has been used to judge the level of social equity (Bocarejo & Oviedo, 2012; Lee, Sener, & Jones, 2017), and has been evaluated in the context of access for different population groups (Lee et al., 2017), including people with disabilities (Lucas & Currie, 2012). For the purposes of this study, the term "accessible" refers to the extent to which individuals with disabilities are able to use or perceive the various factors influencing UTA's public transportation services to be capable of being reached or used. While the Americans with Disabilities Act makes references to services being "accessible to and useable by" people with disabilities, the term accessibility as used in this study does not refer to ADA requirements for transit

services, facilities, or vehicles.

Americans with Disabilities Act (ADA): The first piece of federal legislation protecting the civil rights of individuals with disabilities in many areas of public life including employment (Title I of the ADA), services provided by state and local governments, including public transportation services (Title II), places of public accommodation and commercial facilities (Title III), telecommuting, including telephone and internet services (Title IV). The ADA applies to both public and private entities with very few exceptions (ADA National Network, n.d.). ADA regulations applicable to the provision of public transportation services are found at 49 CFR Parts 27 (nondiscrimination on the basis of disability in programs receiving federal financial assistance), 37 (transportation services for individuals with disabilities), and 38 (accessibility specifications for transportation vehicles). Additionally, federal agencies such as the U.S. Access Board (Access Board), Department of Transportation (DOT), and Department of Justice (DOJ) have issued standards to help public transportation providers understand how to meet the requirements of the ADA regulations.

ADA complementary paratransit services: The ADA requires that public transit agencies which provide fixed route services also provide complementary paratransit services for individuals with disabilities who are functionally unable to access agencies fixed route services. These services are intended to complement fixed route services, thus the name complementary paratransit services. ADA paratransit services must be provided on the same days and during the same hours that fixed route transportation services are provided. Unlike fixed route transportation services which occur only along a

predetermined route, ADA complementary paratransit services operate within ¾ of a mile on either side of a fixed route bus route, or within ¾ miles of a light rail station which means that trip origin and destination points can occur anywhere within ¾ of a mile of an existing fixed route. Public transportation agencies generally use an eligibility process to determine whether an individual is functionally unable to access existing fixed route services, and there are three types of eligibility (unconditional, conditional, and ineligible). Federal guidelines have established that fares for ADA complementary paratransit services can be as much as two times the fare established for fixed route services (National Aging and Disability Transportation Center [NADTC], n.d.).

Beyond-the-curb paratransit service: To fully access ADA complementary paratransit services, some eligible individuals may require additional assistance from public transportation providers than might be available with a curb-to-curb model of service to ensure that the individual is able to successfully travel from their point of origin to their point of destination. The requirement to provide a higher level of service for eligible paratransit customers is outlined by the U.S. Department of Transportation (DOT) at 49 C.F.R. Section 37.129(a) (U.S. Dept. of Transportation, Federal Transit Administration [FTA], n.d.a). UTA provides beyond-the-curb service to eligible individuals as a reasonable service modification (UTA, n.d.a).

Blind or visually impaired: While "blind" and "visual impairment" have different medical definitions, for this study the two terms are being combined into one definition that follows the thinking of Jernigan (2005),

> ...[a person] is blind to the extent that the individual must devise alternative techniques to do efficiently those things which he would do if he had normal

> vision. An individual may properly be said to be "blind" or a "blind person" when he has to devise so many alternative techniques – that is, if he is to function efficiently – that his pattern of daily living is substantially altered. (para. 9)

Curb-to-curb paratransit service: A model of ADA complementary paratransit service in which a transportation agency provides service from an agreed upon exterior service point which is generally located near the curb of a road to another agreed upon exterior service point which is also located near the curb of a road. This is the base model of paratransit service used by many public transportation agencies including the Capital Area Transportation Authority (CATA, n.d.), MetroLINK (n.d.), and the Dallas Area Rapid Transit (DART, n.d.), as well as the UTA (n.d.a).

Deaf or hard of hearing: While "deaf" and "hard of hearing" have different medical definitions, and there may be significant differences between individuals who are deaf and those who are hard of hearing in oral and sign language communications abilities and use (Technological Education Center for Deaf and Hard-of-Hearing Students [DeafTEC], n.d.), for the purposes of this study these two groups are being combined to mean a person whose hearing loss requires them to devise alternative techniques to do efficiently those things which they would do if they had "normal" hearing.

Destination: As it applies to public transportation services, the point at which public transportation service end for each individual trip is considered the destination.

Developmental disability: "A severe, long-term disability that can affect cognitive ability, physical functioning, or both. These disabilities appear before age 22 and are likely to be lifelong. The term 'developmental disability' encompasses intellectual disability but also includes physical disabilities. Some developmental disabilities may be

solely physical, such as blindness from birth. Others involve both physical and intellectual disabilities stemming from genetic or other causes, such as Down syndrome and fetal alcohol syndrome" (National Institutes of Health [NIH], 2010). Friedman and Rizzolo (2016) found that, when individuals with intellectual or developmental disabilities have access to transportation through waiver programs, these services are most commonly used for community access. Furthermore, these transportation services are provided through various transportation methods, including public transportation.

Fixed route transportation services: According to 49 CFR Part 37, a "fixed route [transportation] system means a system of transporting individuals (other than by aircraft), including the provision of designated public transportation services by public entities...including, but not limited to, specified public transportation service, on which a vehicle is operated along a prescribed route according to a fixed schedule." The definition includes both fixed route bus and light rail services, both of which are operated by UTA.

Intellectual disability: "A group of disorders characterized by a limited mental capacity and difficulty with adaptive behaviors such as managing money, schedules and routines, or social interactions. Intellectual disability originates before the age of 18 and may result from physical causes, such as autism or cerebral palsy, or from nonphysical causes, such as lack of stimulation and adult responsiveness" (NIH, 2010). Friedman and Rizzolo (2016) found that, when individuals with intellectual or developmental disabilities have access to transportation through waiver programs, these services are most commonly used for community access. Furthermore, these transportation services are provided through various transportation methods, including public transportation.

Learning disability: "A disorder in one or more basic psychological processes that may manifest itself as an imperfect ability in certain areas of learning, such as reading, written expression, or mathematics" (Learning Disabilities Association of America [LDA], 2012).

Mental health disability: The term mental health disability, or mental illness, refers to a broad range of mental health conditions that can affect mood, thinking, and behavior. Examples of mental health disabilities include depression, anxiety, schizophrenia, eating disorders, and addictive behaviors, among many others (Mayo Clinic, n.d.).

Origin: As it applies to public transportation services, the point at which each individual trip on public transportation begins is considered the origin.

Pedestrian network: An interconnected set of walkways that represent possible routes from one location to another that may be used for nonautomobile circulation (Hess, Moudon, Snyder, & Stanilov, 1999).

Physical disability or mobility impairment: A physical disability is any condition which impacts movement of the body. The extent to which the condition affects mobility determines whether a physical disability may also result in a mobility impairment. Mobility impairments are generally associated with the inability to use one or more extremities, or insufficient strength to walk of lift objects, among other things (Colorado State University [CSU] Department of Occupational Therapy, n.d.) Individuals with mobility impairments often use mobility devices, such as canes, walkers, or manual or powered wheelchairs, to meet their mobility needs.

Private transportation: The term private transportation generally refers to "non-public form(s) of transportation..." (National Transit Database [NTD], 2018) operated by private, for-profit organizations. Examples of private transportation include Amtrak, many taxi services, and ride sharing services such as Uber or Lyft.

Public transportation: The FTA (2019) defines public transportation as "transportation by a conveyance that provides regular and continuing general or special transportation to the public, but does not include school bus, charter, or intercity bus transportation or intercity passenger rail transportation provided by the entity." The FTA (2016) further clarified that this term includes any transportation service provided using vehicles purchased with FTA capital assistance. Public transportation is essentially any transportation service which provides service using federal, state, and/or local public funding.

Reasonable service modification: In November 2015, FTA Circular 4710.1 clarified that public transportation providers are required to make reasonable modifications to existing policies and practices to ensure that individuals with disabilities could access public transportation services in support of the ADA requirements to provide accessible public transportation services. UTA (n.d.b) has similarly identified reasonable service modifications as modifications made to existing policies and practices that ensure access to UTA services for individuals with disabilities, but which do not fundamentally alter the nature of the services UTA provides.

Transit facility: A transit facility is any physical structure with the primary purpose of providing access to and from a transportation system which has scheduled

stops at the structure (49 CFR Part 37.3). Examples include fixed route bus stops, as well as light rail and commuter rail facilities.

Summary

This chapter provided an overview of the problem that this study will address, provided background information related to this problem, presented the purpose and research questions for this study, and provided definitions for relevant key terms. Chapter II will provide a review of relevant literature, including an overview of advocacy efforts which led to accessible public transportation for individuals with disabilities in the community, the interplay between federal legislation resulting from these advocacy efforts and the federal legislation requiring accessible public transportation, an overview of the legislative guidance, including the federal agencies involved in the development and enforcement of said guidance, and a review of current research on the accessibility of public transportation for individuals with disabilities. Chapter III describes the methodology used in this study, including a discussion of the applicability of an applied social research framework, utility of an online survey, foundation for questions to be included in the survey, and the statistical analyses to be used to evaluate survey results. In Chapter IV, statistical information based on survey responses is presented including an introductory discussion of the implications of the statistical analyses. Finally, Chapter V further discusses the findings of this study, including the implications for perceived accessibility of and potential barriers to UTA's public transportation system, as well as implications for transportation accessibility policy.

CHAPTER II

LITERATURE REVIEW

To understand the barriers that individuals with disabilities currently face when accessing public transportation, it is important to understand the role that advocacy, including the larger disability rights movement, had on initial efforts to create accessible public transportation system, including various iterations of legislation and regulations which clarified legal requirements. Although current research indicates that there have been some improvements in transit agency compliance with ADA regulations, individuals with disabilities continue to face barriers when accessing public transportation.

Advocating for Accessible Public Transportation

Many authors have cited the ability to achieve community inclusion as a key reason that accessible transportation is important for people with disabilities is important (Bascom & Christensen, 2017; Caas, 2007; Delbosc & Currie, 2011; Ma et al., 2018; Rajé, 2003; Samuel et al., 2013). However, the concept of including people with disabilities in the fabric of communities through access to public transportation is a relatively new concept, which started largely as the result of Hugh G. Gallagher's inability in access various federal buildings (Katzmann, 1986). Gallagher, a legislative aid during the 1960s to Senator E. L. Bartlett of Alaska, had polio as a child and, as a result, used a wheelchair for mobility. During the time of his work with Senator Bartlett,

Gallagher was often unable to attend meetings because he could not access the meeting rooms. Similarly, Gallagher was unable to access many of the sites in Washington, D.C., including the National Gallery of Art and the Library of Congress. While Gallagher himself made requests to these facilities to install ramps, it was only after a direct appeal from Senator Bartlett that these facilities agreed to do so, in part because a committee on which the senator served oversaw relevant appropriations (Katzmann, 1986). What started as a request to make facilities accessible to one of his staffers increased Senator Bartlett's interest in making federally funded buildings accessible to all individuals with mobility impairments and ultimately resulted in his sponsorship of legislation that would later be known as the Architectural Barriers Act (ABA). Senator Bartlett also found support from other senators, such as Senator Jennings Randall who shepherded the legislation through the senate Public Works committee. Following committee hearings, the language of the ABA was strengthened from requiring that buildings be reasonable accessible to requiring that all public building be accessible to and useable by people with mobility impairments. Though the ABA was not intended to make public transportation accessible for people with disabilities, the definition of building included in the legislation referred to "...any structure constructed or altered by or on behalf of the U.S., leased in whole or in part by the U.S., or financed in whole or in part by a grant or loan made by the U.S." (Katzmann, 1986, p. 24) led to the later proposed amendment to the ABA that the Washington D.C. Metro be fully accessible to individual with mobility impairments. This amendment represented the first legislative advocacy aimed at making public transportation accessible to individuals with disabilities, an effort which would

continue well into the 1970's following passage of the Rehabilitation Act of 1973, and the later signing of regulations for Section 504 of the Rehabilitation Act of 1973 by Joseph Califano, Secretary of the US Department of Health, Education, and Welfare (HEW), on April 28, 1977 (Fleischer & Zames, 2011; Katzmann, 1986).

Simultaneous to efforts within the federal government, the disability community also starting to advocate for community inclusion. Advocacy spearheaded by individuals with disabilities such as Ed Roberts at the University of California at Berkley and Judith Huemann at Long Island University in Brooklyn, New York spurred efforts on college campus across the U.S. to establish organizations that could provide resources and support for individuals with disabilities interested in living independently, with people with disabilities in leadership and counseling positions for the first time (Fleischer & Zames, 2011; Scotch, 1989). In addition to providing independent living resources, these Centers for Independent Living (CILs) also brought together diverse members of the disability community who engaged in important discussions about barriers individuals with disabilities face regarding community access and inclusion. This sharing of experiences, as well as growth in the number of CILs across the U.S., served as the catalyst for the disability rights movement. While disability subgroups had previously advocated for resources that would best serve the specific needs of the needs of their disability, such as blindness or mobility impairments, members of the disability rights movement were able to come together in a unified way to ensure that all people with disabilities had equal access to public facilities, education, and mass transit (Scotch, 1989). Among these issues, accessible public transportation was the primary focus

(McCluskey, 1987). Organizing and maintaining enthusiasm for the movement was no small feat, especially with the many setbacks experienced. In fact, while many had hoped these advocacy efforts which, in conjunction with efforts by lawmakers, resulted in the signing of the Rehabilitation Act of 1973 and, more specifically, inclusion of Section 504, individuals participating in the movement quickly learned that passing legislation through Congress was only the first step in realizing accessible public transportation.

Legislative History

For both individuals with disabilities and public transportation providers, the Rehabilitation Act of 1973 and the subsequent Americans with Disabilities Act (ADA) of 1990 are the hallmark pieces of federal legislation requiring that public transportation be accessible to and useable by people with disabilities. It is important to note, however, that the ADA built on the framework developed in the Rehabilitation Act and, similarly, the Rehabilitation Act built on language used in the Civil Rights Act of 1964, among other federal laws. This section will review early legislative efforts, discuss the importance of the Rehabilitation Act broadly, and Section 504 of the Act specifically, as well as the timeline to create enforceable Section 504 regulations, and, finally, discuss the ADA and its connection to accessible public transportation.

Early Efforts

The first efforts by federal legislators to make federally funded facilities accessible to individuals with disabilities took form in the ABA of 1968 (Katzmann, 1986; Pfeiffer, 1993). Congressional support for the ABA was largely the result of efforts

by Senator Bartlett of Alaska to ensure that one of his staffers, Hugh Gallagher, was able to access federal buildings while using his wheelchair. While the requirements of the ABA were initially intended to apply to federally funded buildings only, the definition of building included in the legislation referred to "...any structure constructed or altered by or on behalf of the U.S., leased in whole or in part by the U.S., or financed in whole or in part by a grant or loan made by the U.S." (Katzmann, 1986, p. 24). Authors of the 1970 Urban Mass Transportation Assistance Act capitalized on this definition when crafting an amendment to the Act, Section 16(a), which required that "special efforts" be made when designing transit systems so that individuals with disabilities and the elderly could use these systems (Katzmann, 1986; Pfeiffer, 1993). In 1973, several important pieces of federal legislation followed the "special efforts" language in the Urban Mass Transportation Assistance Act. First was another amendment, this time to the Federal-Aid Highway Act, which authorized grants and loans to private nonprofits to provide transportation assistance to individuals who were elderly or had a disability and for whom mass transit was either inappropriate or unavailable (Katzmann, 1986). In addition, Representatives Charles Vanick and Senator Hubert Humphries attempted to expand on efforts to eliminate discrimination in transportation by proposing an unsuccessful amendment to the Civil Rights Act of 1964 which would have extended the broad civil rights protections of the Civil Rights Act to individuals with disabilities (Fleischer & Zames, 2011; Scotch, 1989). Though this amendment was ultimately unsuccessful due to President Nixon's pocket veto of the legislation (Katzmann, 1986), efforts the following year by Senator Harrison Williams to add nondiscrimination language to the

reauthorization of the Rehabilitation Act did make it through Congress, resulting in passage of Rehabilitation Act of 1973 (Scotch, 1989).

Rehabilitation Act of 1973

Despite vetoing earlier versions of the Rehabilitation Act, President Nixon signed the Rehabilitation Act of 1973 into law on September 26, 1973 (Fleischer & Zames, 2011; National Low Income and Housing Coalition (NLIHC), 2014). President Nixon's decision to sign the bill was due, at least in part, to a May 1973 rally held at the capitol by individuals with disabilities, including members of the President's Committee on Employment of the Handicapped, as well as an all-night vigil held at the Lincoln Memorial. The intent of the rally and vigil was to urge the President and Congress to reach an agreement regarding the Rehabilitation Act (Fleischer & Zames, 2011). The efforts of advocates were not, however, the primary reason for the introduction or ultimate passage of the Rehabilitation Act. Rather, it was legislators who took up the effort of community inclusion based on the momentum of previously enacted or, in the case of the attempted amendment to the Civil Rights Act of 1964, failed legislative efforts. Legislation which ultimately became the Rehabilitation Act of 1973 was introduced in the U.S. House of Representatives, H.R. 8070, was introduced by Representative John Brandemas (D-IN) with similar legislation sponsored in the Senate (S. 1875) by Senator Randolph Jennings (D-WV; Katzmann, 1986; NLIHC, 2014).

A key reason President Nixon declined to sign earlier versions of the Rehabilitation Act was the language of Sections 501 – 504 which he felt expanded the law from its original vocational intent, in addition to concerns about the cost of

implementing these Sections (Fleischer & Zames, 2011; Katzmann, 1986). Building on the inclusive legislative momentum of the late 1960s and early 1970s, Sections 501 through 504 of the Rehabilitation Act of 1973, which generally aimed to increase community access for individuals with disabilities by providing for their civil rights in all activities, programs, or facilities which used federal funds. Section 501 focused on federal hiring practices (NLIHC, 2014), requiring that federal agencies cannot discriminate against individuals with disabilities in the hiring process (Fleischer & Zames, 2011). Section 503 similarly bars employment discrimination against individuals with disabilities but extends the prohibition to recipients of federal contracts (Fleischer & Zames, 2011; NLIHC, 2014). To aid in the establishment of accessibility guidelines, Section 502 created the Architectural and Transportation Barriers Compliance Board, also referred to as the Access Board, to enforce the provision of the Architectural Barriers Act (Fleischer & Zames, 2011; NLIHC, 2014). Section 504, which stated that "...no otherwise qualified individual with a disability in the U.S....shall, solely by reason of her or his disability be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving federal financial assistance" (NLIHC, 2014) had the most significant implications of all the Sections (Fleischer & Zames, 2011). Members of the disability community, as well as agencies receiving federal financial assistance, such as public transportation agencies both recognized the potential for far reaching implications (Katzmann, 1986). Thus, the development of Section 504 regulatory language received a majority of the attention surrounding Rehabilitation Act regulatory process (Katzmann, 1986).

Section 504 Response

As will be discussed in more detail later in this paper, the successful passage of legislation through the U.S. Congress is an important first step in the legislative and regulatory process, but it is not the final step. To ensure that Congressional intent is met, federal agencies must, in most cases, issue regulations explaining how federal legislation is to be implemented. Not only does this help organizations, such as public transportation providers, understand how to comply but it also establishes enforcement criteria to ensure compliance with both the letter and intent of federal legislation. In the case of Section 504, the federal agency with the initial responsibility of developing guidelines was the Department of Health, Education, and Welfare (HEW; Fleischer & Zames, 2011; Katzmann, 1986; McCluskey, 1987; Scotch, 1989), as firmly clarified by President Ford when he issued Executive Order 11914 that identified the HEW Secretary as having primary responsibility for "coordinating the implementation of Section 504 of the Rehabilitation Act of 1973 by all federal departments and agencies" (Katzmann, 1986, p. 98).

Disability activists were aware of the need for enforceable regulations to ensure full implementation and, almost immediately following passage of the Rehabilitation Act, began contacting then-Secretary of HEW Caspar Weinberger requesting the issuance of Section 504 regulations (Fleischer & Zames, 2011; Katzmann, 1986). At the same time, staff from the HEW Office of Civil Rights (OCR) was working with members of the Senate Subcommittee on the Handicapped to lay the groundwork for Section 504 regulations, although regulations were not required in the legislative language

(Katzmann, 1986). Early drafts of Section 504 regulations were developed by OCR and provided to then-HEW Secretary David Mathews, who had concern about the potential cost of implementing the regulations and sought Congressional guidance to ensure that the regulations were consistent with legislative intent just days before the Ford administration left office, leaving Section 504 regulations unsigned as of early 1977 when Joseph Califano, appointed by President Carter, took office as the HEW Secretary (Fleischer & Zames, 2011; Katzmann, 1986).

Disability advocates, frustrated with the ongoing delays regarding the release of Section 504 regulations by HEW, increased their advocacy efforts. This frustration was, at least partially, because of the value that the disability community saw in Section 504 as a mechanism to ensure that public transportation systems would be accessible to individuals with disabilities (Katzmann, 1986). The American Coalition of Citizens with Disabilities (ACCD) responded to the delays by organizing demonstrations throughout the U.S. to pressure the HEW to issue the 504 regulations (Pfeiffer, 1993). While nationwide demonstrations started on April 4, 1977, in some locations the protests evolved into sit-ins by individuals with disabilities at several HEW regional offices, including the offices in San Francisco and Washington D.C. (Fleischer & Zames, 2011; Pfeiffer, 1993). In the case of the San Francisco office, individuals with disabilities remained inside the HEW offices for a total of 25 days (Fleischer & Zames, 2011). In part to encourage advocates to leave the HEW offices, Secretary Califano signed Section 504 regulations on April 28, 1977 (Fleischer & Zames, 2011; Pfeiffer, 1993). Following the issuance of regulations, and in accordance with Executive Order 11914, issued by

President Ford in 1976, which required HEW to coordinate such compliance (Katzmann, 1986), HEW staff started the process of ensuring that all federal agencies, including the Department of Transportation (DOT), established regulations to ensure compliance with Section 504.

Among the federal agency staff with whom Secretary Califano worked on Section 504 implementation was DOT Secretary Brock Adams (Fleischer & Zames, 2011; Katzmann, 1986) who, on May 19, 1977, declared that all buses purchased with federal funds on or after September 30, 1979 must have a low-floor, ramped boarding option to allow individuals using mobility devices to board independently (Fleischer & Zames, 2011). Although legal action on the part of the American Public Transit Association (APTA), which represented many public transit providers, ultimately resulted in the reversal of this requirement in favor of an equal facilitation option (Fleischer & Zames, 2011; Katzmann, 1986), this initial requirement from Secretary Adams nonetheless set the stage for efforts to ensure that individuals with disabilities were able to access public transportation in accordance with Section 504. For many years following signing of HEW's Section 504 regulations and the DOT's full accessibility rule, disability advocates and public transportation providers lobbied the DOT to ensure that the DOT's Section 504 regulations were either amended (in the case of public transit agencies) or enforced as written (in the case of disability advocates) to meet their respective needs (Fleischer & Zames, 2011; Katzmann, 1986).

In fact, it wasn't until May 1986 that the DOT issued final rules regarding Section 504 (Katzmann, 1986; McCluskey, 1987). Rather than requiring full accessibility, the

final DOT regulations gave transit providers the discretion to determine how best to meet the needs of the disability community in their service area (McCluskey, 1987). More specifically transit providers could choose to meet the transportation needs of individuals with disabilities and the elderly by: (a) providing special services, such as dial-a-ride, also known as paratransit, (b) establishing an accessible fixed route bus system, including accessible transportation vehicles, or (c) using a mix of both special services and accessible fixed route services (Katzmann, 1986; McCluskey, 1987). Additionally, the DOT regulations established six service criteria which were to be met regardless of the service method(s) selected by a transit agency: (a) individuals with disabilities who were unable to use the bus service for the general public must be eligible to use the service specifically provided for those with disabilities, (b) services for those with disabilities had to be provided within 24 hours of a request for such services, (c) a transit agency could not impose restrictions on access to service based on trip purpose, (d) fares for services provided to individuals with disabilities had to be comparable to those charged to the general public, (e) services for individuals with disabilities had to operate during on the same days and during the same general hours as services for the general public, and (f) services for individuals with disabilities had to be provided in the same geographic area as those provided for the general public (Katzmann, 1986). In effect, "Section 504...mandated that all recipients of federal funds mainstream people with disabilities" (Fleischer & Zames, 2011, p. 65) in the provision of public transportation services. Furthermore, the Section 504 regulations would serve as the foundation for the subsequent development of the Americans with Disabilities Act (Mayerson, 1992), a

point that can be seen more clearly when considering the current DOT ADA regulations which will be discussed later in this paper.

Americans with Disabilities Act of 1990

Perhaps because of the length of time it took to the HEW and the DOT to issue Section 504 regulations, the disability community continued its efforts to ensure the protection of civil rights for individuals with disabilities into the 1980's (Scotch, 1989). In fact, in 1982 the National Council on Disability (NCD), which consisted of disability advocates appointed by President Reagan, promulgated presidentially approved recommendations that Congress should undertake efforts to include people with disabilities in the civil rights protects afforded in the Civil Rights Act of 1964 (Fleischer & Zames, 2011; Scotch, 1989), though it was later determined that the disability experience was distinct from those included in the Civil Rights Act and, therefore, warranted separate legislation guaranteeing civil rights protections specific to individuals with disabilities (Fleischer & Zames, 2011). In 1986, the NCD, now an independent federal agency, "proposed an ADA that would require accessible public transportation" (Fleischer & Zames, 2011, p. 90) among other things (Mayerson, 1992; Scotch, 1989). Furthermore, and unlike the Rehabilitation Act of 1973 which applied only to recipients of federal funds, the ADA as draft was to apply to both public and private organizations.

The first draft of the ADA, which was based largely on the NCD's original draft, was introduced to Congress in April 1988 by Senator Lowell Weicker (R-Conn) and Representative Tony Coelho (D-CA) (Fleischer & Zames, 2011; Mayerson, 1992). To learn more about the impact of the draft ADA, a joint congressional hearing was held in

September 1988. In attendance at these hearings were elected officials who would later play an instrumental role in refining the draft legislation and ultimately guiding it successfully through Congress – Senator Tom Harkin (D-Iowa) and Representative Major Owens (D-Maryland; Mayerson, 1992). These legislators, along with many other members of Congress and both presidential candidates, supported the extension of federally protected civil rights to individuals with disabilities (Mayerson, 1992). Some scholars have likely correctly speculated that the presidential candidates Bush and Dukakis supported the ADA because of the impending election cycle, while members of Congress made the reasons for their support more openly. For example, during a 1989 hearing on the ADA, Senator Harkin spoke about his brother who is deaf (Fleischer & Zames, 2011; Mayerson, 1992), Senator Ted Kennedy mentioned his son who had a leg amputation (Mayerson, 1992), and Representative Coelho discussed living with epilepsy (Fleischer & Zames, 2011; Mayerson, 1992).

Members of the disability community also played an important role in garnering support for the ADA. During the September 1988 joint congressional hearing, members of the disability community more than filled the hearing chambers (Mayerson, 1992). Disability rights organizations banded together to take-out full-page ads in the *Washington Post* urging Congress to pass the ADA (Fleischer & Zames, 2011). Attendees at hearings in 1989 talked about their experiences with disability discrimination. Stories of individuals with cerebral palsy who were denied access to movie theaters, war veterans who, due to service related injury, couldn't access their home or public transportation, and an explanation of the experiences of being deaf all

made clear the importance of the ADA (Mayerson, 1992).

The impact of the legislative and disability community efforts was overwhelming. On September 7, 1989, the U.S. Senate voted in favor of the ADA by a vote of 76 to 8 (Fleischer & Zames, 2011; Mayerson, 1992), followed by similarly bipartisan vote in the House of 377 to 28 (Fleischer & Zames, 2011). By the time the ADA passed through both houses of Congress, George H. W. Bush had been elected President of the U.S. On July 26, 1990, President Bush signed the ADA into law stating that, along with access to employment, public accommodations, and telecommunications, ". . . the ADA ensures expanded access to transportation" (U.S. Equal Employment Opportunity Commission [EEOC], n.d.b) for people with disabilities.

The final version of the ADA signed into law on July 26, 1990 defines disability as a physical or mental impairment that substantially limits one or more major life activities, a history of such an impairment, or being regarded as having such an impairment (ADA, 1990; Fleischer & Zames, 2011). The legislation also provides a broad, though not exhaustive, list of major life activities which includes thinking, breathing, learning, and working, among many other activities (ADA, 2008). It seems clear that Congress intended for the protections of the ADA, outlined in the document's five titles, was intended to apply broadly to individuals with many types of disabilities. Protections against discrimination in employment are outlined in Title I of the ADA (ADA, 1990; Fleischer & Zames, 2011). Regulatory development and enforcement for the employment related provisions of the ADA resides with the U.S. Department of Labor and Equal Employment Opportunity Commission (EEOC, n.d.a); Fleischer &

Zames, 2011). Under Title II of the ADA, covered organizations which provide public services cannot discriminate against individuals with disabilities in the provision of said public services while Title III ensures access to places of public accommodation which may include hotels, establishments which provide food and drink, amusement parks, and public transportation stations, among other locations (ADA, 1990; Fleischer & Zames, 2011). The development and enforcement of Title II and Title III standards for non-transportation facilities is done by the U.S. Department of Justice (DOJ), while the U.S. Department of Transportation (DOT) is responsible for the development and enforcement of Title II and Title III standards for transportation facilities (U.S. Access Board, n.d.b). Title IV of the ADA established access to telecommunications services for individuals with disabilities by mandating the availability of nationwide telephone relay services (ADA, 1990; Fleischer & Zames, 2011). The Federal Communications Commission (FCC) is involved the Title IV regulatory process (FCC, 2018; Fleischer & Zames, 2011). Finally, Title V of the ADA covers additional topics to clarify the intent of the ADA, including information on exclusions, such as immunity for states and prohibitions against retaliation against individuals who file ADA claims, as well as guidelines for the recovery of attorney's fees for those ADA complaints which require legal action (ADA, 1990; Fleischer & Zames, 2011).

Transportation Regulations

While both Section 504 and the ADA were significant legislative accomplishments, the impact of these laws could not be realized until enforceable

regulations were promulgated by relevant federal agencies (Fleischer & Zames, 2011; Katzmann, 1986). This section will discuss the federal agencies involved in the development of regulations regarding accessible public transportation, as well as key sections of the relevant regulations. More specifically, the U.S. Access Board, U.S. DOT, and the Federal Transit Administration and Federal Highway Administrations of the DOT, have all promulgated regulation relevant to public transportation access for individuals with disabilities.

U.S. Access Board

Accessibility guidelines issued by the U.S. Access Board ("Board") serve as the foundation upon which all subsequent accessibility regulations for built environments are based, including accessibility guidelines for public transportation facilities and transit vehicles. The Board, established in 1973 as part of language included in Section 502 of the Rehabilitation Act of 1973, is an independent federal agency which generally promotes equality for people with disabilities (U.S. Access Board, n.d.d). Congress intended that the Board would ensure consistency in the efforts of federally funded programs to comply with the Architectural Barriers Act (ABA) of 1968 which required federal facilities be accessible to individuals with disabilities (U.S. Access Board, n.d.e). The 1978 reauthorization of the Rehabilitation Act both expanded the role of the Board and authorized the Board to establish design guidelines under the ABA, as well as to expand the technical assistance the Board provided to include both the removal and identification of barriers in federally funded buildings and facilities. Following this authorization, the Board published its first set of accessibility guidelines outlining

requirements for accessibility in buildings and facilities which required ADA compliance. When the ADA was signed into law on July 26, 1990, the mission of the Board was expanded to include the development of design standards for transportation systems, as well as other facilities and systems. This expansion resulted in the publication of various ADA Accessibility Guidelines (ADAAG), including the September 6, 1991 issuance of the first ADA guidelines on accessible public transportation vehicles and facilities (U.S. Access Board, n.d.e). The intent of the 1991 Access Board guidelines was to inform other federal agencies, including the DOT and the DOJ, on basic accessibility requirements as they developed their own agency-specific ADA guidance. It should be noted that, when the Board updates portions of its ADAAG which might have implications for public transportation accessibility, as was the case in January 2017 when the Board issued updated guidance on public transportation vehicles, federal agencies such as the DOT must update their regulations accordingly.

U.S. Department of Transportation

Consistent with the protections established by Section 504 of the Rehabilitation Act of 1973, the U.S. DOT requires that programs or activities receiving federal financial assistance through the DOT, such as public transportation agencies, cannot discriminate against individuals with disabilities in the provision of these programs or activities. To ensure accessibility to and usability by people with disabilities, the DOT is responsible for issuing and enforcing accessibility ADA standards for public transportation services, including public transportation facilities (U.S. Access Board, n.d.c), as well as public transportation vehicles (U.S. Access Board, n.d.a).

Transportation services for individuals with disabilities (49 CFR Part 37).

The purpose of the DOT guidance found at 49 CFR Part 37 is to "implement the transportation and related provisions of Title II and Title III of the Americans with Disabilities Act" (§37.1). More specifically, this section is intended to help transportation agencies, public and private, understand the legal obligations for accessible public transportation established by the public services (Title II) and public accommodations (Title III) portions of the ADA. While all portions of this Part impact the accessibility of public transportation and, therefore, may have implications for perceptions of individuals with disabilities, past research (Bezyak et al., 2017; Thatcher et al., 2013) indicates that the sections of this Part of most importance in the context of public transportation deal with transportation facilities (Subpart C), paratransit as a complement to fixed route service (Subpart F), and provision of service (Subpart G).

Part 37 also specifies the requirements for an ADA compliant transportation facility, requiring that "public entities shall construct any new facility to be used in providing designated public transportation services so that the facility is readily accessible to and useable by individuals with disabilities...." (§37.41). This accessibility requirement also extends to alterations made to transportation facilities (§37.43). This Part defines a "facility" as "all or any portion of buildings, structures, sites, complexes, equipment, roads, walks, passageways, parking lots, or other real or personal property, including the site where the building, property, structure, or equipment is located" (49 CFR §37.3); this definition, therefore, includes facilities such as bus stops and rail platforms. These standards for public transportation facilities have been clarified in

guidance published by the DOT. The DOT standards provide detailed information about the specifications for transportation facilities and includes diagrams and drawings to contextualize the specifications. For example, 810.2.1 of the DOT standards requires that bus boarding and alighting areas have a firm, stable surface, while 810.2.2 requires that this area have a clear length of 96 inches perpendicular to the road and a clear width of 60 inches measured parallel to the road (U.S. DOT, 2006). Furthermore, this area must be connected to streets, sidewalks, and pedestrian paths by an accessible route (810.2.3) and the slope of this area cannot exceed 1:48 (or 2%) perpendicular to the road (810.2.4). Similarly, the slope of rail platforms cannot exceed 2% (810.5.1) with very few exceptions, detectable warnings must be provided (also referred to as tactile strip; 810.5.2), and platform height must coordinate with the height rail vehicles (810.5.3).

The requirements for the provision of paratransit services as a complement to fixed route transportation services are outlined in Subpart F of 49 CFR § 37. Except for commuter bus, commuter rail, or intercity rail services, all fixed route service operated by a public entity require that "...paratransit or other special service to individuals with disabilities that is comparable to the level of service provided to individuals without disabilities who use the fixed route system" (§37.121(a)). To be comparable, complementary services must operate on the same days and during the same hours as the corresponding fixed route services. Services must be provided to origins and destinations within three-fourths of a mile on each side of a fixed route, as well as a three-fourths mile radius at the end of a fixed route (§37.131(a)), as well as three-fourths of a mile around rail stations (§37.131(a)(2)(i)), and the transportation agency cannot impose restrictions

on providing service based on trip purpose (§37.131(d)). Eligible individuals interested in scheduling a ride on the complementary service must do so at least one day prior to the desired ride (§37.131(b)) and reservation services must be available during hours when a transportation provider's administrative offices are open (§37.131(b)(1)). Fares for a complementary service cannot exceed twice the full price fare for a similar trip (§37.131(c)) and a fare cannot be charged for an individual's personal care attendant (§3.131(c)(1)). Standards for paratransit eligibility are also outlined in section (§37.123), as is the process which must be used to determine individual paratransit eligibility (§37.125). These regulations make clear that complementary paratransit services should only be provided to those individuals who are functionally unable to access the fixed route system, supporting the intent of this Subpart that complementary paratransit act as a "safety net" for those individuals with disabilities who cannot use the fixed route system under any circumstances.

Ensuring that the accessibility features of both fixed-route and complementary paratransit vehicles are functioning, as well as other service provision requirements, are outlined in Subpart G of Part 37 of the DOT ADA guidelines. In general, "public...entities providing transportation services shall maintain in operative condition those features of facilities and vehicles that are required to make the vehicles and facilities readily accessible to and useable by individuals with disabilities" (§37.161) and includes a specific discussion about the requirement to keep vehicle lifts in operating condition (§37.163). Additionally, the circumstances under which audible internal (§37.167(b)(1), (2)) and external (§37.167(c)) stop announcements must be made are

outlined. Allowing sufficient time to both board and alight the vehicle is clarified in §37.167(i) of this subpart, as are the obligations to ensure that individuals with disabilities and the elderly have access to the priority seating and securement areas on public transportation vehicles (§37.167(j)). From time to time, it may be that individuals with disabilities cannot access public transportation services without modifications to existing policies and practices. To accommodate these situations, §37.169 outlines the process to be used by public transportation entities to make these accommodation requests, referred to as service modifications. Finally, to ensure that personnel can meet the above requirements, this subpart also requires that relevant personnel receive requisite training (§37.173).

Accessibility specifications for transportation vehicles (49 CFR Part 38). Establishing minimum guidelines for accessible transportation vehicles to ensure compliance with the ADA is the section of the DOT ADA guidelines found at 49 CFR Part 38. Of relevance to the transportation modes operated by the Utah Transit Authority, this section sets forth minimum standards for buses, vans, and related systems (Subpart B), light rail vehicles and related systems (Subpart D), and commuter rail cars and related systems (Subpart E). Each of these subparts codifies the minimum requirements for doorway clear width, priority seating signage location, barring the installation of handrails, stanchions, or other items which may reduce access to interior circulation paths, and audible interior public information systems to make announcements. Also common among the transportation modes is the requirement that a lift or ramp be provided to allow individuals with disabilities, including those using mobility aids, to

board and alight a public transportation vehicle. Of importance to the operation of fixed route bus services, this Part requires that, where securement is required, the securement envelope must provide an "envelope" of clear space measuring 48 inches deep, 30 inches wide, and 30 inches high.

Federal Transit Administration. The U.S. Department of Transportation is responsible for oversight of work conducted by various operating administrations ranging from the Federal Aviation Administration (FAA) to the Federal Railway Administration (FRA), and including the FTA. Each of these operating administrations is responsible for enforcement of various federal laws, including the ADA. Overseeing compliance with these various federal laws among public transportation providers is the responsibility of the FTA. The FTA's Office of Civil Rights (OCR) is "responsible for ensuring public transit providers comply with all nondiscrimination requirements" (FTA, n.d.b), including the Americans with Disabilities Act (ADA). To aid public transportation agencies with their efforts to comply with the ADA, the FTA occasionally publishes circulars (FTA, 2017). The most recent circular published by the FTA in November 2015 provided this type of assistance to public transit agencies by clarifying ADA obligations on myriad issues ranging from between car barriers for level boarding light rail services to service modifications to clarifying applicability of DOT, not DOJ, definition of service animals.

Federal Highway Administration. While not directly involved in providing ADA regulations, guidance, or circulars to public transportation agencies, several other federal agencies have ADA compliance obligations related to the pedestrian network

beyond the area of public transportation facilities. For example, the Federal Highway Administration (FHWA), a subdivision of the U.S. Department of Transportation, has obligations under both Section 504 of the Rehabilitation Act, as well as Title II of the ADA (U.S. Dept. of Transportation, FHWA, 2017), and is responsible for ensuring that state DOTs, such as the Utah Department of Transportation (UDOT), comply with these federal laws. As with the FTA, ADA guidance provided by the FHWA must be consistent with U.S. Access Board guidelines which are relevant to state DOTs. Perhaps most notable of the FHWA guidance regarding accessibility broadly, and access to public transportation specifically, are the Public Rights-of-Way Guidelines, or PROWAG. The current version of PROWAG requires that newly constructed and substantially rebuilt features which exist in the public right of way must be accessible to individuals with disabilities. Curb ramps, sidewalks, and accessible pedestrian signals are examples of pedestrian facilities which may exist in the public right of way and which, when installed according to PROWAG guidelines, may make public transportation more accessible for individuals with disabilities.

Compliance and Accessibility Research

Following the issuance of regulatory requirements, transportation agencies have worked to find solutions that will meet the requirements of both the Rehabilitation Act and the ADA. These improvements have resulted in significant increases in the use of public transportation services by individuals with disabilities and by the public in general. However, despite the advocacy efforts of the disability community, as well as the

legislative and regulatory impact of federal legislation, people with disabilities continue to encounter barriers accessing both fixed route and complementary paratransit public transportation services.

Accessibility Improvements

In general, the accessibility of public transportation has improved since passage of the ADA (Bezyak, et. al, 2017; NCD, 2005, 2015; Thatcher et al., 2013), with accessibility improvements happening at the vehicle, bus stop, and pedestrian environment levels. As mentioned previously, the ADA, subsequent guidance from the U.A. Access Board, and the corresponding DOT transit vehicle regulations, outline the requirements for a vehicle to be considered ADA compliant. In the case of light rail and commuter rail vehicles, this includes a means for boarding train cars and stop announcements, while fixed route bus vehicles must also include securement areas, among other things. For fixed route bus vehicles, these requirements include providing a securement system, stop announcements, and a lift or ramp among other things. By 2010, only 33 of 681 key stations in the nation's oldest rail systems were not ADA compliant, while 84% of existing and 100% of new rails systems were ADA compliant (Hershey et al., 2010 as cited in Thatcher et al, 2013). Regarding fixed route bus vehicles, 98% were ADA compliance (Hershey et al., 2010, as cited in Thatcher et al, 2013), up from 91% in 2005 (NCD, 2005). Efforts to improve bus stop accessibility have focused on meeting ADA requirements for transportation facilities, such as providing bus stops with a firm, stable surface that measures at least 5 feet wide by 8 feet deep and is connected to an accessible route. While research identified variations in the way transit agencies meet the

ADA requirements (Thatcher et al., 2013), research indicates that meeting these accessibility improvements have been beneficial. For example, Intercity Transit in Olympia, Washington saw an overall increase in ridership of 14% at stops which were improved to meet ADA requirements compared to a 5% increase at unimproved stops. Similarly, ramp deployment data, collected as part of many electronic passenger count systems and which has been used as an indicator of ridership by individuals with disabilities (Thatcher et al, 2013), increased at improved stops by 37% compared to only 16% at unimproved stops (Thatcher et al., 2013). Transit agencies in Portland, Oregon and Baltimore, Maryland saw a reducing in paratransit rides in the area surrounding improved bus stops (Thatcher et al., 2013) indicating that increased access to fixed route public transit may result in decreased use of the costlier paratransit services. Ridership increases resulting from improved bus stop accessibility have been noted in the UTA service area as well. In a 2018 report, Kim, Bartholomew, and Ewing found a mean percentage increase in ridership at improved (ADA compliant) of 4.57% compared to just 2.39% at unimproved (non-ADA compliant) bus stops, a statistically significant difference which shows that "growth rate in bus ridership is 92% higher at bus stops with improvements than at stops without improvements" (p. 15). At the same time, the growth in demand for complementary paratransit service in the area surrounding improved bus stops was 94% lower than in the area surrounding unimproved bus stops (Kim, Bartholomew, & Ewing, 2018). Taken together with the results of national studies, these findings add support to the conclusion that improving the accessibility of bus stops increases overall ridership on fixed route services while decreasing ridership on

complementary paratransit services (NCD, 2015). An important factor contributing to the improvements in vehicle, transit facility, and pedestrian network accessibility has been the involvement of the local disability community in identifying issues as well as solutions (NCD, 2005, 2015).

Fixed Route Barriers

Despite these improvements, barriers to accessing public transportation still exist for individuals with disabilities (NCD, 2005, 2015). Several studies have found significant barriers to accessing fixed route transportation services such as buses, light rail, and commuter rail transportation. For example, researchers have found that the overall inadequacy of public transportation systems is among the top fixed route barriers identified by individuals with disabilities. These inadequacies include limited hours of operation (Bezyak et al., 2017; Thatcher et al., 2013), shortened routes (Rosenbloom, 2007), unreliable arrival and departure times (Rosenbloom, 2007), and lack of information about the transit service (Rosenbloom, 2007) or about potential accessibility issues (Thatcher et al., 2013). Other highly rated barriers include issues with stop announcements, including announcement consistency and audibility (Bezyak et al., 2017; NCD, 2005, 2015), driver attitudes (Bezyak et al., 2017; Thatcher et al., 2013), and barriers in the pedestrian environment, such as broken sidewalks (Bezyak et al., 2017; Rosenbloom, 2007; Thatcher et al., 2013) or distance to a bus stop (Thatcher et al., 2013). Maintenance of transportation vehicle accessibility features such as lifts, ramps, and securement systems also appear to be a significant barrier (NCD, 2005, 2015; Rosenbloom, 2007). Some individuals with disabilities reported a lack of familiarity with

fixed route services as a barrier (Bezyak et al., 2017; Thatcher et al., 2013), which some studies have found could be improve with individuals training (Rosenbloom, 2007). Some riders with disabilities have reported that, although their disability prohibits access to the fixed route system, they were not eligible for paratransit services making general access to public transportation unavailable (Bezyak et al., 2017). Still others identified mobility device-specific issues as a barrier (Thatcher et al., 2013). For example, mobility devices that are too large or too heavy to be used on a fixed route vehicle has been identified as a barrier (Bezyak et al., 2017; Rosenbloom, 2007) as well as difficulty securing a mobility device after boarding a public transportation vehicle (Bezyak et al., 2017; NCD, 2005, 2015). Barriers for fixed route rail services have also been identified by the disability community. These barriers include inoperable elevators and gaps between rail platforms and rail cars which make boarding with a mobility device difficult (NCD, 2005), as well as a limited number of locations on a platform at which individuals with disabilities can alight a train via a level boarding option (NCD, 2015). As has been reported regarding fixed route bus services, stop announcements are also a barrier experienced when riding fixed route rail services (NCD, 2005). Among members of the disability community who use fixed route transportation, there are very few reports of experiencing zero barriers when using fixed route transportation services. In fact, just over 10% of those surveyed by Bezyak et al. (2017) responded that they had not experienced any such barriers. It should be noted that important differences in barriers encountered exist nationally within the general disability community. Studies have found these differences in the experience of transportation-related barriers exist both by

disability category (e.g., blind or deaf) and by geography (e.g., urban, suburban, or rural) (Bezyak et al., 2017). However, no studies were identified which had evaluated individuals with disabilities perceptions of the accessibility of fixed route public transportation systems at the regional level, including within the UTA service area.

Complementary Paratransit Barriers

Perhaps because of the barriers to accessing fixed route public transportation, many people with disabilities use complementary paratransit to meet their transportation needs (Rosenbloom, 2007). Unfortunately, obstacles to public transportation access do not appear to be limited to fixed route transportation services (NCD, 2005). Barriers to using complementary paratransit services may be encountered as early as the eligibility process, where some individuals have found the eligibility process overwhelming and, in the case of processes which require an in-person meeting, the person simply may not be able to attend (NCD, 2005, 2015). In a national study of 1,927 individuals with disabilities, Thatcher and colleagues found that among respondents who only use paratransit public transportation services, 28% indicated they would like to use fixed route services while another 24% were not sure if they would be interested in or able to use fixed routes services. A key reason these individuals were unable to use fixed route public transportation services was accessibility issues at the vehicle, stop, or pedestrian environment level (Thatcher et al., 2013). Another national study in which 35.6% of the over 4,100 respondents indicated they used complementary paratransit services, Bezyak et al. (2017) found that the top barriers to using complementary paratransit services were difficult scheduling paratransit rides and long wait times to schedule rides, each of which

50% or more of respondents indicated were barriers, an issue also identified by the National Council on Disability (NCD, 2005, 2015). Missed pick-up windows, long bus ride times, insufficient times of service, and poor driver attitude were also identified as barriers also make it difficult for many people with disabilities to use complementary paratransit service (Bezyak et al., 2017; NCD, 2005, 2015). For many individuals who are found to be eligible for paratransit services, they are not able to take rides because they need to be picked up from or taken to a location outside of the paratransit service area (NCD, 2005). According to Bezyak et al., only 13.5% of individuals who ride ADA complementary paratransit services indicate they do not encounter barriers when accessing this public transportation service. As with fixed route public transportation services, no studies have been conducted to understand riders with disabilities perceptions of the accessibility of complementary paratransit transportation systems at the regional level, including within the UTA service area.

Summary

This chapter presented information on past and present policy and legislative efforts to ensure that public transportation is accessible to and useable by people with disabilities. This chapter also presented information about the current state of public transportation accessibility, highlighting the benefits of legal compliance while also emphasizing that, despite the requirements of federal legislation, many barriers to accessing all forms of public transportation continue to exist for individuals with disabilities. Of particular importance is the extremely limited published research

examining individuals with disabilities perceptions of public transportation accessibility at the national level. In fact, only one study has been published in the social sciences literature (Bezyak et al., 2017); all other related literature with a national lens has been printed in the form of white papers. At the regional transportation district level there have been no published research on this topic and, more specifically, no such research has been conducted regarding UTA service area specifically. Studying perceptions of accessibility at the UTA services area level may uncover information specific to this area not previously noted in national studies which may, in turn, drive policy and practice decisions to ensure that public transportation services provided by UTA both comply with the ADA and are accessible to individuals with disabilities. For example, if this study indicates that UTA riders with disabilities experience issues with bus stop announcements as was found with the national studies, then there would be a need for additional operator training and monitoring of compliance with federal regulations. Likewise, if this study finds that a key barrier exists in the pedestrian network beyond the bus study and is, therefore, outside of the area where UTA might have legal responsibility, UTA may be able to share these results with governmental agencies which may have responsibility and develop partnerships to improve these barriers and create access to UTA's bus stops. The next chapter will discuss the methodology that was used to explore individuals with disabilities perception of the accessibility of UTA's public transportation services.

CHAPTER III

METHODOLOGY

A historical review of the legislative and advocacy efforts leading to passage of the ADA, as well as the subsequent academic research, indicates that although legislation requiring accessible public transportation has resulted in benefits for both transit providers and riders with disabilities, barriers still exist. While national studies have identified broad barriers, little is known about whether or how these barriers exist at the local level, specifically as it pertains to the UTA service area.

Overview

Research Questions

The purpose of this study was to better understand the barriers and perceived accessibility of UTA's public transportation system for individuals with disabilities living within the UTA service area. In support of this purpose, the following research questions guided this study

1. To what extent do individuals with disabilities living within the UTA service area perceive the UTA system to be accessible to and usable by people with disabilities?
2. What barriers, if any, do people with disabilities face when accessing UTA's transportation services?

These research questions were further examined to determine whether the perceptions and/or barriers vary by county, disability type, mode(s) of transportation used, or frequency of transportation use. The results of this study may be used to information policy regarding transportation accessibility for individuals with disabilities. To answer

these research questions and develop potential policy recommendations, an applied social research approach to collect quantitative data via an online survey aimed at better understanding perceptions and barriers among individuals with disabilities who use UTA services.

Quantitative Methods

Creswell (2003) indicated that quantitative research studies have a predetermined structure, use an instrument to answer questions or collect data, data collected can be attitudinal or observational (among many other types of data), and statistical analysis is used to evaluate collected data. A quantitative method which incorporated a structured, web-based survey and relied on statistical analysis to evaluate responses was selected for this study to meet the needs of UTA to understand perceptions of a representative sample of the disability community along the Wasatch Front. As will be discussed below, a representative sample required the collection of information from more than 300 individuals. Accomplishing this objective with a qualitative study was impractical given the limited resources of the researchers involved in this study. Furthermore, previous studies that examined accessibility on a national level (Bezyak et al., 2017; Thatcher et al., 2013) also used a quantitative method, thus setting the foundation for subsequent quantitative research on the topic.

Applied Social Research Framework

This study used a social research framework to collect quantitative data. Neuman (2012) explained that social research consists of specific practices, techniques, and

strategies to collect information and create knowledge about social phenomena. Furthermore, social research is conducted to learn new things about the social world, including how the social world works and functions (Neuman, 2012). In the case of this study, the social phenomena studied were the perceived accessibility of UTA services, as well as potential barriers individuals with disabilities may face when using UTA's services. As previously mentioned, these are both phenomena about which little is known, making the exploratory and descriptive nature of a social research framework particularly relevant (Hall, 2008) because this study yielded previously unknown information about individuals with disabilities using the UTA public transportation system.

At its most basic level, social research is aimed at expanding knowledge on a particular social phenomenon. In some cases, however, the results of a social research initiative will be used, or applied, to provide insights on a specific practical concern and offer solutions to practical problems (Hall, 2008; Neuman, 2012). Research which is intended to be directly applied to solving questions regarding social phenomena are referred to as applied social research studies. In applied social research the questions to be answered by the research study are often established by an organization with interest in a particular topic rather than by a researcher (Hall, 2008). In the case of the current study, an applied social research framework was most appropriate given that the research topics of interest were established by the UTA and the results of the study were shared with UTA generally, and specific UTA staff with authority to implement change specifically, meaning that UTA's intended use of the results was to better understand the

experiences and perceptions of riders with disabilities in the hopes of making changes as needed to improve ADA compliance as well as the general riding experience.

There are a variety of data collections methods used in applied social research studies (Hall, 2008; Neuman, 2012). Surveys, sometimes referred to as social surveys (Payne & Payne, 2004), are among the most common of these tools (De Vaus, 2002; Neuman, 2012; Payne & Payne, 2004). According to Neuman, social survey research assumes that social realities are based on stable, objective facts that can be measured and quantified, supporting the use of statistical analyses in the evaluation of the social reality being measured. In survey research, study participants, or respondents, are asked to provide information about their opinions and behaviors (Neuman, 2012), as has been done in myriad transportation-related research studies including several studies regarding individuals with disabilities and their public transportation habits (Bezyak, et. al, 2017; NCD, 2015, 2005; TransSystems Corporation, 2014). As it applies to the current study, a key benefit of survey research was the ability to efficiently sample more than three hundred members of the disability community along the Wasatch Front.

Instrumentation

This study used an electronic, web-based survey to collect information regarding participants perception of the accessibility of UTA's public transportation system. As indicated in the literature generally (De Vaus, 2002) and for applied social research specifically (Hall, 2008; Neuman, 2012) a survey was used to systematically collect responses, or data points, from respondents, all of whom were responding to the same set

of questions. While the technique to collect survey data can vary, questionnaires are commonly used in social science research (De Vaus, 2002). Online surveys have increasingly taken the place of other forms of questionnaires (Buchanan & Hvizdak, 2009) in part because of the ability to quickly collect and analyze data (Buchanan & Hvizdak, 2009; Van Selm & Jankowski, 2006) and to reach participants who may be difficult to involved when using specific quality criteria (Andrews, Nonnecke, & Preece, 2003). Another benefit of online surveys is the ability to reach respondents who are geographically dispersed (Van Selm & Jankowski, 2006), as is the case for those using UTA's public transportation services. These benefits have led to the use of online surveys in a wide range of academic fields (Sills & Song, 2002), including transportation research (Bezyak et al., 2017; Thatcher et al., 2013). Despite the benefits and expanded use of online survey for data collection, there are several limitations to survey use. A primary concern regarding the use of online surveys is that of sampling bias (Van Selm & Jankowski, 2006) or self-selection bias (Sills & Song, 2002) wherein the sample of individuals who responds to an online survey has a preexisting interest in the study topic and selects to participate in the study at a higher rate that might be expected from the general population. Similarly, biases in online survey participation have been identified based on age, race, gender, education, and income (De Vaus, 2002; Sills & Song, 2002), many of which may limit internet access and/or general knowledge of the use of technology. While these potential biases are certainly important to consider, study results will still be meaningful given the exploratory nature of the current study. It was expected that individuals with disabilities will have a preexisting interest in the study topic, and to

some extent that self-selection bias will be beneficial for the purpose of this study. Furthermore, information on respondent demographics will provide meaningful information on how these potential biases can be mitigated in future iterations of this study. One final limitation of note is the use of only one survey link for all respondents rather than unique, individual links for each respondent; some authors have noted that this may lead to a single respondent submitting multiple completed surveys (Van Selm & Jankowski, 2006). While this was unlikely in the current study given the length of the survey, Qualtrics did record individual internet protocol (IP) addresses each time a response was submitted. This list of IP addresses was reviewed after the response window closed to ensure multiple responses were not submitted by a single individual. Despite these limitations, the successful use of online surveys as a tool to collect transportation related information from individuals with disabilities has been demonstrated in several previous studies (Bezyak et al., 2017; Thatcher et al., 2013). In keeping with these previous studies, as well as previous literature regarding surveys generally and online surveys specifically, this study used an electronic, web-based survey via the Qualtrics platform for data collection.

Survey length, language, and format have all been identified as potential barriers to online survey completion (Sills & Song, 2002). To guard against these issues, survey questions were based on those used in similar national studies (Bezyak et al., 2017; TransSystems Corporation, 2014). Questions used by Bezyak et al. were piloted with committee members at Meeting the Challenge, a firm which provides accessibility compliance consultation services to ensure compliance with federal disability laws

(Meeting the Challenge, n.d.), and were developed following an extensive review of the literature for similar assessment tools. Questions included in the TransSystems online survey were first piloted with members of local disability communities throughout the U.S. where both fixed route and ADA paratransit public transportation services were available. Telephone interviews were conducted to identify reasons individuals with disabilities might be unable to access fixed route transportation services and the combined responses from all telephone interviews were combined to identify themes which were then used to create questions for the national web-based survey. The survey questions used in the TransSystems study were the foundation for the current study, with questions from the Bezyak et al. study added to address accessibility issues related to both fixed route and ADA paratransit transportation services. These preliminary questions, however, were generally written in such a way that all topics assumed a negative impact on transportation accessibility. Following feedback from committee members, the questions and the corresponding 5-point Likert scales were refined to give respondents an option to indicate that survey items made the UTA system, or a particular service or barrier within the UTA system, accessible rather than assuming the only possible response was that something was somewhat or fully inaccessible. In addition to creating a broader range of possible options, edits to the Likert scales created more equitable spacing between points on the scale. This edit was particularly important as it created scales which, although maintaining components of an ordinal scale, also incorporated components of an interval scale. It was the near approximately of an interval scale which enabled more robust statistical analysis of survey responses.

Consistent with previous literature regarding the successful use of surveys (Neuman, 2012; Payne & Payne, 2011), the survey used in the current study was piloted in September 2018 with eight (8) students in the Aggies Elevated program at Utah State University, an inclusive on-campus college experience for young adults with intellectual disabilities. This group was selected for the pilot test for several reasons. First, this convenience sample consisted of individuals with disabilities and, thus, it was hoped they would be representative of individuals with intellectual disabilities, a subgroup of the intended survey sample. Second, because most Aggies Elevated students live outside the UTA service area when not at Utah State, it was possible to conduct the pilot without potentially biasing responses on the final survey instrument. Finally, members of the lead researcher's dissertation committee are involved in the program, which made it convenient for all parties to participate in the pilot test. The primary purpose of the pilot test was to obtain feedback on potential barriers to use and understanding of the online survey tool. Pilot survey participants were asked to complete the survey on two separate occasions to evaluate reliability of responses over time. The kappa statistic was calculated used to evaluate agreement, or consistency, in pilot participant responses to the survey questions between the two data collection timepoints. Because Cohen's kappa calculates the percentage of overall agreement among all questions (Proffitt, Bartholomew, Ewing, & Miller, 2019), a single, overall statistic was calculated. Kappa statistics can be between -1 and 1, where 0 indicates chance-level consistency in survey responses over time (Green & Salkind, 2008). This analysis yielded a kappa value of 0.10, indicating slightly better than chance agreement among survey respondents between

the first and second survey responses. A higher rate of agreement would normally be expected, particularly because there was very little time between participants first and second responses. It is possible that the lack of agreement was due to limited familiarity with the topic of public transportation. It may also be the case that survey respondents, all of whom had an intellectual disability, had more difficulty providing consistent responses due to their disability.

Despite the lack of agreement, this pilot test did prompt several narrative revisions to improve readability and internal consistency. Revisions included more inclusive language regarding mental health, a more detailed description of fixed route and paratransit services, and inclusion of this description in more than one location. The Flesch-Kincaid Grade Level readability score for the final instrument was 6.9. Following these revisions, the final survey was translated into Spanish, and both the English and Spanish versions were entered in Qualtrics.

The survey instrument, available in Appendix C (English) and D (Spanish), comprised 22 questions, of which participants would complete between 13 and 21 questions depending on their responses. Five questions were asked to gather demographic characteristics (in part to determine inclusion), six questions regarding participant's use of transit services, six questions regarding perceived barriers to fixed route and/or paratransit services, and four questions regarding the use of autonomous vehicles and ride hailing services. One question was used to include participants in a random incentive to receive one of 20 $25 gift cards for completing the survey.

The demographic factors included age, gender, disability, and county of

residence. The questions regarding transit service use included do you use said services, why not (if applicable), and how often. The questions regarding participant's perceived barriers were multi-part questions which used a 5-point Likert scale, for example;

> Below are a few things people with disabilities might think about when deciding if UTA's buses or trains are accessible, or easy for someone with a disability to use. Something that is hard for a person with a disability to use would be inaccessible. On a scale of 1 to 5, with 1 being "inaccessible" and 5 being "accessible," how accessible is each of these things when you use UTA's fixed route buses or trains? If an item doesn't apply to you, select "not applicable."

1. How many days the buses or trains run
2. The hours that buses or trains run
3. The number of transfers you will need to make to finish your trip
4. Cost
5. Knowing how to use buses or trains
6. Past experiences riding buses or trains
7. Service quality
8. Stop announcements
9. Personal safety
10. Distance to or from the bus stop or train station
11. Sidewalks, curb ramps, or crosswalks on the way to the bus stop or train station
12. Information about potential barriers on the way to the bus stop or train station
13. Bus stop or train station accessibility
14. Ability to get on or off the bus or train
15. Whether the bus or train's lift, ramp, or bridge plate is working
16. Having enough accessible seats on the bus, including securement locations
17. Having enough accessible seats on the train
18. Ability to have my mobility device secured how I like
19. Ability to fit my mobility device on the bus or train
20. Driver attitude, assistance, or knowledge
21. Attitudes of other riders
22. Ability to accommodate my service animal

Participants

Study Sample

Approval from the Utah State University Institutional Review Board (IRB) was

obtained prior to any recruitment or data collection efforts and all survey participants were informed of their rights to participate in the study as it related to this IRB approval. A copy of the informed consent information provided to study participants can be found in Appendix A. Following the receipt of IRB approval, and utilizing convenience sampling protocols, the author worked with various community agencies with whom she had professional relationships, as well as UTA marketing and community relations staff, to disseminate recruitment materials. To determine the needed sample size, this study assumed an acceptable level of statistical power (.8; Cohen, 2001) as well as a conservative small to moderate effect size (Cohen's *d* = .3), and a 95% confidence interval (α = .05). The intent of these assumptions was to increase the statistical likelihood of identifying an effect (e.g., that there are differences in perceived accessibility based on disability, service modes used, and ridership frequency) when one exists while simultaneously reducing the likelihood of committing a Type I error by finding that there is a statistically significant difference between groups when, in fact, none exists. Finally, because it was not known whether differences between the groups would be positive or negative, this study used a two-tailed test for statistical significance. Based on these assumptions, the necessary minimum sample size for this study was calculated as follows (Cohen, 2001):

$$n = 2(\frac{\delta}{d})^2 = 2(\frac{3.42}{.3})^2 = 259.92$$

Thus, a sample size of 260 participants would have been sufficient for this study. However, to protect against nonresponse bias and attrition, as well as to increase statistical power, a sample of 380 individuals with disabilities was recruited from among

the 213,169 individuals in the Weber, Davis, Salt Lake, and Utah county portions of the UTA service area (U.S. Census Bureau, 2016) to participate in the electronic survey.

Dissemination

Dissemination of the electronic survey occurred in collaboration UTA, the Utah State Office of Rehabilitation's Vocational Rehabilitation program, the three independent living centers in the UTA service area (Roads to Independence, Utah Independent Living Center, and Ability 1st Utah), and among the members of UTA's Committee on Accessible Transportation (CAT), a UTA sponsored citizen advisory committee consisting of individuals with disabilities, family members, or others connected with the disability community living in the UTA service area. Information about the survey was shared with all university disability resource centers within the UTA service area as well as with various disability service providers. UTA provided advertising via its website and social media platforms, while emails requesting participation were sent to all other groups and individuals by the researcher. The language used in the recruitment email can be found in Appendix B. In some cases, organizations which received emails also shared information about the survey via social media either by copying information from the email into a social media post or by directly sharing UTA's social media posts. Furthermore, many individuals who "liked" UTA's social media pages shared UTA's dissemination information on their individual social media pages. In an attempt to track how respondents learned about the survey, individual survey links were created for recruitment material shared by UTA (including CAT Committee members), the Utah State Office of Rehabilitation, disability service providers, and independent living

centers. The vast majority of survey responses were received using the UTA link, indicating that efforts by UTA were the most successful in encouraging participation. Although it was possible to calculate a required number of survey responses for statistical analysis, it was not possible to calculate a response rate because the number of potential respondents was unknown given the manner in which information about the survey was disseminated.

Study data were collected in October and November 2018. Individuals who opted to participate in the online survey were initially provided with general information about the purpose of the study. All participants were then fully informed of their right to participate in the survey, as well as their right to withdraw from the survey at any time (see Appendix A for Informed Consent form). A link to the Utah State University IRB approval of the research study was also provided prior to any survey questions being presented. To encourage survey participation, respondents were advised that they would have an opportunity to provide their email address upon completion of the survey which would then be entered in a drawing for a chance to win one of 20 $25 gift cards. Gift card recipients were selected on November 28, 2019 and subsequently notified via email.

Inclusion and Exclusion Criteria

To be eligible for participation in this study, respondents had to be individuals with disabilities, family members of individuals with disabilities, or disability service providers who were at least 18 years old. The minimum age of 18 years was selected to focus on the adult population of riders with disabilities of most interest to the Utah Transit Authority. Another participations requirement was that participants lived within

the UTA service area. The UTA service area includes Box Elder, Weber, Davis, Salt Lake, Utah, Summit, and Tooele counties in the state of Utah. However, the UTA services available in Box Elder, Summit, and Tooele counties are limited to connection and commuter services which do not require ADA complementary paratransit services. Because ADA complementary paratransit service is not available in these areas, individuals with disabilities living in Box Elder, Summit, and Tooele counties were not included in this study. Participants had to be users of UTA's fixed route or ADA complementary paratransit services or identify as having an interest in using UTA's transportation services but unable to do so due to barriers.

Survey responses were downloaded on November 29, 2018 at which point a total of 380 responses had been received. Based on the inclusion criteria of having a disability, 10 responses were excluded because the respondent indicated that they did not have a disability. Regarding the age criteria, 24 responses were excluded from statistical analysis because they did not answer the question about age and an additional five responses were excluded because the respondent indicated they were under the age of 18 years. Another eight responses were excluded because the respondent indicated that they did not live in Weber, Davis, Salt Lake or Utah counties while another six responses were excluded because the respondent didn't answer the question about their county of residence. A total of 53 responses were excluded from further analysis resulting in a final sample of 327 survey responses to be used in this study.

Participant Demographic Characteristics

The sample consisted predominantly of individuals with disabilities (n = 204;

62.4%), followed by family members of individuals with disabilities (*n* = 69; 21.1%) and disability service providers (*n* = 46, 14.1%). The remaining survey participants (*n* = 8; 2.4%) identified as belonging to two or more of these categories. As shown in Figure 1,

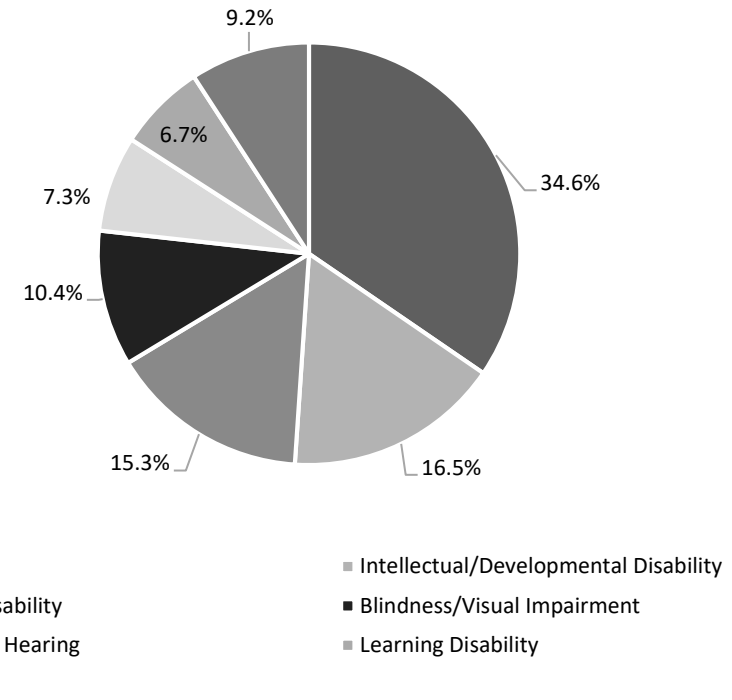

Figure 1. Percent of respondents by disability type.

nearly 35% (*n* = 113) of participants either had or were responding for someone who had a physical disability and the remaining participants were relatively evenly distributed among individuals with intellectual or developmental disabilities (16.5%; *n* = 54), mental health disabilities (15.3%; n = 50), blindness or other visual impairment (10.4%; *n* = 34), deafness or hard of hearing (7.3%; *n* = 24), and learning disability (6.7%; *n* = 22). Slightly more than 9% (*n* = 30) of respondents identified as having some other type of disability. Disabilities identified among these respondents included autism spectrum disorder, cancer, deaf-blindness, diabetes, epilepsy, multiple disabilities, and traumatic

brain injury. In sum, a broad range of disabilities were represented in this study. This is noteworthy because the only peer-reviewed publication to analyze people with disabilities perceptions of the accessibility of public transportation (Bezyak et al., 2017) specifically identified the absence of individuals with intellectual and developmental disabilities in the sample as a limitation to the national survey. Individuals between the ages of 20 and 29 years represented the largest percentage of total respondents at 26.3% (n = 86), as shown in Figure 2, while individuals over the age of 70 years were the least represented in the sample at 2.4% (n = 8). As with disability representation, the age distribution of survey respondents was similarly diverse, with all eligible age ranges represented. Over 50% (51.7%) of survey respondents were female (n = 169), just over 23% of respondents were male (n = 76), and several participants either chose not to disclose their gender (1.8%, n = 6) or chose to self-describe their gender (0.9%, n = 3).

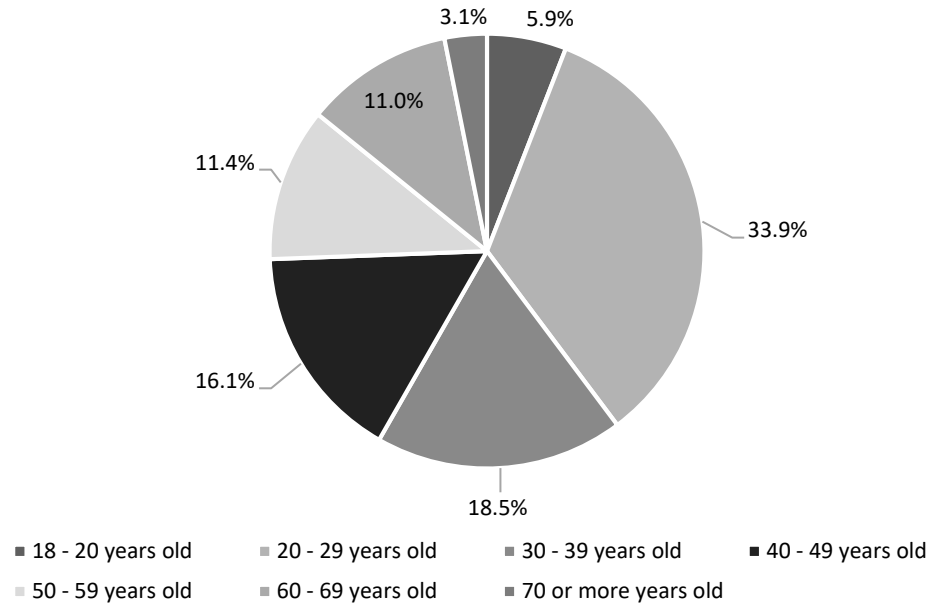

Figure 2. Respondent age distribution.

Following the screening questions, survey respondents were not required to respond to each question before moving to the next question. Additionally, some questions allowed respondents to select multiple answers. For these reasons, the number of responses and response percentages for each question may not be equal to the total number of responses or to 100%.

Table 1 provides information by county regarding respondent awareness of UTA services provided in their community. More than 44% (n = 145) of respondents lived in Salt Lake County, followed by nearly 34% (n = 111) in Utah county, nearly 13% in Davis county (n = 42), and just under 9% (n = 29) in Weber county. Most respondents indicated that UTA offered both fixed route and paratransit services in their community (60%; n = 189) while only 4.1% (n = 13) of respondents indicated that UTA did not provide these services in their community. The remaining participants indicated they did not know if UTA offered both fixed route and paratransit services in their community (34.6%; n = 113). Over 200 (n = 202; 61.8%) respondents indicated that they only used UTA's fixed route services, such as buses and trains, 55 (16.8%) respondents indicated

Table 1

Frequency of UTA Service Awareness Responses by County of Residence

	UTA fixed route and paratransit services available in community		
County	Yes	No	Not Sure
Weber	21	2	5
Davis	25	3	11
Salt Lake	100	3	37
Utah	43	5	60

they use both fixed route and paratransit services, and 19 (5.8%) indicated that they only used UTA's complementary paratransit services. Nearly 12% of respondents (n = 39) indicated they did not use any UTA services.

Among survey respondents who indicated that they used UTA's fixed route services, either alone or in combination with paratransit, 53.8% (n = 176) used fixed route bus, 52.9% (n = 173) used TRAX, and 50.5% (n = 165) used FrontRunner. Most respondents used fixed routes services almost every day (21.1%, n = 69) or a few times each week (16.2%, n = 53), while others used fixed route services less frequently. For example, 49 respondents (15.0%) indicated they used UTA's fixed route services a few times a month, 23 (7.0%) indicated they rode about once a week, 26 (8.0%) use fixed route services once a month, and only 13 (4.0%) respondents indicated they use fixed route services about once a year.

Procedures

Data Collection and Storage

This study collected primarily quantitative data, though survey participants were able to provide some qualitative data via a few open-ended questions. All data were initially collected and stored in Qualtrics. As was previously mentioned, all data collected as of November 28, 2018 were downloaded into SPSS 25. The survey remained open for data collection following the November 28, 2018 download.

Statistical Analysis

Quantitative data were analyzed using IBM's Statistical Package for Social

Sciences (SPSS) 25 software. Descriptive statistics were calculated for all quantitative survey questions. While medians are generally seen as the most appropriate measure of central tendency for ordinal data collected via a Likert scale (Kampen & Swyngedouw, 2000; Liddell & Kruschke, 2018), there have been arguments that strict adherence to the use of medians may not be practical in all situations where Likert scales are used as there may be value in understanding the nuances of the data (Kampen & Swyngedouw, 2000). Perhaps because of this need for to practically apply the statistical results of ordinal, the interpretation of ordinal, or Likert, data as metric is a common practice among applied researchers (Liddell & Kruschke, 2018). To ensure that the calculations of means had practical implications, medians and means were calculated for the perceived accessibility of each UTA service. Whereas the calculation of means identified differences in perceived accessibility of each UTA mode of service, as outlined in Table 2, the calculation of medians indicated that all UTA services were perceived as having the same "somewhat accessible" level of accessibility. Bearing in mind the applied social research framework selected for this study and support from the literature indicating that the calculation of means is somewhat ubiquitous in the social sciences, means and standard deviations were the descriptive statistics calculated for this study to ensure that the end users would take notice of the differences in perceived accessibility rather than viewing all services as equally accessible. Analysis of variance (ANOVA) analysis procedures were used to determine if statistically significant differences in perceptions of accessibility and potential barriers existed by disability types, mode of transportation used, and frequency of transportation use. This statistical method was selected because,

as Zhou and Skidmore (2017) noted, “ANOVA is a statistical model for analyzing mean differences across...groups” (p. 3). Zhou and Skidmore (2017) noted, however, that the ability to generalize the results of ANOVA depend on whether several assumptions are met. Primary among these assumptions is that the dependent variable is normally distributed in each group, that the variance is the same for all populations, and that the survey responses represent a random sample from the population (Green & Salkind, 2008). In the case of applied research such as the current study, however, the assumption of equal variance is rarely met (Zhou & Skidmore, 2017). The large sample of 327 useable survey responses was sufficient to address possible violations of these assumptions (Green & Salkind, 2008). An alpha threshold of .05 was used for all statistical analyses. Effect size in an ANOVA is calculated as η^2 (eta squared), a statistic which measures the proportion of the variance in the dependent variable which can be explained by membership in a particular group, or independent variable (Richardson, 2010). Eta square results range in value from 0 to 1, with 0 indicating there are no differences in the means of the groups and one indicating there is a difference in means two or more of the groups (Green & Salkind, 2008). In cases where the ANOVA indicated that a statistically significant difference in means existed, post hoc analyses were conducting using Tukey’s honestly significant difference (HSD), a statistic which compares all pairs of means to determine which mean differences are significant (Abdi & Williams, 2010; Gravetter & Wallnau, 2010). This post hoc statistic was selected because it is commonly used in psychological research (Gravetter & Wallnau, 2010) and because it is conservative in terms of identify significant differences because it relies on the

largest mean difference (Abdi & Williams, 2010). Participant responses to open-ended questions were used to add additional context to the statistical analysis results.

Summary

This chapter provided an overview of the quantitative methods that this study used to better understand people with disabilities perceptions of the accessibility of UTA's public transportation services, as well as potential barriers they encounter when using UTA services. The rationale for the use of an applied social research framework was explained, and information about the instrument used for data collection, survey participants, and the procedures used for collecting, storing, and analyzing survey data were also presented in this chapter. The next chapter will present the statistical findings, as well as some preliminary discussion related to these findings, regarding the two research questions guiding this study and the 327 survey participants.

CHAPTER IV

RESULTS

This study had two purposes: (a) to understand the extent to which individuals with disabilities living within the UTA service area perceive the UTA system to be accessible to and useable by people with disabilities, and (b) to determine what, if any, barriers these individuals face when accessing UTA's services. To explore these purposes an online study was conducted in partnership with representatives from UTA, as well as several disability related organizations during October and November 2018.

Perceptions of Accessibility

To address the first research question, and better understand people with disabilities' overall perception of how accessible and useable the public transportation services provided by the UTA, participants were asked to rank each UTA service – fixed route bus, TRAX, FrontRunner, and paratransit – on a scale from 1 to 5, with 1 being "inaccessible" and 5 being "accessible." Table 2 provides a listing of all mean accessibility scores (based on a 5-point scale) while Table 3 provides percentages of valid responses, as well as frequencies, for the number of responses for each level of accessibility for each mode of service. Overall, respondent perceptions of the accessibility of the UTA system fell somewhere between neutral and somewhat accessible for individuals with disabilities though there were differences in perceptions of accessibility for each mode of service. For example, respondents generally felt that UTA's FrontRunner was the most accessible service, with 98 respondents indicating that

Table 2

Mean Accessibility of Each UTA Transit Mode

UTA service	Mean accessibility
Fixed route bus	3.39
TRAX	3.64
FrontRunner	3.83
Paratransit	3.56

Note. Based on a 5-point scale.

Table 3

Percentage and Frequency of General Accessibility Perceptions for Each Mode of UTA Service

	Level of accessibility									
	Inaccessible		Somewhat inaccessible		Neutral		Somewhat accessible		Accessible	
UTA service	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency
Fixed route bus	8.6	21	24.3	59	11.1	27	31.3	76	24.7	60
TRAX	6.6	15)	18.1	41	13.7	31	27.8	63	33.9	77
FrontRunner	4.2	10)	16.1	38	13.6	32	24.6	58	41.5	98
Paratransit	10.5	16)	16.3	25	17.0	26	19.0	29	37.3	57

the service was accessible and only 10 respondents indicating the service was inaccessible ($M = 3.83$). Respondents indicated that fixed route bus was the least accessible UTA service with 21 respondents indicating that the service is inaccessible while 60 indicated the service is accessible ($M = 3.39$).

Perceived Accessibility and Disability Type

Survey responses were also analyzed to identify potential differences in the

perceived accessibility of each mode of UTA transportation based on primary type of disability. Table 4 provides the mean accessibility scores for UTA's TRAX, FrontRunner and paratransit mode of service by disability type. Table 5 provides mean accessibility scores, as well as standard deviations, for UTA's fixed route bus service.

Table 4

Mean Accessibility for TRAX, FrontRunner, and Paratransit by Disability Type

	Mode of UTA service		
Disability type	TRAX	FrontRunner	Paratransit
Physical disability	3.60	3.90	3.56
Blindness	3.81	4.11	3.50
Deafness	3.43	3.73	3.33
ID/DD	3.57	3.45	3.69
Learning	4.00	4.06	4.00
Mental Health	3.86	4.08	4.00
Other	3.30	3.35	2.81

Note. Based on a 5-point scale.

Table 5

Mean Accessibility, Standard Deviation for Fixed Route Bus by Disability Type

Disability type	Mean	*SD*
Learning	4.06	1.12
Mental health	3.92	1.24
Blindness	3.73	1.15
Deafness	3.47	1.19
ID/DD	3.21	1.30
Physical disability	3.10	1.39
Other	3.04	1.25

Note. Based on a 5-point scale.

A one-way analysis of variance (ANOVA) was conducted for each mode of service to evaluate the relationship between disability type and the perceived accessibility of each mode of UTA service. The independent variable, disability type, included seven levels: physical disability, including mobility impairments; blindness or other visual impairment; Deafness or hard of hearing; intellectual and/or developmental disability; learning disability; mental health disability; and other types of disabilities. The dependent variable was perceived level of accessibility. The ANOVA for fixed route bus was significant, $F(6, 236) = 3.316$, $p = .004$. The strength of the relationship between disability type and level of accessibility, as assessed by η^2, was moderate with disability type accounting for 7.8% of the variance in perceptions of the accessibility of UTA's fixed route bus service. ANOVAs conducted for TRAX, FrontRunner, and paratransit were not significant.

Follow-up tests were conducted using the Tukey's HSD statistic to evaluate pairwise differences by disability type among the means for the perceived accessibility of UTA's fixed route bus service. There was a significant difference in the means ($\alpha = .02$) between individuals with mental health disabilities ($M = 3.92$, $SD = 1.24$) and those with physical disabilities, including mobility impairments ($M = 3.10$, $SD = 1.39$) in their perceptions of the accessibility of UTA's fixed route bus service (95% CI [0.08, 1.57][-1.57, -0.08]). Individuals with physical disabilities were less likely than individuals with mental health disabilities to view UTA's fixed route bus services as accessible. There were no other statistically significant differences in the mean perceived accessibility of UTA's fixed route bus service based on primary type of disability.

Perceived Accessibility and General Service Modes Used

Another area of interest was whether the modes of UTA services used – fixed route, paratransit, both fixed route and paratransit, or no UTA services – was related to perceptions of accessibility. Table 6 provides the mean accessibility scores and standard deviations for fixed route bus by each general mode, or combinations of modes, used by the respondent. Table 7 provides the same information for TRAX, Table 8 for FrontRunner, and Table 9 for paratransit.

To determine if statistically significant differences existed in perceived accessibility of each UTA service based on service modes used, a one-way ANOVA was conducted for each of the independent variables: use fixed route modes of service, use

Table 6

Mean Accessibility, Standard Deviation of Fixed Route Bus by Modes of UTA Services Used

Modes used	Mean	*SD*
Use fixed route services, but not paratransit	3.56	1.24
Use paratransit, but not fixed route services	3.33	1.30
Use fixed route services and paratransit	3.20	1.78
Don't ride any UTA services	2.76	1.38

Note. Based on a 5-point scale.

Table 7

Mean Accessibility, Standard Deviation of TRAX by Modes of UTA Services Used

Modes used	Mean	*SD*
Use fixed route services, but not paratransit	3.81	1.20
Use fixed route services and paratransit	3.80	1.41
Use paratransit, but not fixed route services	3.00	1.38
Don't ride any UTA services	2.61	1.20

Note. Based on a 5-point scale.

Table 8

Mean Accessibility, Standard Deviation of FrontRunner by Modes of UTA Services Used

Modes used	Mean	*SD*
Use fixed route services, but not paratransit	4.04	1.14
Use fixed route services and paratransit	3.81	1.35
Use paratransit, but not fixed route services	3.00	1.28
Don't ride any UTA services	2.92	1.25

Note. Based on a 5-point scale.

Table 9

Mean Accessibility, Standard Deviation for Paratransit by Modes of UTA Services Used

Modes used	Mean	*SD*
Use paratransit, but not fixed route services	4.29	1.44
Use fixed route services, but not paratransit	3.67	1.32
Use fixed route services and paratransit	3.55	1.44
Don't ride any UTA services	2.83	1.30

Note. Based on a 5-point scale.

only paratransit service, use both fixed route and paratransit, or did not ride UTA services. The dependent variable was perceived level of accessibility of each mode of UTA service (fixed route bus, TRAX, FrontRunner, and paratransit). The ANOVA for fixed route bus was significant, $F(3, 239) = 3.521$, $p = .016$, as were the ANOVAs for TRAX, $F(3, 223) = 7.524$, $p = .000$, FrontRunner, $F(3, 232) = 8.504$, $p = .000$, and paratransit, $F(3, 149) = 3.691$, $p = .013$. The strength of the relationship between service mode(s) used and perceived accessibility, as assessed by η^2, for fixed route bus was small with service modes used accounting for only 4.2% of the variance in perceptions of the accessibility of UTA's service. The strength of the relationship between service modes used and perceived accessibility for TRAX, FrontRunner, and paratransit were moderate with service modes used accounting for 9.2%, 9.9%, and 6.9%, respectively, of the

variance of the perceptions of accessibility of UTA's services.

Post hoc tests were conducted using the Tukey's HSD statistic to evaluate pairwise differences among the means for each of these relationships. The post hoc analysis for fixed route bus identified a significant difference (α = .013) between individuals who used fixed route buses or trains (*M* = 3.56, *SD* = 1.24) and those who did not ride any UTA service (*M* = 2.76, *SD* = 1.38) in their perception of the accessibility of UTA's fixed route bus services (95% CI [0.13, 1.48][-1.48, -0.13]). Individuals who used fixed route buses or trains were more likely than individuals who did not use ride any UTA services to view UTA's fixed route bus services as accessible. No other statistically significant differences in perceived accessibility of UTA's fixed route bus service based on modes of service used were identified.

Post hoc analyses for differences in perceptions of TRAX accessibility identified a statistically significant difference (α = .000) between those who used fixed route buses or trains (*M* = 3.81, *SD* = 1.19) and those who did not ride any UTA service (*M* = 2.61, *SD* = 1.20) (95% CI [0.48, 1.92][-1.92, -0.48]). A statistically significant difference (α = .001) was also identified between those who rode the buses and/or trains and paratransit (*M* = 3.80, *SD* = 1.20) and those who did not ride any UTA service (95% CI [0.37, 2.01][-2.01, -0.37]). Individuals who used fixed route services either alone or in combination with paratransit services were more likely to indicate that UTA's TRAX services were accessible for individuals with disabilities than individuals who did not use any UTA services.

Regarding perceived accessibility of FrontRunner services, post hoc analyses

found a statistically significant difference (α = .019) between those who used fixed route buses or trains (*M* = 4.04, *SD* = 1.14) and those who used only paratransit services (*M* = 3.00, *SD* = 1.35) (95% CI [0.12, 1.97][-1.97, -0.12]), as well as a statistically significant relationship with those who did not use any UTA services (α = .000; *M* = 2.92, *SD* = 1.29; 95% CI [0.46, 1.79][-1.79, -0.46])). A statistically significant difference (α = .016) was also identified between those who rode fixed route bus and/or rail services as well as paratransit services (*M* = 3.81, *SD* = 1.28) and those who did not ride any UTA services (95% CI [0.12, 1.67][-1.67, -0.12]). As with perceptions of TRAX, individuals who used UTA's fixed route bus or rail services, either alone or in combination with UTA's paratransit services, were more likely to perceive FrontRunner to be accessible to individuals with disabilities than survey respondents who did not use any UTA services.

Finally, as it applies to UTA's paratransit services, post hoc analyses identified a statistically significant difference (α = .01) in perceptions of paratransit accessibility between individuals who used only UTA's paratransit services (*M* = 4.29, *SD* = 1.44) and those who did not use any UTA services (*M* = 2.83, *SD* = 1.30; 95% CI [0.26, 2.66][-2.66, -0.26])). Individuals who used UTA's paratransit service were more likely to perceive the service to be accessible to individuals with disabilities than survey respondents who did not use any UTA services.

Perceived Accessibility and Fixed Route Modes Used

To better understand how the modes of fixed route services used by individuals with disabilities might influence perceptions of fixed route service accessibility,

participants were asked to report the modes of UTA's fixed route service they used. Perceived accessibility of UTA's paratransit service was not included in this analysis. The percent and frequency of individuals who reported using each combination of fixed route modes is reported in Table 10. The mean perceived accessibility of UTA's fixed route bus service based on participant service modes used, as well the standard deviation, is reported in Table 11. The same information for UTA's TRAX service is reported in Table 12 and in Table 13 for FrontRunner.

Table 10

Percentage and Frequency of Respondents Using Each Mode of UTA's Fixed Route Service

Mode(s) of service used	Percent	Frequency
Fixed Route Bus, TRAX, and FrontRunner	42.9	100
Fixed Route Bus, TRAX	12.0	28
TRAX, FrontRunner	12.0	28
Fixed Route Bus, Frontrunner	10.7	25
Fixed Route Bus	9.9	23
TRAX	7.3	17
FrontRunner	5.2	12

Table 11

Mean Accessibility, Standard Deviation of Fixed Route Bus by Modes of Fixed Route Services Used

Mode(s) of service used	Mean	*SD*
Fixed Route Bus	4.10	1.14
Fixed Route Bus, FrontRunner	3.96	1.15
Fixed Route Bus, TRAX, and Frontrunner	3.59	1.30
FrontRunner	3.44	1.13
TRAX, FrontRunner	3.32	1.18
Fixed Route Bus, TRAX	2.81	1.17
TRAX	2.64	0.93

Note. Based on a 5-point scale.

Table 12

Mean Accessibility, Standard Deviation of TRAX by Modes of Fixed Route Services Used

Mode(s) of service used	Mean	*SD*
Fixed Route Bus, TRAX, and Frontrunner	4.09	1.16
Fixed Route Bus, FrontRunner	4.07	1.07
FrontRunner	4.00	1.31
TRAX, FrontRunner	3.74	1.18
Fixed Route Bus	3.43	1.16
Fixed Route Bus, TRAX	3.35	1.36
TRAX	3.06	1.24

Note. Based on a 5-point scale.

Table 13

Mean Accessibility, Standard Deviation of FrontRunner by Modes of Fixed Route Services Used

Mode(s) of service used	Mean	*SD*
Fixed Route Bus, FrontRunner	4.35	0.94
Fixed Route Bus, TRAX, and Frontrunner	4.22	1.15
FrontRunner	3.91	1.14
TRAX, FrontRunner	3.88	1.15
Fixed Route Bus	3.69	1.14
TRAX	3.55	1.13
Fixed Route Bus, TRAX	3.35	1.27

Note. Based on a 5-point scale.

One-way ANOVAs were conducted for each of the independent variables, or combination of modes of fixed route services used: fixed route bus, TRAX, FrontRunner, fixed route bus and TRAX, fixed route bus and FrontRunner, TRAX and FrontRunner, and all modes of fixed route services. The dependent variable was perceived level of accessibility of each mode of UTA service (fixed route bus, TRAX, FrontRunner, and paratransit). The ANOVA for fixed route bus was significant, $F(6, 195) = 4.154$, $p = .001$, as were the ANOVAs for TRAX, $F(6, 185) = 2.905$, $p = .010$, FrontRunner, $F(6, 192) = 2.724$, $p = .015$, and paratransit, $F(6, 109) = 2.958$, $p = .010$. The strength of the

relationship between fixed route service mode(s) used and perceived accessibility, as assessed by η^2, for fixed route bus, TRAX, and FrontRunner was moderate with modes of fixed route services used accounting for 11.3%, 8.6%, and 7.8%, respectively, of the variance in perceptions of the accessibility of UTA's service. The strength of the relationship between service modes used and perceived accessibility of paratransit was large with service modes used accounting for 14% of the variance of the perceptions of accessibility of UTA's services.

Follow-up tests were conducted using Tukey's HSD to evaluate pairwise differences among the means for each of the combinations of fixed route mode(s) of service used and perceived accessibility of UTA's fixed route bus services. Table 11 provides information for all means and standard deviations related to this analysis. Regarding the perceived accessibility of UTA's fixed route bus service, there were statistically significant difference between those who rode only fixed route bus (M = 4.10, SD = 1.14) and those who rode only TRAX (M = 2.64, SD = 0.93; (95% CI [0.21, 2.69][-2.69, -0.21]) (α = .011), as well as those who rode fixed route bus and TRAX (M = 2.81, SD = 1.17; 95% CI [0.23, 2.34][-2.34, -0.23])(α = .006). Survey respondents who rode only fixed route bus generally found UTA's fixed route bus to be more accessible to individuals with disabilities than respondents who rode only TRAX or a combination of fixed route bus and TRAX. Statistically significant differences were also found between those who rode only TRAX and those who rode fixed route bus and FrontRunner (M = 3.96, SD = 1.15; 95% CI [0.09, 2.53][-2.53, -0.09])(α = .026). Respondents who rode only TRAX generally found UTA's fixed route bus system to be less accessible to

individuals with disabilities than those who rode fixed route bus and FrontRunner. Respondents who rode fixed route bus and TRAX and those who ride fixed route bus and FrontRunner also had statistically significant difference in perceived accessibility (α = .018). Individuals who rode fixed route bus and TRAX generally perceived UTA's fixed route bus service to be less accessible than respondents who rode fixed route bus and FrontRunner. No other statistically significant differences were found.

Pairwise comparisons to evaluate differences among the means for each of the combinations of fixed route modes of service used and perceived accessibility of UTA's TRAX services were also conducted. Mean differences and standard deviations for this analysis can be found in Table 12. Statistically significant (α = .030) differences were identified between respondents who rode only TRAX (M = 3.06, SD = 1.24) and those who rode all modes of UTA fixed route services, including fixed route bus, TRAX, and FrontRunner (M = 4.09, SD = 1.16; 95% CI [0.06, 1.99][-1.99, -0.06])). In this case, respondents who rode all modes of UTA fixed route services generally perceived UTA's TRAX service to be more accessible to individuals with disabilities than did respondents who used only TRAX. No other statistically significant differences were identified regarding perceptions of UTA's TRAX service.

Tukey's HSD was also used to evaluate differences in perceived accessibility of UTA's FrontRunner service (see Table 13 for means and standard deviations). Respondents who rode fixed route bus and TRAX (M = 3.35, SD = 1.27) generally perceived FrontRunner to be less accessible to individuals with disabilities than respondents who used all mode of UTA's fixed route services (M = 4.22, SD = 1.15; 95%

CI [0.08, 1.97][-1.97, -0.08])), with the differences in these perceptions being statistically significant ($\alpha = .021$). No other statistically significant differences were identified regarding perceptions of UTA's FrontRunner service.

Perceived Accessibility and Frequency of Ridership

Ridership frequency was also examined to determine if the frequency with which an individual chose to ride influenced their perceptions of the accessibility of UTA services. The percent of respondents who reported using UTA's fixed route or paratransit services at certain frequencies is reported in Table 14. Mean accessibility of UTA's fixed route bus, TRAX, and paratransit services based on frequency of fixed route ridership are reported in Table 15. Because a statistically significant difference in means based on fixed route ridership frequency was found, Table 16 separately presents the mean accessibility, as well as standard deviations, for UTA's FrontRunner service. Finally, Table 17 presents the mean accessibility for all UTA modes of service based on paratransit ridership frequency.

Several one-way ANOVAs were conducted to evaluate the relationship between fixed route ridership frequency and perceived accessibility of each mode of UTA service. The independent variable, fixed route ridership frequency, included six levels: every day or almost every day, a few times a week, about once a week, a few times a month, about once a month, and about once a year. The dependent variable was perceived level of accessibility. The ANOVA for FrontRunner was significant, $F(5, 193) = 3.779$, $p = .015$. The strength of the relationship between frequency of fixed route ridership and perceived

Table 14

Percentage and Frequency of Ridership Frequency for Fixed Route and Paratransit Services

	Fixed route services		Paratransit	
Ridership frequency	%	Frequency	%	Frequency
Every day or almost every day	29.6	69	23.9	11
A few times a week	22.7	53	17.4	8
About once a week	9.9	23	10.9	5
A few times a month	21.0	49	13	6
About once a month	11.2	26	13	6
About once a year	5.6	13	21.7	10

Table 15

Mean Accessibility of Fixed Route Bus, TRAX, and Paratransit by Frequency of Fixed Route Ridership

Ridership Frequency	Fixed Route Bus	TRAX	Paratransit
Every day or almost every day	3.60	3.94	3.69
A few times a week	3.63	4.02	3.29
About once a week	3.75	3.90	3.9
A few times a month	3.51	3.74	3.76
About once a month	2.81	3.29	3.31
About once a year	2.91	3.45	4.0

Note. Based on a 5-point scale.

Table 16

Mean Accessibility, Standard Deviation of FrontRunner by Frequency of Fixed Route Ridership

Ridership frequency	Mean	*SD*
A few times a week	4.26	1.10
A few times a month	4.26	0.94
About once a week	4.15	1.09
About once a year	4.00	1.00
Every day or almost every day	3.80	1.30
About once a month	3.36	1.25

Note. Based on a 5-point scale.

Table 17

Mean Accessibility of Fixed Route Bus, TRAX, FrontRunner, and Paratransit by Frequency of Paratransit Ridership

Ridership Frequency	Fixed Route Bus	TRAX	FrontRunner	Paratransit
Every day or almost every day	2.30	3.10	3.33	3.20
A few times a week	3.75	4.38	4.29	4.50
About once a week	3.40	3.20	3.80	3.00
A few times a month	3.83	3.33	3.50	3.33
About once a month	3.67	4.50	4.50	4.33
About once a year	2.89	4.20	3.70	3.00

accessibility of UTA's FrontRunner service, as assessed by η^2, was moderate, with ridership frequency accounting for only 7.0% of the variance in perceptions of the accessibility of UTA's FrontRunner service. Tukey's HSD was used to evaluate differences in perceived accessibility of UTA's FrontRunner service. Respondents who rode fixed route services a few times a week (M = 4.15, SD = 1.09) generally perceived FrontRunner to be more accessible to individuals with disabilities than respondents who rode UTA's fixed route services about once a month (M = 3.36, SD = 1.25; 95% CI [0.08, 1.72][-1.72, -0.08]), with the differences in these perceptions being statistically significant (α = .021). ANOVAs conducted for fixed route bus, TRAX, and paratransit were not significant.

One-way ANOVAs were also conducted to evaluate the relationship between paratransit ridership frequency and perceived accessibility of each mode of UTA service. This analysis did not find any statistically significant relationships between frequency of paratransit ridership and perceptions of accessibility for any UTA mode of service.

Discussion

Statistical analyses generally indicated that members of the disability community have neutral to somewhat positive views of the accessibility of UTA's public transportation services, with UTA's FrontRunner service identified as the most accessible service ($M = 3.83$) and UTA's fixed route bus service identified as the least accessible service ($M = 3.39$). It should be noted, however, that "least accessible" in this case indicates that the measure of accessibility was nearly neutral, not necessarily that the service was either somewhat or fully inaccessible. In general, this study found that there are no UTA services which are viewed by the disability community as being somewhat or fully inaccessible to people with disabilities. This finding may imply that the current combination of services and facilities are meeting the minimum requirements set forth by the Department of Transportation ADA Standards. Some important differences in these perceptions were noted when analyzing how factors such as disability, general modes of UTA services used, specific modes of fixed route services used, and frequency of ridership impacted perceived accessibility.

Regarding primary type of disability, UTA's FrontRunner was still perceived as the most accessible UTA service for individuals with nearly all types of disabilities, except those with intellectual and developmental disabilities who identified paratransit as the most accessible UTA service. It is possible that the heightened perceived accessibility of UTA's FrontRunner service is the result of fewer accessibility barriers to using this service, a topic which will be expanded upon in greater detail in the next section. One factor worth highlighting at this point, however, is that UTA's FrontRunner service

utilizes an entirely automated stop announcement system, including visual stop announcements, and has train hosts specifically for the purpose of aiding customers with disabilities as they board and alight FrontRunner vehicles. Regarding the differences in the UTA service perceived as most accessible based on disability type, it may be that a greater portion of respondents with intellectual and developmental disabilities are using UTA's paratransit service than are using fixed route services, particularly UTA's FrontRunner service. Furthermore, it is possible that individuals with intellectual and developmental disabilities perceive paratransit service to be more accessible than other UTA services because it is a curb to curb service which, in most instances, picks up the rider at the point of their trip's origin and delivers them directly to their destination, whereas the use of all other UTA services requires a rider to travel to one or more bus stops or train stations to complete a trip. For individuals with intellectual or developmental disabilities it may be that it is not possible to travel to the bus stop or train station or successfully manage the number of transfers which may explain why UTA's curb to curb paratransit is a more accessible mode of transportation.

Unlike FrontRunner, there was less agreement based on disability type that fixed route bus was the least accessible service with only individuals with physical disabilities and those with intellectual or developmental disabilities identifying the service as the least accessible. It should be noted that respondents with physical disabilities comprised nearly 35% of survey respondents while individuals with intellectual and developmental disabilities represented 16.5% of the total sample. When combined, individuals with these disabilities represented a majority of survey respondents. This majority role may, in

turn, explain why it was possible for agreement to exist only between these two disability groups. It may also have influenced the overall statistical impact of perceptions on this mode of UTA service. Respondents with physical disabilities may have identified fixed route bus as the least accessible service because use of this service requires traveling to a bus stop, many of which aren't currently accessible to individuals who use mobility devices. Furthermore, boarding a fixed route bus requires that individuals using mobility devices board via a ramp or have the bus kneeled, both of which may make entering the vehicle challenging. Finally, once on board the bus, customers using mobility devices must have their device secured by a UTA employee which not only draws attention to the individual but also delays departure. Each of these steps must be repeated when disembarking from a fixed route bus. Thus, it may be that there are steps throughout the process of using UTA's fixed route bus which may make the service more inaccessible for individuals with physical disabilities or who use a mobility device than would be the case for those who are not similarly situated. For respondents with intellectual and developmental disabilities, it may be that fixed route bus represents the opposite rider experience when compared to using paratransit service, the UTA service individuals with this type of disability found to be most accessible. If this is the case, it makes sense that they would identify fixed route bus as the least accessible UTA service. Respondents who were blind or visually impaired, Deaf or hard of hearing, had a learning disability, or had other types of disabilities identified paratransit as the less accessible service. This perception may be linked to the requirement that paratransit rides must be scheduled at least a day in advance, whereas fixed route services do not require advance scheduling,

and the ability to use paratransit services require the individual to participate in an eligibility process which isn't required to use UTA's fixed route services. It is possible that these are more significant considerations for individuals who are blind or visually impaired, Deaf or hard of hearing, or have a learning or other type of disability. Finally, respondents with mental health disabilities and those with learning disabilities identified TRAX as the less accessible service. Although UTA's TRAX service operates on a fixed schedule and makes internal and external stop announcements at each platform, the service utilizes both high- and low-floor vehicles which may make using the service complicated for individuals with mental health or learning disabilities. Furthermore, unlike FrontRunner, fixed route bus, and paratransit services which are provided all along the Wasatch Front, UTA currently provides TRAX service in Salt Lake county. For individuals with disabilities living outside of Salt Lake county, which may include many of the survey respondents with mental illness or learning disabilities, this would certainly make using TRAX inaccessible.

This analysis also considered the role that general modes of UTA services used may have in influencing perceived accessibility. The term "general modes" referred to: (a) fixed route services only, (b) paratransit services only, (c) both fixed route and paratransit services, or (d) no UTA services. Respondents who used only fixed route services had the highest perceived accessibility of UTA's fixed route bus ($M = 3.56$), TRAX ($M = 3.81$) and FrontRunner ($M = 4.04$) services while respondents who rode only paratransit had the highest perceived accessibility of UTA's paratransit service ($M = 4.29$). On the other hand, respondents who did not use any UTA services had the lowest

perceived accessibility of UTA's fixed route bus (M = 2.76), TRAX (M = 2.61) FrontRunner (M = 2.92), and paratransit services (M = 2.83). These findings seem to indicate that use of a particular mode of UTA service positively impacts perceived accessibility whereas the lack of experience using a service may inaccurately reduce perceived accessibility. Regarding the unanimous finding that individuals who do not ride any UTA service have the lowest perceived accessibility of all UTA services, it is possible that those who do not use UTA services are not familiar with the services available in their area. In fact, several survey respondents provided written feedback that they weren't aware that UTA offered paratransit services at all. It may also be the case that UTA does not provide transportation services in their area. If this is the case, efforts by UTA to increase awareness, exposure, and use of these services would positively influence perceived accessibility by the disability community. Finally, it may be that individuals with disabilities do not use UTA services due to barriers, they are not able to access UTA's transportation services which will be discussed in more details in the following section regarding potential barriers to system access.

Additional analysis of the combination of fixed route modes used was conducted to consider whether the combination of fixed route modes each respondent influenced perceptions of accessibility. The combination of fixed route modes used were: (a) fixed route bus only, (b) TRAX only, (c) FrontRunner only, (d) bus and TRAX, (e) bus and FrontRunner, (f) TRAX and FrontRunner, or (g) all fixed route modes. Perceived accessibility of UTA's paratransit service was not included in this analysis. Respondents who rode only fixed route bus had the highest perceived accessibility of UTA's fixed

route bus service (M = 4.10). Individuals who rode all fixed route modes had the highest perceived accessibility of UTA's TRAX service (M = 4.09). The highest perceived accessibility of UTA's FrontRunner (M = 4.35) was had by respondents who rode fixed route bus and FrontRunner. These findings lend additional support to the idea that use of a particular mode of UTA services increases perceived accessibility of that service. Regarding UTA's TRAX service, it may be that, because those who had the highest perceived accessibility of this service had also used all other UTA fixed route services, they had more information about system-wide accessibility and, as a result, were able to identify TRAX as the most accessible service. It may also be the case, however, that this same group of respondents lived primarily in Salt Lake county, the only county in which TRAX service is available. Regarding the findings for UTA's FrontRunner service, it appears that, when compared to respondents who use only fixed route bus service (and thus find fixed route bus to be the most accessible service), the addition of FrontRunner use led respondents to find FrontRunner to be more accessible. There are several potential reasons for this. First, as an extension to the finding that use of a service increases perceived accessibility, it may be that having additional information about bus versus rail services helps riders identify components of rail service which are more accessible. Another reason that individuals who use fixed route bus and FrontRunner had the highest perceived accessibility of FrontRunner is that they may be using fixed route bus as a "feeder" service, or tool, to access FrontRunner. Thus, and as may have been the case regarding the perceived accessibility of TRAX, it may be that exposure to fixed route bus gave these individuals more information about the breadth of services offered

by UTA, making it easier to identify FrontRunner as the most accessible service. It appears that there may also be something unique to UTA's rail services, specifically UTA's FrontRunner service, which individuals with disabilities find more accessible as the respondents who found UTA's TRAX and FrontRunner services both used FrontRunner. There were also interesting differences in specific fixed route service modes used and perceived accessibility. Respondents who rode only TRAX had the lowest perceived accessibility of UTA's fixed route bus service ($M = 2.64$) and TRAX ($M = 3.06$) services. Respondents who rode both fixed route bus and TRAX had the lowest perceived accessibility of UTA's FrontRunner service ($M = 3.35$). As with the analysis regarding general service modes used, it appears that the lack of use of a service is indicative of lower perceived accessibility, except for UTA's TRAX service where individuals who used that service also have the lowest perceived accessibility of the service. It may be that a lack of service availability or familiarity with services that are available may contribute to these reduced perceptions of fixed route bus and FrontRunner. This would not be the case, however, for TRAX as those with the lowest perceived accessibility of the service are also users of the service. In this case, it appears that there is something specific to UTA's TRAX service that riders find inaccessible. There are several potential reasons for this reduction in perceived accessibility as a result of service use. First, unlike UTA's fixed route bus and FrontRunner services which use essentially the same model of vehicle on all routes, UTA's TRAX service uses both high- and low-floor trains. High-floor trains are generally used on UTA's Blue line TRAX service, while low-floor trains are generally used on the Red and Green line services.

Unlike the low-floor train cars where customers can independently press a button on the exterior of the car to board the train and are able to board directly from the floor of the TRAX platform, individuals wishing to use UTA's high-floor train must board on a separate high-block and must rely on the TRAX operator to manually deploy the ramp. Furthermore, where each car on a low-floor train consist has a ramp and is, therefore, accessible to individuals with disabilities, only one car on a high-floor train consist is accessible with a ramp thus limiting the number of individuals with disabilities who may ride on the train at any given time. These two potential issues may increase the confusion of using the TRAX system which, in turn, would decrease the accessibility of the TRAX service. This finding lends additional support to the idea that people with disabilities higher perceived accessibility of UTA's rail services is specific to FrontRunner and does not extend to TRAX.

The final factor considered was whether the frequency with which respondents rode UTA's services influenced perceived accessibility of each service. Respondents who rode UTA fixed route services about once a week had the highest perceived accessibility of UTA's fixed route bus service ($M = 3.75$), while those who rode a few times a week had the highest perceived accessibility of TRAX ($M = 4.02$) and FrontRunner ($M = 4.26$), shared with those who rode a few times a month. Respondents who rode UTA's fixed route services about once a year had the highest perceived accessibility of paratransit services ($M = 4.00$). On the other hand, respondents who rode UTA fixed route services about once a month had the lowest perceived accessibility of UTA's fixed route bus service ($M = 2.81$), TRAX ($M = 3.29$), and FrontRunner ($M = 3.36$). Respondents who

rode UTA's fixed route services a few times a week had the lowest perceived accessibility of paratransit services (*M* = 3.29). This variation in means doesn't seem to indicate any particular trend which may indicate that the frequency with which individuals with disabilities ride UTA's fixed route services has little impact on perceived accessibility, an idea supported by the statistical analyses for this factor which identified very few statistically significant differences were found in perceived accessibility based on frequency of ridership and that those few were limited to UTA's FrontRunner service. It is also worth mentioning that, even among the "least accessible" services based on fixed route ridership frequency, the mean was generally somewhere between neutral, or a score of 3 on a 5-point scale, and somewhat accessible, or a score of 4 on a 5-point scale. This would seem to add further evidence in support of the idea that fixed route ridership frequency has a limited influence on perceived accessibility. For paratransit ridership, those who rode a few times a month had the highest perceived accessibility of UTA's fixed route bus service (*M* = 3.83). Those who rode paratransit about once a month had the highest perceived accessibility of TRAX (*M* = 4.50) and FrontRunner (*M* = 4.50). Regarding UTA's paratransit service, those who rode paratransit a few times a week had the highest perceived accessibility (*M* = 4.50) of the paratransit service. On the other hand, those who rode UTA's paratransit service every day or almost every day had the lowest perceived accessibility of UTA's fixed route bus service (*M* = 2.30), TRAX (*M* = 3.10), and FrontRunner (*M* = 3.33). Regarding UTA's paratransit service, those who rode paratransit about once a week and about once a year had the lowest perceived accessibility (*M* = 3.00). Among these mean accessibility scores, it is interesting to note

that the mean perceived accessibility score for UTA's fixed route bus service is the first mean which was closer to somewhat inaccessible. However, as with fixed route ridership, there doesn't appear to be a clear trend that would indicate frequency of paratransit ridership influences perceived accessibility of each UTA services, a finding that is supported by the statistical analysis process which did not identify any statistically significant differences in means based on paratransit ridership frequency. Regarding the results for both fixed route and paratransit ridership frequency, it should be noted that survey respondents were able to respond to questions about the general accessibility of each UTA service regardless of whether they had used the service in the past, so, although the data were controlled to screen out respondents who indicated they did not have an opinion about how accessible each service was, it is possible that individuals who had not used each service provided a response which may have influenced mean scores. It is not clear, however, in which direction this would have influenced the results.

Some of these differences based on disability type, modes of services used in general, modes of fixed route services used, and frequency of ridership were found to be statistically significant. Of these factors, service mode used (fixed route, paratransit, fixed route and paratransit, no use of UTA services) and, more specifically, the combination of fixed route service modes used, appear to have the most significant influence on perceptions of the accessibility of UTA's public transportation system. Put another way, the modes of service used explain a greater percentage of the variance in accessibility perceptions than do either disability type or frequency of ridership. For example, analyses by general modes of services used identified statistically significant relationships for all

four modes of service (fixed route bus, TRAX, FrontRunner, and paratransit), resulting in five statistically significant differences. It should be noted that four of these five differences were between individuals who rode one or more modes of UTA services and respondents who did not use any UTA service. The analyses for the combination of fixed route modes used found significant relationships for fixed route bus, TRAX, and FrontRunner, resulting in six statistically significant differences. By comparison, the analyses for disability type and ridership frequency had only one statistically significant difference each. Thus, it appears that using (or not using) UTA services, as well as the modes of UTA services used, have the greatest influence on perceived accessibility of UTA service modes.

Accessibility Barriers

To address the second research question, and better understand whether individuals with disabilities encounter barriers when using UTA's public transportation system and, if barriers were encountered, how these barriers influenced perceptions of the accessibility of UTA's fixed route and paratransit services, participants responded to questions regarding potential transportation barriers, ranking each potential barrier on a scale from 1 to 5, with 1 being "inaccessible" and 5 being "accessible." Table 18 provides the percentage and frequency of responses for each level of accessibility on a variety of potential barriers related to fixed route services, while Table 19 provides the mean perception of accessibility for each barrier. Tables 20 and 21 provides similar information, but regarding potential paratransit barriers.

Table 18

Percentage and Frequency of Level of Perceived Accessibility Responses for Fixed Route Services

	Level of perceived accessibility									
	Inaccessible		Somewhat inaccessible		Neutral		Somewhat accessible		Accessible	
Potential accessibility barriers	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency
How many days the buses or trains run	3.0	7	12.6	29	12.6	29	21.7	50	50.0	115
The hours the buses or trains run	4.8	11	17.8	41	12.2	28	26.5	61	38.7	89
The number of transfers you will need to make to finish your trip	8.0	18	19.0	43	22.6	51	23.0	52	27.4	62
Cost	7.0	15	12.7	27	25.4	54	13.6	29	41.3	88
Knowing how to use buses or train	4.3	10	18.6	43	11.3	26	24.7	57	41.1	95
Past experiences riding buses or trains	6.1	14	16.6	38	12.7	29	27.5	63	37.1	85
Service quality	4.3	10	10.0	23	22.6	52	19.1	44	43.9	101
Stop announcements	11.4	26	21.0	48	15.3	35	20.1	46	32.3	74
Personal safety	6.5	15	17.7	41	18.2	42	20.8	48	36.8	85
Distance to or from the bus stop or train station	9.6	22	17.7	58	18.2	28	20.8	58	36.8	64
Sidewalks, curb ramps, or crosswalks on the way to the stop/station	11.0	25	20.3	46	17.6	40	17.2	39	33.9	77
Information about potential barriers on the way to the stop/station	21.9	48	28.3	62	20.1	44	14.6	32	15.1	33
Bus stop or train station accessibility	7.4	17	16.2	37	17.0	39	23.6	54	35.8	82
Ability to get on or off the bus or train	4.8	11	11.9	27	12.8	29	21.6	49	48.9	111
Whether the bus or train's lift, ramp, or bridge plate is working	4.0	7	9.1	16	23.9	42	21.0	37	42.0	74
Having enough accessible seats on the bus, including securement locations	9.6	20	14.4	30	17.3	36	19.2	40	39.4	82
Having enough accessible seats on the train	10.5	22	14.3	30	14.3	30	18.6	39	42.4	89
Ability to have my mobility device secured how I like	7.2	10	16.5	23	28.8	40	18.8	25	29.5	41
Ability to fit my mobility device on the bus or train	9.0	13	17.2	25	25.5	37	11.7	17	36.6	53
Driver attitude, assistance or knowledge	5.2	11	17.0	36	18.9	40	20.8	44	28.2	81
Attitudes of other riders	9.0	20	17.6	39	27.1	60	22.2	49	24.0	53
Ability to accommodate my service animal	12.5	12	21.9	21	34.4	33	10.4	10	20.8	20

Note. Based on a 5-point scale.

Table 19

Mean Accessibility and Standard Deviation of Fixed Route Barriers

Potential accessibility barrier	Mean	*SD*
How many days the buses or trains run	4.03	1.19
Ability to get on or off the bus or train	3.98	1.24
Service quality	3.88	1.20
Whether the bus or train's lift, ramp, or bridge plate is working	3.88	1.17
Knowing how to use buses or train	3.80	1.27
The hours the buses or trains run	3.77	1.27
Past experiences riding buses or trains	3.73	1.28
Driver attitude, assistance or knowledge	3.70	1.28
Cost	3.69	1.31
Having enough accessible seats on the train	3.68	1.41
Bus stop or train station accessibility	3.64	1.31
Having enough accessible seats on the bus, including securement locations	3.64	1.38
Personal safety	3.64	1.31
Ability to fit my mobility device on the bus or train	3.50	1.37
Ability to have my mobility device secured how I like	3.46	1.27
Sidewalks, curb ramps, or crosswalks on the way to the stop/station	3.43	1.41
The number of transfers you will need to make to finish your trip	3.43	1.29
Stop announcements	3.41	1.41
Distance to or from the bus stop or train station	3.37	1.37
Attitudes of other riders	3.34	1.27
Ability to accommodate my service animal	3.05	1.29
Information about potential barriers on the way to the stop/station	2.73	1.36

Note. Based on a 5-point scale.

The information in Table 18 indicates that the top five fixed route service factors survey respondents found to make UTA services accessible to individuals with disabilities were how many days the buses or trains run (115 responses), ability to get on or off the bus or train (111), service quality (101), knowing how to use buses or trains (95), and having enough accessible seats on the train (89 respondents). This pattern was generally supported by the mean accessibility scores, found in Table 19, which ranked

Table 20

Percentage and Frequency of Level of Perceived Accessibility Responses for Paratransit

	Level of perceived accessibility									
	Inaccessible		Somewhat inaccessible		Neutral		Somewhat accessible		Accessible	
Potential accessibility barriers	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency
How many days paratransit runs	8.2	5	14.8	9	9.8	6	21.3	13	45.9	28
The hours that paratransit services run	14.8	9	13.7	8	9.8	6	18	11	44.3	27
Cost	18.0	11	19.7	12	19.7	12	13.1	8	29.5	18
Knowing how to use paratransit	16.7	10	10.0	6	11.7	7	21.7	13	40.0	24
Past experiences riding paratransit	11.7	7	11.7	7	25.0	15	11.7	7	40.0	24
Service quality	14.8	9	6.6	4	18.0	11	18.0	11	42.6	26
Personal safety	8.2	5	6.6	4	9.8	6	29.5	18	45.9	28
Distance to or from service point	13.8	8	25.9	15	13.8	8	19.0	11	27.6	16
Sidewalks, curb ramps, or crosswalks on the way to the service point	10.3	6	24.1	14	15.5	9	12.1	7	37.9	22
Information about potential barriers on the way to the service point	19.6	11	35.7	9	21.4	12	14.3	8	28.6	16
Ability to get on or off the paratransit vehicle	6.7	4	3.3	2	3.3	2	16.7	10	70.0	42
Lift not working on the paratransit vehicle	16.3	7	7.0	3	27.9	12	16.3	7	32.6	14
Ability to have my mobility device secured how I like	8.3	3	6.3	4	12.5	7	16.7	6	56.3	28
Ability to fit my mobility device on the paratransit vehicle	6.3	3	8.3	4	14.6	7	12.5	6	58.3	28
Driver attitude, assistance or knowledge	13.1	8	8.2	5	19.7	12	9.8	6	49.2	30
Attitudes of other riders	6.8	4	5.1	3	27.1	16	16.9	10	44.1	26
Ability to accommodate my service animal	13.8	4	3.4	1	41.4	12	20.7	6	20.7	6
Scheduling paratransit rides	18.3	11	28.3	17	6.7	4	13.3	8	33.3	20
Driver arriving outside of the pick-up window	16.1	9	32.1	18	16.1	9	17.9	10	17.9	10
Length of the paratransit ride time	19.7	12	23.0	14	16.4	10	18.0	11	23.0	14
No-show/late cancellation policy	22.4	13	19.0	11	22.4	13	15.5	9	20.7	12
Ability to qualify for paratransit services	16.7	10	11.7	7	18.3	11	15.0	9	38.3	23
Paratransit eligibility process	21.7	13	13.3	8	13.3	8	13.3	8	38.3	23

Note. Based on a 5-point scale.

Table 21

Mean Accessibility, Standard Deviation of Paratransit Barriers

Potential accessibility barrier	Mean	*SD*
Ability to get on or off the paratransit vehicle	4.40	1.15
Ability to fit my mobility device on the paratransit vehicle	4.08	1.28
Ability to have my mobility device secured how I like	4.06	1.31
Personal safety	3.98	1.26
Attitudes of other riders	3.86	1.24
How many days paratransit runs	3.82	1.37
Driver attitude, assistance or knowledge	3.74	1.47
Service quality	3.67	1.46
The hours that paratransit services run	3.64	1.52
Knowing how to use paratransit	3.58	1.51
Past experiences riding paratransit	3.57	1.42
Ability to qualify for paratransit services	3.47	1.51
Sidewalks, curb ramps, or crosswalks on the way to the service point	3.43	1.46
Lift not working on the paratransit vehicle	3.42	1.44
Paratransit eligibility process	3.33	1.61
Ability to accommodate my service animal	3.31	1.26
Distance to or from service point	3.21	1.45
Cost	3.16	1.50
Information about potential barriers on the way to the service point	3.16	1.50
Scheduling paratransit rides	3.15	1.58
Length of the paratransit ride time	3.02	1.47
Length of the paratransit ride time	3.02	1.47
Driver arriving outside of the pick-up window	2.89	1.37

Note. Based on a 5-point scale.

how many days the buses or trains run ($M = 4.03$) as the most accessible factor, followed by ability to get on or off the bus or train ($M = 3.98$), service quality ($M = 3.88$), whether the bus or train's lift, ramp, or bridge plate is working ($M = 3.88$), and knowing how to use the buses or trains ($M = 3.80$). This data would seem to indicate that the current daily schedule and quality of service provided on these days make using UTA's fixed route services somewhat accessible for members of the disability community. This finding is

particularly interesting because previous research conducted by Bezyak et al. (2017) identified inadequate transit systems as a key barrier for individuals with disabilities, while TransSystems Corporation (2014) similarly found that fixed-route transit not running often enough as a key reason some individuals with disabilities do not use fixed route transportation services. Assuming the concepts of inadequate transit systems and fixed-route transit no running often enough incorporate factors such as the days that service is provided and the overall quality of the transportation service, it would appear that individuals with disabilities have a different, more accessible, view of UTA's system that was seen in the national studies conducted by Bezyak et al. and TransSystems Corporation. Data for the current study also indicated that UTA's current bus and rail fleet have some components that make using fixed route somewhat accessible. As shown in Table 20, for paratransit services the top five factors survey respondents identified as making UTA's paratransit service accessible were ability to get on or off the paratransit vehicle (42 respondents), driver attitude, assistance or knowledge (30), personal safety (28), ability to have my mobility device secured how I like (28), and ability to fit my mobility device on the paratransit vehicle (28 respondents). As with fixed route factors, the pattern seen based on frequencies generally held true when considering mean accessibility scores of paratransit factors. The factor with the highest mean accessibility score was ability to get on or off the paratransit vehicle ($M = 4.40$) followed by ability to fit my mobility device on the paratransit vehicle ($M = 4.08$), ability to have my mobility device secured how I like ($M = 4.06$), personal safety ($M = 3.98$), and attitudes of other riders ($M = 3.86$). Like the data for fixed route services, it appears that the vehicles used

by UTA to provide paratransit service are a strength in making that service accessible for individuals with disabilities. Unlike fixed route services, however, it appears that drivers of UTA's paratransit service play an important role in making this service accessible. This would seem to make sense inasmuch as individuals using UTA's paratransit service have a more individualized riding experience that includes direct interaction with the driver whereas fixed route services operate on specific routes with specific timepoints and serve a larger number of customers which makes one-on-one interactions less likely.

There were also several factors that survey respondents indicated made using UTA's fixed route services inaccessible. According to the frequency of survey responses, the current level of information about potential barriers on the way to the stop/station (48 responses) is the factor that made UTA's services least accessible to individuals with disabilities, followed by stop announcements (26), sidewalks, curb ramps, or crosswalks on the way to the stop/station (25), distance to or from the bus stop or train station (22), and having enough accessible seats on the train (22 responses). Mean accessibility scores mirrored these issues with information about potential barriers on the way to the stop/station and the most problematic barrier ($M = 2.73$). Additional factors based on mean accessibility scores included ability to accommodate my service animal ($M = 3.05$), attitudes of other riders ($M = 3.34$), distance to or from the bus stop or train station ($M = 3.37$) and stop announcements ($M = 3.41$). It appears that the key barriers to using UTA's fixed route systems relate to barriers in the pedestrian environment which, if removed, may increase the perceived accessibility of UTA's fixed route services. As researchers with TransSystems found in 2014, barriers in the pedestrian environment are one of the

primary reasons individuals with disabilities do not use fixed route services, instead relying on costlier paratransit services to meet their transportation needs. When considering the TransSystems (2014) findings in the context of the current study, it appears that, in addition to improving perceived accessibility, reducing barriers in the pedestrian environment may also increase fixed route ridership among members of the disability community. Similar to the findings from a national study by Bezyak et al. (2017), barriers in the pedestrian environment, which could include a lack of sidewalks, curb ramps, or crosswalks (referred to as "no accessible route to stop/station in the Bezyak et al. study), represent a significant barrier for individuals with disabilities in the UTA service area. This would seem to indicate that this barrier is not unique to UTA and likely exists nationally. Respondents who rode UTA's paratransit services identified the agencies no-show/late cancellation policy, as well as the paratransit eligibility process, as the factors that made the service least accessible (13 respondents). Additional factors influencing the accessibility of UTA's paratransit service included length of paratransit ride times (12), information about potential barriers on the way to the service point (11), and scheduling paratransit rides (11 respondents). Mean accessibility score identified drivers arriving outside of the pick-up window (M = 2.89) as the factor which made using UTA's paratransit service least accessible, followed by the no-show/late cancellation policy (M = 2.93), length of the paratransit ride time (M = 3.02), scheduling paratransit rides (M = 3.15), information about potential barriers on the way to the service point (M = 3.16), and cost (M = 3.16). Based on mean accessibility scores, the only barriers which fell into the somewhat inaccessible range were arriving outside of the pick-up window

and no-show/late cancellation policy. Mean scores for all other barriers which are identified as "least accessible" indicate generally neutral feelings regarding perceived accessibility on these issues. The identification of pick-up window and no-show policy issues mirrors study findings from Bezyak et al., which similarly identified these as issues for individuals with disabilities nationally. While issues with pick-up window arrival times may be able to be managed at the local level via improved technology for routing paratransit vehicles, the Federal Transit Administration has established specific guidelines public transportation agencies must follow regarding no-show and late cancellation policies for complementary paratransit services. It appears that policy efforts to ensure equitable enforcement of no-show and late cancellation policies may have had the unintended effect of making paratransit service less accessible for some of the individuals the service is intended to support. It is possible, however, that the impact of this federal mandate has improved since the data collected by Bezyak and colleagues in 2009 as this requirement was not formalized by the FTA until 2015. Therefore, the measures from the current study may be a more accurate representation of the impact of this federal requirement than was the case for the results of the Bezyak and colleagues' study. Unlike the study by Bezyak et al., which identified scheduling problems as a top barrier encountered by individuals with disabilities nationally, individuals who used UTA's paratransit service had generally neutral feelings about this potential barrier. This would seem to indicate that UTA may be approaching the process of scheduling paratransit rides in a manner than is more accessible than other transportation agencies in the U.S. Thus, although this potential barrier is identified as a less accessible component

of the UTA paratransit service based on a ranking of mean accessibility scores, it appears that it may be a strength of the UTA system inasmuch as UTA customer have a higher perception of the accessibility of the scheduling process than customers do nationally.

In addition to descriptive statistics, further statistical analyses were conducted to determine if statistically significant differences in barriers, and perceived accessibility based on these barriers, existed due to factors such as disability type, modes of services used, and frequency of ridership.

Differences in Perceived Barriers and Disability Type

Several one-way ANOVAs were conducted to determine if statistically significant relationships existed between a respondent's disability and the extent to which potential barriers make using UTA's fixed route services accessible for individuals with disabilities. The independent variables for this analysis was primary type of disability. The dependent variable for each analysis was the accessibility of each of the listed barriers as related to using UTA's fixed route services. Mean accessibility scores, as well as standard deviations, for this comparison can be found in Table 22. A total of nine statistically significant relationships were identified through this analysis. First, the ANOVA for the barrier "number of transfers you will have to make" was significant, $F(6, 219) = 2.31$, $p = .035$. The strength of the relationship, as assessed by η^2, was moderate with disability type accounting 6% of the variance in perceptions of the impact that transfers have on the accessibility of UTA's fixed route services. Follow-up tests were conducted using Tukey's HSD to evaluate pairwise differences among the means for each

Table 22

Mean Accessibility, Standard Deviations for Fixed Route Accessibility Barriers by Disability Type

	Disability types													
	Physical disability		Blindness		Deafness		ID/DD		Learning disability		Mental health		Other	
Potential accessibility barriers	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
How many days the buses or trains run	4.15	1.05	4.07	1.22	3.79	1.32	4.00	1.11	3.67	1.53	4.24	1.03	3.73	1.52
The hours the buses or trains run	3.77	1.21	3.68	1.25	3.84	1.12	4.00	1.24	3.78	1.44	3.82	1.25	3.43	1.56
The number of transfers you will need to make to finish your trip[a]	3.25	1.32	3.29	1.27	3.44	1.24	3.46	1.21	3.50	1.38	4.08	1.04	3.05	1.40
Cost[a]	3.62	1.33	3.92	1.26	3.59	1.37	3.26	1.13	3.94	1.43	4.27	1.15	3.20	1.36
Knowing how to use buses or train	3.95	1.28	3.71	1.30	3.63	1.30	3.41	1.37	4.11	1.45	4.03	1.01	3.35	1.23
Past experiences riding buses or trains[a]	3.58	1.33	3.96	1.17	3.84	1.43	3.89	0.97	3.94	1.31	4.05	1.10	2.95	1.46
Service quality	3.79	1.23	3.89	1.25	3.84	1.21	4.00	0.83	4.00	1.37	4.13	1.12	3.57	1.44
Stop announcements[a]	3.62	1.34	2.79	1.40	2.11	1.28	3.41	1.31	4.00	1.41	3.89	1.28	3.26	1.39
Personal safety	3.54	1.34	3.89	1.22	3.32	1.42	3.33	1.78	3.67	1.37	4.16	1.20	3.39	1.37
Distance to or from the bus stop or train station	3.24	1.34	3.64	1.31	3.33	1.37	3.37	1.33	3.61	1.46	3.68	1.23	2.74	1.60
Sidewalks, curb ramps, or crosswalks on the way to the stop/station[a]	3.26	1.43	3.04	1.55	3.33	1.33	3.30	1.33	4.17	1.38	4.17	0.97	2.95	1.50
Information about potential barriers on the way to the stop/station[a]	2.65	1.34	2.13	1.12	3.00	1.28	2.76	1.20	3.47	1.59	3.06	1.39	2.27	1.35
Bus stop or train station accessibility	3.56	1.31	3.54	1.43	3.35	1.32	3.56	1.28	4.22	1.31	4.00	1.12	3.30	1.43
Ability to get on or off the bus or train	3.69	1.31	4.22	1.28	4.00	1.24	3.96	1.09	4.11	1.32	4.38	0.98	3.91	1.31

(*table continues*)

	Disability types													
	Physical disability		Blindness		Deafness		ID/DD		Learning disability		Mental health		Other	
Potential accessibility barriers	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Whether the bus or train's lift, ramp, or bridge plate is working[a]	3.77	1.15	4.00	0.97	3.45	1.37	3.96	0.98	4.47	1.19	4.32	1.04	3.40	1.39
Having enough accessible seats on the bus, including securement locations[a]	3.34	1.44	3.90	1.18	3.67	1.29	4.00	1.10	4.18	1.29	4.00	1.32	3.09	1.51
Having enough accessible seats on the train[a]	3.35	1.46	3.62	1.60	3.59	1.37	3.96	1.02	4.41	1.23	4.12	1.20	3.43	1.53
Ability to have my mobility device secured how I like	3.42	1.35	3.45	0.93	3.11	1.27	3.81	1.17	4.20	1.32	3.58	1.24	2.86	1.03
Ability to fit my mobility device on the bus or train	3.42	1.43	4.00	1.04	3.20	1.23	3.41	1.28	4.20	1.32	3.62	1.50	3.07	1.44
Driver attitude, assistance or knowledge	3.72	1.31	3.74	0.94	3.67	1.45	3.73	1.08	4.33	1.40	3.72	1.30	3.13	1.42
Attitudes of other riders	3.31	1.28	3.11	1.23	3.28	1.45	3.27	1.15	4.00	1.37	3.53	1.31	3.13	1.06
Ability to accommodate my service animal	2.91	1.15	3.33	1.12	3.00	1.51	3.00	0.95	3.88	1.81	2.92	1.55	2.91	1.38

[a] Statistically significant difference in means.

type of disability and the extent to which transfers influence perceived accessibility of UTA's services. There was a statistically significant difference between individuals with physical disabilities, including mobility impairments (M = 3.25, SD = 1.32), and those with mental health disabilities (M = 4.08, SD = 1.04; 95% CI [0.08, 1.59][-1.59, -0.08]) (α = .019). Survey respondents with physical disabilities generally indicated that the number of transfers a trip might require made using UTA services neutral, though leaned toward slight accessibility, while individuals with mental health disabilities reported that the number of transfers made using UTA services somewhat accessible. A significant difference also existed between individuals with mental health disabilities and those with other types of disabilities (M = 3.05, SD = 1.40; 95% CI [0.02, 2.05][-2.05, -0.02])(α = .042), with the relationship between individuals with these types of disabilities nearly mirroring the relationship between individuals with physical disabilities and those with mental health disabilities. The implication is that the number of transfers is a larger concern for individuals with physical disabilities and other types of disabilities than for individuals with mental health disabilities. This is somewhat intuitive as individuals with physical disabilities are more likely to use a mobility device which may make the process of boarding and exiting multiple UTA bus or rail vehicles more difficult that may be the case for an individual who does not use a mobility device. It should be noted, however, that significant differences among this group were really focused on a difference between those with neutral views of accessibility on this factor and those with somewhat accessible views. This may be an indication that, although there were statistically significant differences, in general it does not appear that the number of transfers required

to complete a trip makes using UTA's services inaccessible for individuals with physical disabilities, mental health disabilities, or other types of disabilities. No other significant differences were identified for this barrier. The lack of additional statistically significant differences would also appear to indicate that the number of transfers required to complete a trip using UTA services does not make using the system inaccessible for individuals with any type of disability.

Statistically significant differences were also found for the barrier "cost," $F(6, 206) = 2.423$, $p = .028$. The strength of the relationship was moderate with disability type accounting for 6.6% of the variance in perceptions of cost influences perceptions of UTA's fixed route transportation services. Tukey's post hoc analysis identified a significant difference between individuals with intellectual and developmental disabilities ($M = 3.26$, $SD = 1.13$) and individuals with mental health disabilities ($M = 4.27$, $SD = 1.1$; 95% CI [0.02, 2.01][-2.01, -0.02]5)($\alpha = .043$). Respondents with intellectual and developmental disabilities generally viewed cost as making UTA services less accessible than respondents with mental health disabilities. While it is true that many members of the disability community are unemployed or underemployed, resulting in limited economic resources, this is especially true for those with intellectual and developmental disabilities which may contribute to cost being a greater concern for individuals with intellectual and developmental disabilities than those with other types of disabilities. Once again, however, it should be noted that the mean score for individuals with intellectual and developmental disabilities was essentially neutral indicating that the cost of fixed route service makes the service neither accessible nor inaccessible. Significant

differences weren't identified for any other comparison based on disability type. As with the previous barrier, the limited number of statistically significant differences, coupled with the neutral to somewhat accessible views of the potential barrier "cost" would seem to indicate that the current cost of UTA's fixed route services do not make using the system inaccessible for individuals with disabilities, at least when considering this barrier at the level of primary type of disability.

The barrier "past experiences riding buses or trains" was significant, $F(6, 222) = 2.330$, $p = .033$, and the strength of the relationship between primary type of disability and the role that past experiences play in perceived accessibility was small, accounting for just 5.9% of the variance in this relationship. Post hoc testing identified a significant difference between individuals with mental health disabilities ($M = 4.05$, $SD = 1.10$) and those with other types of disabilities ($M = 2.95$, $SD = 1.46$; 95% CI [0.09, 2.11][-2.11, -0.09]) ($\alpha = .023$). As with the "cost" barrier discussed previously, individuals with mental health disabilities had generally more positive views of this potential barrier than respondents with other types of disabilities as it pertains to the accessibility of UTA services. Interestingly, this is the first barrier with a significant difference in perceived accessibility in which one of the disability groups, those with other types of disabilities, on average viewed the barrier as less than neutral and tended toward indicating that UTA services were somewhat inaccessible as a result of the past experiences barrier. No other statistically significant differences were identified.

ANOVA analysis indicated that there are statistically significant differences for the barrier "stop announcements," $F(6, 222) = 5.607$, $p = .000$. The strength of the

relationship between this barrier and disability type was medium to large, with disability type explaining 13.2% of the variance in perceived accessibility of this barrier. Follow up testing identified several statistically significant differences in how the barrier "stop announcements" impacts the accessibility of UTA's fixed route services. First, a significant difference between respondents with physical disabilities (M = 3.62, 1.34) and those who were Deaf or hard of hearing (M = 2.11, SD = 1.29; 95% CI [0.47, 2.54][-2.54, -0.47]) was identified (α = .000). Respondents with physical disabilities viewed stop announcements as less of a barrier to accessing UTA's services than did respondents who were Deaf or hard of hearing. This might be expected as individuals with physical disabilities likely do not face barriers in hearing stop announcements, a significant barrier for those who are unable to hear the stop announcement. Notably, the mean for responses from individuals who were Deaf was at the low end of making services somewhat inaccessible, bordering on making the system completely inaccessible which was among the lowest accessibility scores among all analyses conducted for this survey. In general, UTA only provides audible stop announcements on fixed route bus while providing both audible and visual announcements on TRAX and FrontRunner. This finding seems to indicate that the lack of visual stop announcements on fixed route bus service is among the least accessible components of UTA current services. Another statistically significant difference was identified between survey respondents who are blind or have visual impairments (M = 2.79, SD = 1.40) and those with mental health disabilities (M = 3.89, SD = 1.25; 95% CI [0.12, 2.10][-2.10, -0.12])(α =.017). Individuals who were blind or visually impaired saw UTA's current stop announcement program as making use of the

organization's public transportation services less accessible that did respondents with mental health disabilities. This may be because individuals who are blind or visually impaired rely entirely on audible stop announcements to orient themselves to their location in the UTA system where individuals with mental health disabilities are more likely to be able to rely on visual cues for system orientation. UTA's currently provides audible stop announcements at all TRAX and FrontRunner stations, but only provides audible stop announcements on the fixed route bus service at major intersections, transfer points to another route or service, destinations along the route, and upon specific request in accordance with the DOT ADA standards. Though UTA complies with the ADA minimum requirements, it appears that the current stop announcement protocols for fixed route bus may be problematic for riders who are blind or visually impaired. Several additional relationships between individuals who are Deaf or hard of hearing and those with intellectual or developmental disabilities (M = 3.41, SD = 1.31; 95% CI [0.09, 2.50][-2.50, -0.09])(α = .027), those with learning disabilities (M = 4.00, SD = 1.41; 95% CI [0.47, 2.54][-2.05, -0.02])(α = .001), and those with mental health disabilities (M = 3.89, SD = 1.25; 95% CI [0.54, 2.92][-2.92, -0.65])(α = .000) were identified. As compared to individuals who are Deaf or hard of hearing, respondent with intellectual or developmental disabilities, learning disabilities, and mental health disabilities all viewed stop announcements as less of a barrier to using UTA's public transportation services than did respondents who were Deaf or hard of hearing. As was previously noted, these differences may be due to the lack of audible announcements. The results of the post hoc analyses for the "stop announcement" barrier seem to indicate that individuals with

sensory-related disabilities view current stop announcement practices as a more significant barrier than respondents with most other types of disabilities. Furthermore, these findings seem to indicate that improvements to both the audible and visual components of the current UTA stop announcement protocol would greatly improve system accessibility.

Disability type also had a statistically significant influence on the barrier "sidewalks, curb ramps, or crosswalks," $F(6, 220) = 3.724$, $p = .002$. In this case, the relationship between disability type of accessibility of the "sidewalks, curb ramps, or crosswalks" barrier was moderate, explaining 9.2% of the variance in how accessible this barrier made using UTA's services. Tukey's HSD post hoc analyses identified significant relationships between individuals with mental health disabilities ($M = 4.17$, $SD = 0.97$) and those with physical disabilities ($M = 3.26$, $SD = 1.43$)($\alpha = .019$; 95% CI [0.09, 1.73][-1.73, -0.09]), as well as those who are blind or visually impaired ($M = 3.04$, $SD = 1.55$; 95% CI [0.11, 1.73][-1.73, -0.11])($\alpha = .020$). As compared to individuals with mental health disabilities, respondents with physical disabilities or who were blind or visually impaired viewed sidewalks, curb ramps, or crosswalks as a more significant barrier to using UTA's fixed route services. This might be expected as individuals with physical disabilities, especially those who use mobility devices, often require the use of sidewalks, curb ramps, and crosswalks to provide an unobstructed, level surface to gain access to a bus stop or train station; the absence of these accessibility features would make accessing a UTA facility extremely difficult if not impossible. Individuals who are blind or visually impaired may use these features in the pedestrian environment for navigation purposes,

allowing individuals who are blind or visually impaired to run their cane along these features to orient them to their location. As with the previous barriers, it should be noted that a mean score at or near 3 indicates generally neutral perceived accessibility. For this barrier, the indication is that individuals with physical disabilities and those who are blind or visually impaired view the accessibility of sidewalks, curb ramps, or crosswalks in neutral terms while those with mental health disabilities, who are less likely to require a smooth, stable surface or tactile accessibility features, view this potential barrier as making access to UTA's fixed route services somewhat accessible. No other significant relationships based on disability type were identified.

Analysis of survey responses found a statistically significant relationship between disability type and the barrier "information about potential barriers on the way to the bus stop or train station," $F(6, 212) = 2.685$, $p = .016$. The strength of the relationship was moderate, with disability type explaining 7.1% of the variance in how accessible information about potential barriers makes using UTA's services. Follow up testing identified a significant difference ($\alpha = .026$) between respondents who were blind or visually impaired ($M = 2.13$, $SD = 1.12$) and those with a learning disability ($M = 3.47$, $SD = 1.59$; 95% CI [0.09, 2.60][-2.60, -0.09]). Individuals who are blind or visually impaired reported that the information about potential barriers in the path to a UTA bus stop or train station makes using the system less accessible than was reported by respondents with learning disabilities. Presumably the lower accessibility score given by individuals who are blind or visually impaired indicates that there is a lack of information about possible barriers currently being provided. No other statistically significant

differences in the role that barrier information plays in perceptions of accessibility were identified.

Another statistically significant relationship was found between disability type and the barrier "whether the bus or train's lift, ramp, or bridge plate is working," $F(6, 169) = 2.172$, $p = .048$. The strength of this relationship, as assessed by η^2, was moderate with disability type explaining 7.2% in the variance in responses to the impact of lift, ramp, or bridge plate functionality on the perceived accessibility of UTA's services. A significant relationship was also identified for the barrier "having enough accessible seats on the bus, including securement locations" was also identified, $F(6, 201) = 2.494$, $p = .024$. The strength of this relationship was moderate with disability type explaining 6.9% of the variance in the role that accessible seating on buses plays in the perceived accessibility of UTA's services. Finally, ANOVA results identified a statistically significant relationship between disability type and the barrier "having enough accessible seats on the train," $F(6, 203) = 2.380$, $p = .030$. The strength of the relationship between these two barriers was moderate, with disability type explaining 6.6% of the variance in responses about how accessible seating on trains impacts perceived accessibility of UTA's services. In the context of all the other variables during the initial ANOVA calculation for each of these barriers it appeared that there were significant relationships. However, when conducting follow-up analyses examining relationships at the individual variable level significance was not seen. It appears that the interaction with other variables is what lead to the significant ANOVA results.

It appears that, in general, primary type of disability is not significantly related to

perceived accessibility for most potential barriers regarding UTA's fixed route services. There are, however, several barriers where the relationship between primary type of disability and potential barriers are noteworthy. Of the 22 fixed route barriers, the barrier with the most significant relationship based on p values was "stop announcements" (p = .000) for which the strength of the relationship between primary type of disability and perceived accessibility was moderate to large and accounted for more than 13% of the variance on this factor – more than any of the other barriers. Furthermore, post hoc analyses identified five statistically significant mean differences for the barrier stop announcement based on primary type of disability which was also more than was identified for any of the other potential barriers. While the intention of the ADA regulations requiring audible stop announcements have generally been assumed to meet the needs of individuals who were blind or visually impaired, it is interesting that this statistical analysis indicates that Deaf or hard of hearing riders of UTA services identified the current state of stop announcements, which are provided only in audible format on fixed route bus services, as the least accessible component of riding UTA services and at rates higher than survey respondents who were blind or visually impaired. It appears that some consideration of providing visual stop announcements could improve the accessibility of this barrier. At 9.2%, primary type of disability accounted for the next highest amount of variance for the barrier "sidewalks, curb ramps, or crosswalks" (p = .002) for which post hoc analyses identified two statistically significant mean differences, followed by the barrier "information about potential barriers" (p = .016; 7.1% of variance explained, one significant mean difference in post hoc analyses), "cost" (p = .028; 6.6%

of variance explained, one significant mean difference), "past experiences riding buses or trains" (p = .033; 5.9% of variance explained, one significant mean difference), and barrier "number of transfers you will have to make" (p = .035) for which primary type of disability explained 6% of the variance in perceived accessibility of UTA services based on this barrier. The statistically significant differences identified based on primary type of disability incorporate several of the most inaccessible barriers identified when considering only descriptive mean and frequency data including: (a) information about potential barriers, (b) stop announcements, and (c) sidewalks, curb ramps, or crosswalks. Primary type of disability appears to increase the inaccessibility of the stop announcement barrier as compared to descriptive data while reducing the inaccessibility of the "information about potential barriers" factor. While statistically significant differences were identified for three other potential barriers (whether the bus or train's lift, ramp, or bridge plate is working, having enough accessible seats on the bus, including securement locations, and having enough accessible seats on the train), post hoc analyses did not identify significant differences at the individual disability level, indicating that these significant relationships only exist when all potential combinations of factors are being considered.

Several one-way ANOVAs were conducted to determine if statistically significant relationships existed between disability type and the extent to which potential barriers make using UTA's paratransit services accessible for individuals with disabilities. The independent variables for this analysis consisted of 23 potential barriers (see Table 23 for a complete list of barrier means and standard deviations, with significant relationships

Table 23

Mean Accessibility, Standard Deviations of Paratransit Barriers by Disability Type

	Disability types									
	Physical disability		Blindness		ID/DD		Learning disability		Other	
Potential accessibility barriers	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
How many days paratransit runs	3.92	1.32	3.25	1.50	4.29	1.06	3.67	2.31	2.57	1.51
The hours that paratransit services run[a]	3.80	1.32	2.50	1.73	4.14	1.32	3.67	2.31	2.29	1.70
Cost	3.24	1.48	2.25	0.50	3.62	1.36	3.33	2.08	2.00	1.73
Knowing how to use paratransit	3.76	1.48	3.00	1.83	3.85	1.39	3.67	2.31	2.57	1.51
Past experiences riding paratransit	3.63	.41	2.50	1.92	3.90	1.18	3.67	2.31	3.00	1.53
Service quality	3.64	1.55	3.25	1.71	4.19	0.98	3.67	2.31	2.57	1.62
Personal safety	4.20	1.04	3.50	1.73	4.29	0.85	3.67	2.31	2.86	1.86
Distance to or from service point	3.56	1.47	4.00	1.00	3.05	1.40	3.00	2.00	2.00	1.10
Sidewalks, curb ramps, or crosswalks on the way to the service point	3.67	1.52	3.75	1.50	3.58	1.35	3.33	2.08	2.14	1.07
Information about potential barriers on the way to the service point	3.45	1.50	1.67	0.58	3.35	1.35	3.33	2.08	2.29	1.70
Ability to get on or off the paratransit vehicle	4.48	1.05	5.00	0.00	4.60	0.75	3.67	2.31	3.71	1.89
Lift not working on the paratransit vehicle	3.47	1.42	3.00	--	3.94	1.24	3.00	2.83	2.17	1.33
Ability to have my mobility device secured how I like[a]	4.21	1.18	--	--	4.53	0.92	3.00	2.83	2.83	.60
Ability to fit my mobility device on the paratransit vehicle	4.46	0.98	5.00	--	3.93	1.44	3.00	2.83	3.33	1.37
Driver attitude, assistance or knowledge	3.88	1.39	3.00	2.31	4.14	1.11	3.67	2.31	2.57	1.62
Attitudes of other riders	4.00	1.17	3.75	1.89	4.05	0.87	3.67	2.31	3.14	1.68
Ability to accommodate my service animal	3.50	0.97	3.00	2.83	3.62	0.74	3.00	2.83	2.83	1.60
Scheduling paratransit rides	3.04	1.68	3.00	1.41	3.33	1.49	3.67	2.31	2.86	1.77
Driver arriving outside of the pick-up window	3.04	1.40	3.25	1.50	2.89	1.13	3.00	2.83	2.14	1.68
Length of the paratransit ride times	3.04	1.51	2.50	1.29	3.10	1.30	3.67	2.31	2.71	1.89
No-show/late cancellation policy	3.17	1.44	2.33	1.16	3.00	1.26	3.67	2.31	2.14	1.68
Ability to qualify for paratransit services	3.56	1.45	2.25	1.50	3.71	1.42	3.67	2.31	3.17	1.84
Paratransit eligibility process	3.28	1.62	2.25	1.89	3.67	1.46	3.67	2.31	3.17	1.84

[a] Statistically significant difference in means.

based on disability type noted). The dependent variable for each analysis was the accessibility of each of the listed barriers as related to using UTA's fixed route services. As previously mentioned, individuals with mental illness who rode UTA's paratransit service were excluded from this statistical analysis because of insufficient sample size. Individuals who were Deaf or hard or hearing are also absent from this table as no survey respondent were Deaf or hard of hearing indicated they rode paratransit services.

Of the 23 potential barriers, only two statistically significant relationships were identified through this analysis. First, the ANOVA for the barrier "the hours that paratransit runs" was significant, $F(4, 55) = 2.301$, $p = .030$. The strength of the relationship between primary type of disability and the hours that UTA's paratransit service runs impacts accessibility of the service, as assessed by η^2, was large with disability type accounting 17.4% of the variance in perceptions of the impact that this barrier has on the accessibility of UTA's paratransit service. Follow-up tests were conducted using Tukey's HSD to evaluate pairwise differences among the means for each type of disability and the extent to which the hours UTA's paratransit service is offered influence accessibility of UTA's services. There was a statistically significant difference between individuals with intellectual or developmental disabilities ($M = 4.14$, $SD = 1.32$) and those with other types of disabilities ($M = 2.29$, $SD = 1.70$; 95% CI [0.09, 3.63][-3.63, -0.09]) ($\alpha = .035$). Survey respondents with other types of disabilities generally indicated that the hours of UTA's paratransit service make using UTA services less accessible while individuals with intellectual or developmental disabilities reported that the hours of service made using UTA paratransit services somewhat accessible. This may be because many

paratransit riders with intellectual and developmental disabilities use the service to travel to and from club houses, sheltered workshops, or other day programs which are generally open and close during traditional peak transportation times which are also the peak hours for UTA services, including paratransit service. On the other hand, it is possible that respondents with other types of disabilities are interested in using paratransit during off peak hours where UTA's fixed route services and, accordingly, paratransit services are significantly reduced. It may be that this reduced service during non-peak hours makes UTA's paratransit somewhat inaccessible for individuals with other types of disabilities. No other significant differences were identified for this barrier.

Statistically significant relationships also existed for the barrier "ability to have my mobility device secured how I like," $F(3, 43) = 3.362$, $p = .027$. The strength of the relationship was large, with disability type accounting for 19% of the variance in perceptions of the impact that mobility device securement has on the accessibility of UTA's paratransit service. Post hoc analyses identified a statistically significant difference ($\alpha = .031$) between respondents with intellectual or developmental disabilities ($M = 4.53$, $SD = 0.92$) and those with other types of disabilities ($M = 2.83$, $SD = 1.60$; 95% CI [0.12, 3.28][-3.28, -0.12]). Survey respondents with other types of disabilities indicated that the ability to have their mobility device secured as they would like madeusing UTA's paratransit service less accessible than did respondents with intellectual or developmental disabilities, who generally found UTA's paratransit service to be between somewhat and fully accessible on this potential barrier. It should be noted that this difference was between a general accessibility perception very near neutral

(among those with other types of disabilities) and tone that was somewhat to fully accessible (among those with intellectual and developmental disabilities). Interestingly no statistically significant differences were found between individuals with mobility impairments ($M = 4.21$), who more commonly use mobility devices, and survey respondents with all other types of disabilities. The mean score among individuals with physical disabilities regarding this barrier indicated a somewhat to fully accessible perception. It is likely that the lack of a statistically significant difference indicates that the mean accessibility score from individuals with physical disabilities simply was different enough to be statistically significant. Given that there was a difference between individuals with intellectual and developmental disabilities ($M = 4.53$) and those with other types of disabilities ($M = 2.83$), it appears that the mean accessibility score among respondents with physical disabilities would need to be higher for a statistically significant difference to have been identified. No other statistically significant differences based on disability type were identified for the mobility device securement barrier. It should be noted that, in addition to the exclusion of individuals with mental health disabilities or who were dear or hard of hearing, this analysis did not include individuals who were blind or visually impaired as no respondents who ride paratransit and have these disabilities indicated that this barrier was relevant to them.

For most potential accessibility barriers related to using UTA's paratransit service, primary type of disability is not significant related to perceived accessibility. In fact, a statistically significant difference in mean accessibility was only identified for two of the of the 23 potential paratransit barriers whereas a significant relationship was found

for six of 22 fixed route barriers. The *p* values for the paratransit relationships were generally lower than for fixed route relationships and post hoc analyses found fewer relationships between individual disability types. However, the strength of the relationship for both paratransit barriers was large, exceeding the strength of relationships for all fixed route barriers. It may be that there are fewer disability-specific barriers for paratransit service than with fixed route barriers because paratransit is often a curb to curb, origin to destination service which would not require a rider to encounter the significant fixed route barriers of stop announcements or transfers. Paratransit is also less likely to require getting to a service point as most riders are picked up and dropped off at or very near their origin or destination, so riders would be less likely to encounter sidewalks, curb ramps, or crosswalks and so would be less concerned about potential barriers on the way to a pick-up location.

Differences in Perceived Barriers and Fixed Route Modes Used

Due to the nature of the services, potential transportation barriers a person with a disability may encounter when riding UTA's fixed route services are different than those that would be encountered when riding paratransit service. For this reason, it was not possible to directly compare differences in perceived accessibility based on potential transportation barriers between those who ride fixed route and paratransit services. It was, however, possible to analyze differences based on the combination of fixed route service modes used. To conduct this analysis several one-way ANOVAs were conducted to determine if statistically significant relationships exist between the mode, or combination

of modes, of UTA's fixed route services used by a respondent and the extent to which potential barriers make using UTA's fixed route services accessible for individuals with disabilities. The independent variables for this analysis was the mode, or modes, of UTA's fixed route services used. The dependent variable was the accessibility of several potential barriers as related to using UTA's fixed route services. Mean accessibility scores, as well as standard deviations, for this comparison can be found in Table 24. A total of 12 statistically significant relationships were identified through this analysis.

First, the ANOVA for the barrier "past experiences riding buses or trains" was significant, $F(6, 222) = 3.483$, $p = .003$. The strength of the relationship between modes of fixed route services used and how past experiences riding UTA buses or trains impacts accessibility, as assessed by η^2, was moderate with modes of fixed route services accounting 8.6% of the variance in perceptions of the impact that past experiences have on the accessibility of UTA's fixed route services. Follow-up tests were conducted using Tukey's HSD to evaluate pairwise differences among the means for each mode, or combination of modes, of fixed route service used and the extent to which past experiences influence perceived accessibility of UTA's services. There was a statistically significant difference between individuals who rode fixed route bus and TRAX (M = 3.00, SD = 1.31) and those who rode all fixed route modes of service (bus, TRAX, and FrontRunner) (M = 4.00, SD = 1.23; 95% CI [0.21, 1.79][-1.79, -0.21]) ($\alpha = .003$). In this case the difference is essentially between a neutral perception of accessibility and a somewhat accessible perception. It appears that using all modes of UTA fixed route services, as opposed to using just fixed route bus and TRAX, increases perceptions of

Table 24

Mean Accessibility, Standard Deviations of Fixed Route Barriers by Mode(s) of Fixed Route Services Used

	Mode(s) of fixed route services used													
	Bus		TRAX		FrontRunner		Bus, TRAX		Bus, Frontrunner		TRAX, FrontRunner		Bus, TRAX, Frontrunner	
Potential accessibility barriers	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
How many days the buses or trains run	4.04	1.36	4.00	1.37	4.25	0.97	4.14	1.15	4.28	1.14	4.00	1.09	3.92	1.21
The hours the buses or trains run	3.96	1.19	3.44	1.32	4.25	1.22	3.64	1.31	3.76	1.27	4.00	1.16	3.68	1.31
The number of transfers you will need to make to finish your trip	3.48	1.21	3.12	1.50	3.27	1.56	3.14	1.08	4.08	1.10	3.48	1.31	3.40	1.31
Cost	3.76	1.38	3.13	1.46	3.91	1.14	3.35	1.02	4.05	1.21	3.74	1.38	3.75	1.36
Knowing how to use buses or train	3.83	1.37	3.24	1.44	3.50	1.45	3.57	1.20	3.54	1.18	3.89	1.37	4.02	1.20
Past experiences riding buses or trains[a]	4.00	1.07	3.06	1.39	3.42	1.38	3.00	1.31	3.84	1.21	3.71	1.24	4.00	1.23
Service quality[a]	4.13	1.01	3.29	1.26	3.91	1.14	3.25	1.27	3.96	1.21	3.93	1.15	4.07	1.18
Stop announcements[a]	3.83	1.07	2.94	1.48	3.45	1.21	2.71	1.46	3.44	1.45	3.89	1.32	3.44	1.44
Personal safety[a]	3.74	1.10	2.71	1.26	3.92	1.17	3.11	1.20	4.04	1.40	3.61	1.20	3.80	1.34
Distance to or from the bus stop or train station	3.65	1.50	3.00	1.32	3.25	1.55	3.11	1.42	3.96	1.31	3.48	1.28	3.26	1.33
Sidewalks, curb ramps, or crosswalks on the way to the stop/station[a]	3.65	1.47	2.31	1.35	3.50	1.62	3.18	1.34	3.83	1.24	3.96	1.13	3.37	1.43
Information about potential barriers on the way to the stop/station	3.18	1.30	2.00	1.31	3.08	1.68	2.46	1.20	3.00	1.35	2.93	1.14	2.64	1.40
Bus stop or train station accessibility[a]	3.77	1.31	2.82	1.38	3.36	1.36	3.11	1.47	3.92	1.22	3.89	1.12	3.80	1.25
Ability to get on or off the bus or train[a]	4.26	1.01	3.25	1.39	4.25	0.75	3.32	1.49	4.32	1.03	3.93	1.14	4.11	1.22

(*table continues*)

	Mode(s) of fixed route services used													
	Bus		TRAX		FrontRunner		Bus, TRAX		Bus, Frontrunner		TRAX, FrontRunner		Bus, TRAX, Frontrunner	
Potential accessibility barriers	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Whether the bus or train's lift, ramp, or bridge plate is working[a]	3.94	1.16	3.53	1.13	4.13	0.84	3.29	1.08	4.53	0.80	3.68	1.13	4.01	1.25
Having enough accessible seats on the bus, including securement locations[a]	3.91	1.48	2.33	1.11	3.33	1.58	3.40	1.23	3.96	1.26	3.82	1.06	3.77	1.43
Having enough accessible seats on the train[a]	3.71	1.40	2.56	1.41	2.91	1.58	3.04	1.31	4.54	0.72	3.79	1.23	3.89	1.42
Ability to have my mobility device secured how I like[a]	4.07	0.96	2.57	1.22	3.75	1.58	3.11	1.33	4.13	0.84	3.39	1.20	3.53	1.23
Ability to fit my mobility device on the bus or train[a]	4.13	1.13	2.79	1.48	3.88	1.36	2.90	1.21	4.50	0.85	3.44	1.15	3.50	1.44
Driver attitude, assistance or knowledge	4.09	1.08	3.06	1.18	3.70	1.42	3.33	1.33	3.57	1.21	3.77	1.31	3.83	1.29
Attitudes of other riders	3.59	0.96	2.75	1.07	3.58	1.51	3.07	1.36	3.87	1.18	3.21	1.26	3.34	1.30
Ability to accommodate my service animal	3.55	1.13	2.45	1.29	2.80	1.48	2.89	1.27	3.25	1.39	3.25	1.39	3.05	1.32

[a] Statistically significant difference in means.

accessibility. It may be that the addition of FrontRunner service use contributes to improved perceptions of experiences riding UTA services. Given that FrontRunner was identified by survey respondents as the most accessible of UTA's fixed route services, it would seem to make sense that incorporating this service would have a positive impact on perceived accessibility. No other statistically significant differences were identified for this barrier.

Statistically significant differences were also found for the barrier "service quality," $F(6, 223) = 2.667$, $p = .016$. The strength of the relationship was moderate with mode(s) of fixed route services used accounting for 6.7% of the variance of how service quality influences the accessibility UTA's fixed route transportation services. Tukey's post hoc analysis identified a significant difference between individuals who rode fixed route bus and TRAX ($M = 3.25$, $SD = 1.27$) and those who rode all modes of fixed route transportation ($M = 4.07$, $SD = 1.18$; 95% CI [0.07, 1.57][-1.57, -0.07])($\alpha = .022$). Respondents who rode bus and TRAX generally viewed service quality as having a neutral influence on service accessibility while respondents who used all fixed route modes of service viewed service quality as making UTA services somewhat accessible to individuals with disabilities. As was discussed previously, the increased perceptions of accessibility may be explained by the incorporation of FrontRunner services in the modes of UTA services used by individuals with disabilities. Significant differences weren't identified for any other comparison for the barrier service quality based on modes of fixed route services used.

The barrier "stop announcements" was significant, $F(6, 224) = 2.419$, $p = .023$,

and the strength of the relationship between modes of fixed route services used and the role that stop announcements play in perceived accessibility was moderate, accounting for 6.1% of the variance in this relationship. Post hoc testing identified a significant difference between individuals who rode fixed route bus and TRAX (M = 2.71, SD = 1.46) and those who rode TRAX and FrontRunner (M = 3.89, SD = 1.3; 95% CI [0.08, 2.28][-2.28, -0.08]2)(α = .028). Individuals who rode fixed route bus and TRAX had less positive views of this potential barrier than respondents who rode TRAX and FrontRunner. In fact, views among those using fixed route bus and TRAX were somewhat inaccessible to neutral while respondents using TRAX and FrontRunner were neutral to nearly somewhat accessible. This may be explained by the lack of audible announcements at every fixed route bus stop, whereas stop announcements are made at all TRAX and FrontRunner stations. No other statistically significant differences were identified.

Analysis of survey responses found a statistically significant relationship between fixed route services modes used and the barrier "personal safety," $F(6, 224) = 3.102$, p = .006. The strength of the relationship was moderate, with fixed route service modes used accounting for 7.7% of the variance in how personal safety impacts the accessible information of UTA's services. Follow up testing identified a significant difference (α = .018) between respondents who rode only TRAX (M = 2.71, SD = 1.26) and those who rode fixed route bus and FrontRunner (M = 4.04, SD = 1.40; 95% CI [0.14, 2.53][-2.53, -0.14]), as well those who rode all fixed route modes (M = 3.80, SD = 1.34; 95% CI [0.09, 2.09][-2.09, -0.09])(α = .022). Individuals who rode only TRAX reported neutral, though

moving toward somewhat inaccessible, perceptions of personal safety while respondents who rode bus and FrontRunner, as well as those who rode all modes of fixed route services, reported that personal safety made using UTA's services somewhat accessible. It is possible that concerns about personal safety while using TRAX may be related to significant efforts in the past year to increase police presence on UTA's TRAX service in an effort to curb criminal activity in portions of UTA's "free fare zone," which includes a large portion of TRAX service in downtown Salt Lake City. However, several fixed route bus routes also run through the free fare zone, connecting riders to UTA services at North Temple and Salt Lake Central FrontRunner stations, so it isn't entirely clear that providing service in the free fare zone is a cause of concern for personal safety. It may be that the concern is related to a lack of mobility device securement on UTA TRAX vehicles, an accessibility feature which is available on fixed route bus. However, this service is not available on FrontRunner either so it isn't entirely clear that a lack of securement on TRAX can explain the significant difference in mean accessibility. It may simply be that there are a variety of factors which were not present with fixed route bus and FrontRunner services that cause individuals with disabilities who use only UTA's TRAX service to feel less safe when doing so. No other statistically significant differences in the role that this barrier may play in influencing perceptions of accessibility were identified.

Statistically significant differences were found for the barrier "sidewalks, curb ramps, or crosswalks on the way to the bus stop or train station," $F(6, 220) = 3.067$, $p = .007$. The strength of the relationship was moderate with mode(s) of fixed route services

used accounting for 7.7% of the variance in how sidewalks, curb ramps, or crosswalks influences the accessibility UTA's fixed route transportation services. Tukey's post hoc analysis identified a significant difference between individuals who rode fixed route bus (M = 3.65, SD = 1.47) and those who rode TRAX (M = 2.31, SD = 1.35; 95% CI [0.01, 2.67][-2.67, -0.01])(α = .048). Respondents who rode TRAX viewed the current state of sidewalks, curb ramps, or crosswalks as making UTA services somewhat inaccessible, while respondents who rode only fixed route bus were neutral to somewhat accessible responses for this potential barrier. Significant difference were also found between those who rode only TRAX and those who rode fixed route bus and FrontRunner (M = 3.18, SD = 1.34; 95% CI [0.20, 2.84][-2.84, -0.20])(α = .013), as well as those who rode TRAX and FrontRunner (M = 3.96, SD = 1.13; 95% CI [0.36, 2.94][-2.94, -0.36])(α = .003). As with differences between riders of fixed route bus and TRAX, when compared to riders of fixed route bus and FrontRunner, as well as those who rode TRAX and FrontRunner, individuals who rode only TRAX had lower perceptions of the accessibility of the sidewalks, curb ramps, or crosswalks on the way to the bus stop or train station. It is interesting that individuals who used only TRAX found this potential barrier to be somewhat inaccessible because all TRAX stations comply with ADA regulations regarding an accessible route to board the platform whereas UTA is still actively working to ensure that all fixed route bus stops are accessible to individuals with disabilities. Furthermore, TRAX stations have been developed in high-density areas and significant improvements were made to the pedestrian infrastructure at the time the stations were installed, all of which was done after passage of the ADA. It is, therefore, not entirely

clear that this difference can be explained by one or two factors but rather may be the result of a combination of factors not present with fixed route bus and FrontRunner services. No other statistically significant differences were identified.

The barrier "ability to get on or off the bus or train" was significant, $F(6, 220) = 3.228$, $p = .005$, and the strength of the relationship between modes of fixed route services used and the role that the ability to get on or off the bus or train plays in perceived accessibility was moderate, accounting for 8.1% of the variance in this relationship. Post hoc testing identified a significant difference between individuals who rode fixed route bus and TRAX ($M = 3.32$, $SD = 1.49$) and those who rode fixed route bus and FrontRunner($M = 4.32$, $SD = 1.03$)($\alpha = .045$; 95% CI [0.01, 1.98][-1.98, -0.01]), as well as those who rode all fixed route service modes ($M = 4.11$, $SD = 1.22$; 95% CI [0.02, 1.98][-1.98, -0.02])($\alpha = .039$). Individuals who rode fixed route bus and TRAX generally had neutral views of this potential barrier while respondents who rode fixed route bus and FrontRunner, as well as those who rode all fixed route services, viewed the ability to get on or off the bus or train as making UTA services somewhat accessible. It appears that the difference on this barrier centered around use of UTA's FrontRunner service, which was identified by survey respondents at UTA's most accessible fixed route service. It may be that respondents found FrontRunner easier to get on or off because the process of boarding UTA's FrontRunner trains generally involves a train host specifically for the purpose of assisting customers with disabilities. No other statistically significant differences were identified.

Analysis of survey responses found a statistically significant relationship between

fixed route services modes used and the barrier "whether the bus or train's lift, ramp, or bridge plate is working," $F(6, 169) = 2.553$, $p = .022$. The strength of the relationship was moderate, with fixed route service modes used accounting for 8.3% of the variance in whether the lift, ramp, or bridge plate is working impacts the accessible information of UTA's services. Follow up testing identified a significant difference ($\alpha = .014$) between respondents who rode fixed route bus and TRAX ($M = 3.29$, $SD = 1.08$) and those who rode fixed route bus and FrontRunner ($M = 4.53$, $SD = 0.80$; 95% CI [0.16, 2.32][-2.32, -0.16]). Individuals who rode fixed route bus and TRAX reported generally neutral perceptions of the role that a functioning lift, ramp, or bridge plate plays in the accessibility of UTA's services while respondents who rode bus and FrontRunner reported that this functionality makes UTA's services somewhat to fully accessible. As with the pervious barrier, it appears that the primary difference is use of UTA's FrontRunner service which may be more accessible because of assistance provided by a train host. No other statistically significant differences in the role that this barrier may play in influencing perceptions of accessibility were identified.

The ANOVA also identified statistically significant differences for the barrier "having enough accessible seats on the bus, including securement locations," $F(6, 201) = 3.196$, $p = .005$. The strength of the relationship was moderate with mode(s) of fixed route services used accounting for 8.7% of the variance in how the among of accessible seating on fixed route buses influences the accessibility UTA's transportation services. Tukey's post hoc analysis identified a significant difference between individuals who rode fixed route bus ($M = 3.91$, $SD = 1.48$) and those who rode TRAX ($M = 2.33$, $SD =$

1.99; 95% CI [0.25, 2.91][-2.91, -0.25])(α = .009). Respondents who rode only TRAX generally viewed the current number of accessible seats on fixed route buses as impeding the accessibility of UTA's services while respondents who rode only fixed route bus indicated that accessible seating on buses makes UTA services somewhat accessible to individuals with disabilities. Significant difference were also found between those who rode only TRAX and those who rode fixed route bus and FrontRunner (*M* = 3.96, *SD* = 1.26; 95% CI [0.30, 2.94][-2.94, -0.30])(α = .006), those who rode TRAX and FrontRunner (*M* = 3.82, *SD* = 1.06; 95% CI [0.22, 2.76][-2.76, -0.22])(α = .011), and those who rode all fixed route services (*M* = 3.77, *SD* = 1.38; 95% CI [0.32, 2.55][-2.55, -0.32])(α = .003). As with differences between riders of fixed route bus and TRAX, when compared to riders of fixed route bus and FrontRunner, TRAX and FrontRunner, and those who rode all fixed route services, individuals who ride only TRAX had lower perceptions of the accessibility of the amount of accessible seating on UTA's fixed route bus vehicles. This finding is especially interesting because the respondents with the lowest perception do not ride fixed route bus, while those who do ride this service find the number of accessible seats make using UTA services somewhat accessible. It may be that the reduced perceived accessibility is due to a lack of experience with UTA's fixed route bus service by those who ride only TRAX. No other statistically significant differences were identified.

The barrier "having enough accessible seats on the train" also had statistically significant differences between groups, $F(6, 203) = 5.569$, $p = .000$, with the strength of the relationship between modes of fixed route services used and the impact that the

amount of accessible seating on UTA trains plays in perceived accessibility was large, accounting for 14.1% of the variance in this relationship. Post hoc testing identified a significant difference between individuals who rode only TRAX (M = 2.56, SD = 1.41) and those who rode fixed route bus and FrontRunner (M = 4.54, SD = 0.72; 95% CI [0.70, 3.25][-3.25, -0.70])(α = .000), as well as those who rode all fixed route service modes (M = 3.89, SD = 1.42; 95% CI [0.25, 2.40][-2.40, -0.25])(α = .005). Individuals who rode TRAX generally had neutral to somewhat inaccessible views of this potential barrier while respondents who rode fixed route bus and FrontRunner, as well as those who rode all fixed route services, indicated that the number of accessible seats available on UTA trains makes using UTA services between somewhat accessible and fully accessible. It looks as though the use of FrontRunner may play an important positive role in perceptions on this potential barrier. Significant differences were also found when comparing the perception of individuals who rode only FrontRunner (M = 2.91, SD = 1.58) and those who rode fixed route bus and FrontRunner (95% CI [0.19, 3.07][-3.07, -0.19]; α = .015). Individuals who rode only FrontRunner service had significantly lower views of the accessibility of UTA services given the current number of accessible seats available on trains than did respondents who rode both bus and FrontRunner. In this case, it appears that riding multiple modes of fixed route service in conjunction with FrontRunner services may positively influence accessibility perceptions. This analysis also identified a statistically significant difference between those who rode fixed route bus and TRAX (M = 3.04, SD = 1.31) and those who rode fixed route bus and FrontRunner (α = .002; 95% CI [0.37 2.63][-2.63, -0.37]), with bus and TRAX riders

having generally neutral perceptions on this barrier. No other statistically significant differences were identified int his analysis.

Statistically significant differences were found for the barrier "ability to have my mobility device secured how I like," $F(6, 132) = 2.600$, $p = .021$. The strength of the relationship was moderate with mode(s) of fixed route services used accounting for 10.6% of the variance in mobility device securement influences the accessibility UTA's fixed route transportation services. Tukey's post hoc analysis identified a significant difference between individuals who rode fixed route bus ($M = 4.07$, $SD = 0.96$) and those who rode TRAX ($M = 2.57$, $SD = 1.22$; 95% CI [0.13, 2.86][-2.86, -0.13])($\alpha = .022$). Respondents who rode TRAX viewed the current state of securement on UTA vehicles as making UTA services somewhat inaccessible, while respondents who rode only fixed route bus viewed the system as somewhat accessible regarding this potential barrier. It is worth noting that UTA TRAX vehicles do not have a securement system for mobility devices, likely because the ADA does not require these systems on light rail vehicles. All UTA fixed route bus vehicles are equipped with securement systems because they are required to meet the DOT ADA Specifications for public transportation vehicles. This difference in the presence or absence of securement systems may explain the difference in perceptions on this item. No other statistically significant differences were identified.

Analysis of survey responses found a statistically significant relationship between fixed route services modes used and the barrier "ability to fit my mobility device on the bus or train," $F(6, 138) = 3.039$, $p = .008$. The strength of the relationship was moderate, with fixed route service modes used accounting for 11.7% of the variance in whether the

ability to fit a mobility device on the bus or train impacts the accessible information of UTA's services. Follow up testing identified a significant difference ($\alpha = .032$) between respondents who rode only TRAX ($M = 2.79$, $SD = 1.48$) and those who rode fixed route bus and FrontRunner ($M = 4.50$, $SD = 0.85$; 95% CI [0.08, 3.34][-3.34, -0.08]). Individuals who rode only TRAX reported neutral to somewhat inaccessible perceptions of the role fitting a mobility device on a bus or train plays in the accessibility of UTA's services while respondents who rode bus and FrontRunner reported that this functionality makes UTA's services somewhat to fully accessible. As was mentioned previously in this paper, UTA's TRAX service uses both high- and low-floor trains. Where every low-floor train is equipped with a ramp and is, therefore, accessible to individuals with disabilities, only one vehicle in each high-floor consist is similarly accessible thus limiting the number of accessible seats available on the train, particularly for those who require use of the ramp to board or alight. A statistically significant difference was also found between those who rode fixed route bus and TRAX ($M = 2.90$, $SD = 1.21$) and those who rode fixed route bus and FrontRunner (95% CI [0.08, 3.12][-3.12, -0.08]; $\alpha = .033$). As with respondents who rode only TRAX, those who rode both fixed route bus and TRAX reported neutral to somewhat inaccessible perceptions of UTA services, especially compared to respondents who rode fixed route bus and FrontRunner. As the only difference is the mode of rail service used, it appears that use of TRAX service is the factor which may negatively influence perceived accessibility. Alternatively, it may be that there are features of the FrontRunner train or the provision of train hosts which make it easier for customers with various types of mobility devices to successfully board the

train. No other statistically significant differences in the role that this barrier may play in influencing perceptions of accessibility were identified.

Another statistically significant relationship was found between disability type and the barrier "bus stop or train station accessibility," $F(6, 222) = 2.690$, $p = .015$. The strength of this relationship, as assessed by η^2, was moderate with modes of fixed route services used explaining 6.8% in the variance in responses to the impact of bus stop or train station accessibility on the perceived accessibility of UTA's services. In the context of all the other variables during the initial ANOVA calculation for each of these barriers it appeared that there was a significant relationship between modes of fixed route services used and bus stop or train station accessibility. However, when conducting post hoc analyses examining relationships at the individual variable level, significance was not seen. It appears that the interaction with other variables is what lead to the significant ANOVA results.

Modes of fixed route services used appears to have a broader influence on the perceived accessibility of potential public transportation barriers to a greater extent that was seen regarding primary type of disability, influencing a total of 12 potential barriers. The barrier "having enough accessible seats on the train" was the potential barrier where perceived accessibility was most significantly affected ($p = .000$). The strength of the relationship between modes of fixed route services used and perceived accessibility on this barrier was large, accounting for just over 14% of the variance on this barrier – the only barrier for which the strength of the relationship was large. Among the four statistically significant differences identified with post hoc analyses, all differences

included respondents who used TRAX in some way. Furthermore, the analyses where the respondent used TRAX alone saw the most significant differences when compared to respondents who either did not use TRAX or used TRAX in conjunction with other UTA services. It stands to reason that riders who use UTA's TRAX service are most familiar with the need for additional accessible seating on this service. The remaining top five barriers based on significance of mean differences related to modes of fixed route services used were past experiences riding buses or trains ($p = .003$), ability to get on or off the bus or train ($p = .005$), having enough accessible seats on the bus ($p = .005$), and personal safety ($p = .006$). The strength of the relationship for each of these barriers, as well as all remaining barriers, was moderate and the number of significant differences found via post hoc analyses varied from one to four. Among these top five move significant differences, only the barrier "past experiences riding buses or trains" is held in common with the top five barriers identified based on primary type of disability. In order from most to least significant, the remaining barriers for which modes of fixed route services used had a significant influence on perceived accessibility were: sidewalks, curb ramps, or crosswalks on the base to the bus or train station ($p = .007$; 7.7% of variance explained, two significant differences in post hoc analyses), ability to fit my mobility device on the bus or train ($p = .008$; 11.7% of variance explained, two significant mean difference), service quality ($p = .016$; 6.7% of variance explained, one significant mean difference), ability to have my mobility device secured how I like ($p = .021$; 10.6% of variance explained, one significant mean difference), whether the bus or train's lift, ramp, or bridge plate is working ($p = .022$; 8.3% of variance explained, one significant mean

difference), and stop announcements (p = .028; 6.1% of variance explained, one significant mean difference). It is interesting that, although the barrier stop announcements was the barrier most significantly influenced by primary type of disability, it is also the barrier which, although still significant, was least significantly influenced by modes of fixed route services used. In addition to influencing the number of significant relationships identified, it appears that modes of fixed route services used also altered the hierarchy of these barriers when compared to the previous analysis which considered primary type of disability by influencing perceived accessibility in different ways the was the case when only primary type of disability was considered.

Differences in Perceived Barriers and Frequency of Ridership

To evaluate potential statistically significant differences in the extent to which barriers were perceived as influencing accessibility based on fixed route ridership frequency, several one-way ANOVAs were conducted. In these analyses the independent variable was frequency of fixed route ridership while the dependent variable was the accessibility of UTA services on several potential transportation barriers. Table 25 present mean accessibility scores and standard deviations for fixed route service barriers while Table 26 presents the same information for paratransit barriers. Several statistically significant differences were identified for both fixed route and paratransit services through this analysis.

First, the ANOVA for the fixed route barrier "knowing how to use buses or trains" was significant, $F(5, 225) = 5.328$, $p = .000$. The strength of the relationship

Table 25

Mean Accessibility, Standard Deviations of Fixed Route Barriers by Ridership Frequency

	Ridership frequency											
	Everyday/almost everyday		A few times a week		About once a week		A few times a month		About once a month		About once a year	
Potential accessibility barriers	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
How many days the buses or trains run	4.10	1.21	3.87	1.24	4.17	1.03	4.19	1.16	3.76	1.23	4.00	1.16
The hours the buses or trains run	3.74	1.27	3.49	1.35	4.30	0.82	3.92	1.25	3.56	1.36	3.92	1.26
The number of transfers you will need to make to finish your trip	3.37	1.29	3.57	1.24	3.74	1.25	3.37	1.40	3.08	1.16	3.54	1.39
Cost	3.57	1.40	3.88	.27	3.73	1.28	3.80	1.31	3.32	1.25	3.92	1.24
Knowing how to use buses or train[a]	3.83	1.29	4.10	1.07	4.26	0.86	3.75	1.35	2.73	1.28	3.92	1.26
Past experiences riding buses or trains	3.88	1.26	3.82	1.26	3.87	1.39	3.81	1.21	3.08	.32	3.31	1.32
Service quality	3.85	1.21	3.92	1.22	4.23	1.23	3.90	1.24	3.58	1.14	3.85	1.07
Stop announcements	3.21	1.49	3.42	1.26	3.91	1.24	3.38	1.55	3.42	1.36	3.67	1.44
Personal safety	3.69	1.40	3.66	1.37	4.04	1.19	3.73	1.25	3.19	1.06	3.08	1.32
Distance to or from the bus stop or train station	3.58	1.38	3.23	1.31	3.43	1.41	3.35	1.42	3.15	1.32	3.15	1.52
Sidewalks, curb ramps, or crosswalks on the way to the stop/station	3.60	1.38	3.36	1.47	3.59	1.50	3.29	1.46	3.15	1.26	3.54	1.45
Information about potential barriers on the way to the stop/station	2.86	1.45	2.65	1.44	2.81	1.17	2.56	1.32	2.60	1.04	3.08	1.61
Bus stop or train station accessibility	3.71	1.35	3.62	1.33	3.87	1.29	3.69	1.29	3.27	1.19	3.54	1.45
Ability to get on or off the bus or train	4.12	1.17	3.90	1.32	4.32	1.21	4.00	1.22	3.54	1.21	3.75	1.42

(*table continues*)

	Ridership frequency											
	Everyday/almost everyday		A few times a week		About once a week		A few times a month		About once a month		About once a year	
Potential accessibility barriers	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Whether the bus or train's lift, ramp, or bridge plate is working[a]	4.00	1.25	4.07	1.13	4.00	1.17	3.89	1.09	3.15	1.04	3.73	1.19
Having enough accessible seats on the bus, including securement locations	3.84	1.32	3.42	1.54	4.30	1.13	3.52	1.38	3.24	1.27	3.77	1.17
Having enough accessible seats on the train	3.66	1.48	3.61	1.50	3.95	1.47	3.74	1.35	3.48	1.26	3.85	1.28
Ability to have my mobility device secured how I like	3.72	1.28	3.27	1.31	3.62	1.33	3.30	1.24	3.53	1.18	3.20	1.40
Ability to fit my mobility device on the bus or train	3.51	1.47	3.24	1.54	3.93	1.33	3.69	1.23	3.42	1.17	3.30	1.25
Driver attitude, assistance or knowledge[a]	3.59	1.35	3.73	1.25	4.48	0.81	3.85	1.22	3.24	1.23	3.23	1.42
Attitudes of other riders[a]	3.29	1.35	3.22	1.25	4.04	1.02	3.55	1.06	3.00	1.27	2.85	1.52
Ability to accommodate my service animal	3.27	1.34	2.55	1.23	3.78	1.20	3.20	1.40	2.71	1.14	3.00	1.00

Note. Based on a 5-point scale.

[a] Statistically significant difference in means.

Table 26

Mean Accessibility, Standard Deviations of Paratransit Barriers by Ridership Frequency

	Ridership frequency											
	Everyday/almost everyday		A few times a week		About once a week		A few times a month		About once a month		About once a year	
Potential accessibility barriers	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
How many days paratransit runs	3.45	1.44	4.75	0.71	3.60	1.14	3.33	1.37	3.83	1.17	3.30	1.83
The hours that paratransit services run	2.91	1.70	4.50	1.07	2.20	0.84	3.00	1.79	3.67	1.03	3.60	1.84
Cost[a]	1.91	0.94	4.00	0.93	1.60	0.89	2.50	1.05	3.00	1.27	3.90	1.66
Knowing how to use paratransit	2.82	1.66	4.25	1.39	2.40	0.55	3.17	1.47	4.00	1.10	3.60	1.90
Past experiences riding paratransit	3.00	1.41	4.50	0.93	2.40	0.89	3.67	1.51	3.67	1.21	3.56	1.94
Service quality	3.45	1.37	4.38	0.92	2.00	1.00	3.17	1.60	4.33	0.82	3.60	1.90
Personal safety[a]	3.55	1.13	4.63	0.74	2.20	0.84	4.00	1.27	4.50	0.84	3.70	1.89
Distance to or from the service point	2.45	1.21	3.25	1.75	2.50	0.58	3.67	1.03	3.20	0.84	3.50	1.96
Sidewalks, curb ramps, or crosswalks on the way to the service point	2.64	0.92	3.75	1.58	3.00	1.58	3.33	1.67	4.17	1.17	3.60	1.84
Information about potential barriers on the way to the service point	2.40	1.35	3.71	1.11	2.60	1.67	2.40	1.14	3.33	.03	3.80	.93
Ability to get on or off the paratransit vehicle[a]	3.18	1.47	4.88	0.35	5.00	0.00	4.50	0.84	4.67	.52	4.20	1.69
Whether the lift on the paratransit vehicle is working	2.82	1.40	4.60	0.55	4.00	1.41	3.20	1.10	3.50	1.29	3.00	2.19
Ability to have my mobility device secured how I like	3.30	.49	5.00	0.00	3.67	1.15	4.00	1.00	4.20	0.84	3.90	1.79
Ability to fit my mobility device on the paratransit vehicle	2.90	1.52	4.60	0.89	4.00	1.16	4.20	1.10	4.20	0.84	4.50	1.27
Driver attitude, assistance or knowledge	3.18	1.54	4.37	0.92	2.80	1.48	3.00	1.79	4.00	1.27	3.70	1.77

(table continues)

	Ridership frequency											
	Everyday/almost everyday		A few times a week		About once a week		A few times a month		About once a month		About once a year	
Potential accessibility barriers	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Attitudes of other riders	3.55	1.13	4.50	0.76	3.50	1.00	3.17	1.60	3.83	1.17	4.11	1.76
Ability to accommodate my service animal	2.83	1.17	3.50	0.71	3.25	1.71	2.33	1.16	3.75	0.96	4.00	2.00
Scheduling paratransit rides	2.36	1.57	3.63	1.41	2.20	1.30	2.67	0.82	2.67	1.51	3.33	2.00
Driver arriving outside of the pick-up window	2.55	1.21	3.33	1.03	2.40	1.52	2.00	0.89	3.00	1.27	3.11	1.90
Length of the paratransit ride times	2.18	1.17	4.13	1.13	2.20	1.10	2.67	1.51	3.00	1.41	3.30	1.89
No show/late cancellation policy[a]	2.00	1.00	3.86	0.90	1.80	0.84	1.60	0.89	3.67	0.82	3.30	1.89
Ability to qualify for paratransit service[a]	2.18	1.25	4.38	0.92	3.00	0.82	3.00	1.67	3.17	1.72	3.90	1.66
Paratransit eligibility process[a]	2.18	1.54	4.50	0.76	2.00	1.16	2.83	1.84	3.67	1.37	3.60	1.71

Note. Based on a 5-point scale.

[a] Statistically significant difference in means.

between ridership frequency and knowing how to use buses/trains impacts accessibility, as assessed by η^2, was moderate with modes of this barrier accounting for 10.6% of the variance in perceptions of the impact that system knowledge has on the accessibility of UTA's fixed route services. Follow-up tests were conducted using Tukey's HSD to evaluate pairwise differences among the means for ridership frequency and the extent to which system experience influences perceived accessibility of UTA's services. There was a statistically significant difference between individuals who rode fixed route services every day or almost every day ($M = 3.83$, $SD = 1.29$) and those who rode about once a month ($M = 2.73$, $SD = 1.28$; 95% CI [0.29, 1.90][-1.90, -0.29]) ($\alpha = .002$). It appears that individuals who ride the system every day or almost every day have higher perceived accessibility based on knowledge of system use than do individuals who ride the system only once per month. This relationship is somewhat intuitive inasmuch as increased use of the system will inherently lead to increased knowledge of how to use UTA buses and trains. No other statistically significant differences were identified for this barrier.

Statistically significant differences were found for the barrier "driver attitude, assistance, or knowledge," $F(5, 206) = 2.882$, $p = .015$. The strength of the relationship was moderate with ridership frequency accounting for 6.5% of the variance in how driver related considerations influence the accessibility UTA's fixed route transportation services. Tukey's post hoc analysis identified a significant difference between individuals who rode fixed route services about once a week ($M = 4.48$, $SD = 0.81$) and those who rode about once a month ($M = 3.24$, $SD = 1.23$; 95% CI [0.17, 2.30][-2.30, -0.17])($\alpha = .013$). Respondents who rode UTA's fixed route services about once a week viewed

driver attitude, assistance or knowledge as between somewhat and fully accessible, while those who rode the services less frequently at about once a month had generally neutral perceptions of the influence that driver related issues had on the accessibility of UTA services. As with the potential barrier regarding system knowledge, it appears that increase ridership positively influences the perceived accessibility of UTA's fixed route services. It may be that individuals who ride the service more often are more familiar with the operators in general, particularly if a customer rides the same routes and services as operators usually have set schedules so it is possible that a customer would encounter the same operator on most, if not all, of their trips through the month when traveling about once a week. No other statistically significant differences were identified.

Another statistically significant difference was found for the barrier "attitudes of other riders," $F(5, 215) = 2.598$, $p = .026$. The strength of the relationship between ridership frequency and how the attitudes of other riders impacts accessibility, as assessed by η^2, was small to moderate with modes of this barrier accounting for 5.7% of the variance on this barrier. Post hoc testing to evaluate pairwise differences among the means identified a statistically significant difference between individuals who rode fixed route about once a week ($M = 4.04$, $SD = 1.02$) and those who ride about once a month ($M = 3.00$, $SD = 1.27$; 95% CI [0.02, 2.07][-2.07, -0.02]) ($\alpha = .044$). It appears that individuals who ride the system about once a week have higher perceived accessibility as it relates to the attitudes of other riders than do individuals who ride the system only once per month. Perhaps because of increased ridership frequency, it may be that individuals who rode more often also had more opportunities to interact with and become familiar

with other riders, thus improving perceived accessibility regarding this potential barrier. It should be noted, however, that mean accessibility among those who rode UTA services about once a month was neutral and did not necessarily indicate that interactions with other riders made using UTA services either accessible or inaccessible. No other statistically significant differences were identified for this barrier.

Finally, though not originally identified as significant by the ANOVA because it was excluded by the selected alpha threshold ($\alpha = .05$), post hoc analyses of the barrier "whether the bus or train's lift, ramp, or bridge plate is working" ($F(5, 170) = 2.010$, $p = .080$) identified statistically significant mean differences. This oversight maybe due to the omnibus nature of the ANOVA statistic in as much as it looks at overall means, rather than individually comparing the means of subgroups. A weak statistically significant difference was identified between those who rode UTA fixed route services a few times a week ($M = 4.07$, $SD = 1.13$) and those who rode about once a month ($M = 3.15$, $SD = 1.04$; 95% CI [0.01, 1.83][-1.83, -0.01])($\alpha = .044$). Individuals who rode UTA's fixed route services a few times a week saw the current state of lift, ramp, or bridge plate functionality as somewhat accessible while those who rode about once a month had nearly neutral feelings regarding the accessibility of this factor. No other statistically significant differences were identified for this barrier.

It is interesting to note that when compared to either primary type of disability or modes of fixed route services used, fewer statistically significant differences were found when considering the role that ridership frequency may play in perceived accessibility of UTA's fixed route services. This would seem to indicate that simply riding UTA's fixed

route services more frequently may not influence perceptions of accessibility in the same way as other factors. This is not to say, however, that increased ridership frequency does not positively influence perceived accessibility. For example, the barrier "knowing how to use buses or trains" was influenced to a greater extent than any other barrier when considering ridership frequency.

Several one-way ANOVAs were conducted to determine if statistically significant relationships existed between frequency of paratransit ridership and the extent to which potential barriers make using UTA's paratransit services accessible for individuals with disabilities. The independent variables for this analysis consisted the barriers outlined in Table 26, which also included information on the means and standard deviations for these barriers. The dependent variable for each analysis was frequency of paratransit ridership. A total of six statistically significant relationships were identified through this analysis. First, the ANOVA for the barrier "cost" was significant, $F(5, 40) = 5.655$, $p = .000$. The strength of the relationship between frequency of paratransit ridership and the cost of riding UTA's paratransit service, as assessed by η^2, was small with ridership frequency accounting for just 4.1% of the variance in perceptions of the impact that this barrier had on the accessibility of UTA's paratransit service. Follow-up tests were conducted using Tukey's HSD to evaluate pairwise differences among the means for various ridership frequencies and the extent to which cost influenced the perceived accessibility of UTA's paratransit services. There was a statistically significant difference between individuals who rode paratransit every day or almost every day ($M = 1.91$, $SD = 0.94$) and those who rode a few times a week ($M = 4.00$, $SD = 0.93$; 95% CI [0.44, 3.74][-3.74, -0.44]) ($\alpha =$

.006), as well as those who rode UTA's paratransit service about once a year (M = 3.90, SD = 1.66; 95% CI [0.44, 3.54][-3.54, -0.44])(α = .005). Significant differences were also found between those who rode a few times a week and those who rode about once a week (M = 1.60, SD = 0.89; 95% CI [0.37, 4.43][-4.43, -0.37])(α = .012). Individuals who rode UTA's paratransit service about once a week also had significantly different perceptions of cost when compared to individuals who rode the service about once a year (95% CI [0.35, 4.25][-4.25, -0.35]; α = .013). It appears that, when compared to individuals who ride less frequently than themselves, those who ride more frequently perceive UTA's paratransit service to be less accessible regarding cost. Each one-way trip on UTA's paratransit service costs the rider $4 or $8 for a round trip. For an individual who rides five or more times a week the total cost to ride this service would be more than someone who rides two to three times a week. Thus, it stands to reason that those individuals who ride more frequently and have a higher total cost to ride the service view the cost of the service differently than those who ride less frequently. No other statistically significant differences were identified for this barrier.

Statistical analysis also identified significant differences for the barrier "personal safety," $F(5, 40) = 2.824$, $p = .028$. The strength of the relationship between ridership frequency and how perceived personal safety while riding paratransit impacts accessibility, as assessed by η^2, was large with ridership frequency accounting for 26.1% of the variance on this barrier. Post hoc testing to evaluate pairwise differences among the means identified a statistically significant difference between individuals who rode paratransit a few times a week (M = 4.63, SD = .074) and those who rode about once a

week (M = 2.20, SD = 0.84; 95% CI [0.28, 4.57][-4.57, -0.28])(α = .018). A statistically significant difference (α = .015) was also found between those who rode about once a week and those who rode about once a month (M = 4.50, SD = 0.84; 95% CI [0.03, 4.57][-4.57, -0.03]). In both cases, individuals who rode UTA's paratransit service about once a week had much lower perceptions of UTA's paratransit service regarding personal safety than did individuals who ride a few times a week or once a month. No other statistically significant differences were identified for this barrier.

Analysis of survey responses found a statistically significant relationship between paratransit ridership frequency and the barrier "ability to get on or off the paratransit vehicle," $F(5, 40) = 3.011$, $p = .021$. The strength of the relationship was large, with ridership frequency accounting for 23.3% of the variance in how this potential barrier impacts the accessibility of UTA's paratransit service. Follow up testing identified a significant difference (α = .033) between respondents who rode paratransit every day or almost every day (M = 3.18, SD = 1.47) and those who rode a few times a week (M = 4.88, SD = 0.35; 95% CI [0.09, 3.29][-3.29, -0.09]). Individuals who rode paratransit services every day or nearly every day had generally neutral perceptions while individuals who rode a few times a week nearly fully accessible views of the ability to get on or off the paratransit vehicle. No other statistically significant differences in the role that this barrier may play in influencing perceptions of accessibility were identified.

The barrier "no-show/late cancellation policy" also had statistically significant differences between groups, $F(5, 38) = 4.585$, $p = .002$, with the strength of the relationship between frequency of ridership and perceived accessibility based on UTA

paratransit's no show/late cancellation policy being large, accounting for 37.6% of the variance in this relationship. Post hoc testing identified a significant difference between individuals who rode every day or almost every day (M = 2.00, SD = 1.00) and those who a few times a week (M = 3.86, SD = 0.90; 95% CI [0.09, 3.62][-3.62, -0.09])(α = .034). Individuals who rode paratransit services daily viewed UTA's paratransit service as somewhat inaccessible based on the no show policy and had lower perceived accessibility of the service than did those who rode a few times a week. Riders in the latter group viewed the services as neutral to somewhat accessible on the same potential barrier. Because the number of no-show or late cancellations a customer may have will increase with the number of trips scheduled, it makes sense that individuals who ride the service more frequently see the no-show/late cancellation policy as more of a barrier as there is a greater chance that they will violate the policy. Significant differences were also found when comparing the perception of individuals who rode a few times a week and those who rode a few times a month (M = 1.60, SD = 0.89; 95% CI [0.12, 4.40][-4.40, -0.12])(α = .033). Respondents who indicated they rode a few times a month viewed UTA's paratransit service as somewhat to fully inaccessible because of the policy while those who rode more frequently had more positive views of the service's accessibility. It may be that increased ridership results in increased familiarity with the policy, something a customer who rides the service only once a month may lack. Thus, it is possible that the somewhat inaccessible views shared by those who ride a few times a month are related to limited familiarity with UTA's no-show/late cancellation policy. No other statistically significant differences were identified int his analysis.

Statistically significant differences were found for the barrier "ability to qualify for paratransit service," $F(5, 39) = 2.782$, $p = .030$. The strength of the relationship was large with ridership frequency accounting for 26.3% of the variance in how UTA's paratransit eligibility process influences perceptions of the accessibility of UTA's paratransit service. Tukey's post hoc analysis identified a significant difference between individuals who rode UTA's paratransit service every day or about every day ($M = 2.18$, $SD = 1.25$) and those who rode a few times a week ($M = 4.38$, $SD = 0.92$; 95% CI [0.23, 4.15][-4.15, -0.23])($\alpha = .020$). Respondents who rode paratransit daily viewed the services as somewhat inaccessible as related to the ability to qualify for paratransit service, while those who rode the services a few times a week had more positive views of the accessibility of the service regarding the qualification process. No other statistically significant differences were identified.

Finally, the ANOVA for the barrier "paratransit eligibility process" was significant, $F(5, 39) = 3.184$, $p = .017$. The strength of the relationship between frequency of paratransit ridership and the paratransit eligibility process, as assessed by η^2, was large with ridership frequency accounting for 29% of the variance in perceptions of the impact that this barrier has on the accessibility of UTA's paratransit service. Follow-up tests were conducted using Tukey's HSD to evaluate pairwise differences among the means for various ridership frequencies and the extent to which the paratransit eligibility process influences accessibility of UTA's paratransit services. There was a statistically significant difference between individuals who rode paratransit services every day or almost every day ($M = 2.18$, $SD = 1.54$) and those who rode a few times a week ($M =$

4.50, *SD* = 0.76; 95% CI [0.27, 4.36][-4.36, -0.27]) (α = .018). Individuals who rode most frequently saw the impact of the paratransit eligibility process as detrimental to the accessibility of UTA's paratransit service, with the service ranking as somewhat inaccessible. On the other hand, individuals who rode the service less frequently at a few times a week viewed the system as somewhat accessible when considering the eligibility process. No other statistically significant differences were identified for this barrier.

Among the potential paratransit barriers considered, that of "cost" (p = .000) appears to be most statistically significantly influenced by ridership frequency with those who rode most frequently, and therefore pay more in fare to ride the service, indicating that cost made using UTA's paratransit service less accessible. However, among the six barriers for which statistically significant differences were identified, the strength of the relationship between frequency of ridership and cost was the lowest at just 4.1% whereas all other factors had very strong relationships to ridership frequency. The barrier with the next highest statistically significant relationship to frequency of paratransit ridership was no-show/late cancellation policy (p = .002), followed by paratransit eligibility process (p = .017), ability to get on or off the paratransit vehicle (p = .021), personal safety (p = .028), and ability to qualify for the paratransit service (p = .030). It is interesting to note that frequency of ridership appears to have a broader influence on perceptions of accessibility for UTA's paratransit service, for which six barriers were statistically significantly impacted, than was seen for fixed route services for which only four barriers were impacted. Furthermore, the strength of the relationship between ridership frequency and most of the significant paratransit barriers was very large whereas the percentage of

variance in perceived accessibility on the four fixed route barriers was moderate.

Discussion

Several interesting comparisons between factors that influence perceptions of potential accessibility barriers for UTA's fixed route and paratransit services can be made based on these statistical results. First, disability type appears to play a greater role in identifying statistically significant differences in perceived accessibility among riders of UTA's fixed route services, where nine significant differences were found, than among those riding paratransit service among which only two statistically significant differences based on disability type were identified. This difference is notable even after considering that the number of significant differences for fixed route barriers decreased slightly to six when post hoc testing results were considered. As described previously, there were also differences in types of barriers for which there were statistically significant differences between UTA's fixed route and paratransit services. On the other hand, frequency of ridership played a larger role in identifying statistically significant differences in the perceived accessibility of UTA's paratransit services than was seen for UTA's fixed route services. Whereas, six statistically significant differences were identified for paratransit, only four differences were identified for UTA's fixed route services.

There are several potential reasons for these differences. First, because UTA's paratransit is intended to serve those individuals whose disability prevents them from using the fixed route system, this service, by its nature, is already a more accessible service by providing curb to curb transportation services. Therefore, it would seem to make sense that there would be fewer perceived barriers based on disability for riders of

paratransit services. Second, all paratransit riders have been determined by UTA to be functionally unable to use the fixed route system in some way. Because there is no similar way to gauge the functional abilities for those using UTA's fixed route system there may be a disparity in functional abilities among fixed route service riders that lends itself to the identification of more fixed route barriers when the analysis focuses on disability type. Third, UTA's fixed route service includes both bus and rail services whereas paratransit service is focused on bus-type service. The breadth in service modes may also interact with disability experiences in a way that paratransit ridership does not. Finally, regarding differences based on ridership frequency, the barrier for which most significant difference based on frequency for paratransit was that of "cost," whereas the most significant fixed route barrier was "knowing how to use the buses or trains." Unlike the fixed route barrier which would improve with increased ridership as an individual gains knowledge and experience which, in turn, would make using fixed route services more accessible, the increased cost for paratransit service would make frequent use of the service less accessible. Thus, it appears that increased ridership of fixed route services improved perceived accessibility while increased ridership on paratransit services decreases perceived accessibility.

Although it was possible to compare differences between UTA's fixed route and paratransit service based on primary type of disability and frequency of ridership, it was not possible to make similar comparisons based on modes of fixed route services, the factor which resulted in the most statistically significant differences in perceived accessibility among riders of UTA's fixed route services. Whereas five statistically

significant differences were found based on primary type of disability and four were found regarding frequency of ridership, differences in modes of fixed route services used resulted in statistically significant differences in perceived accessibility on 12 of 22 barriers. In nearly all cases where there were statistically significant differences, it was those individuals who rode UTA's TRAX service either alone or in combination with fixed route bus who had the lowest or neutral perceived accessibility of the barrier while those who used either other (non-TRAX) modes of UTA's fixed route services or all of UTA's fixed route service modes, including TRAX. It appears that use UTA's fixed route bus and FrontRunner services either alone or in combination with use of UTA's TRAX service increases perceptions of accessibility while use of UTA's TRAX service alone may decrease perceptions of accessibility.

Additional Analyses

Beyond evaluating survey responses to identify answers to the research questions guiding this study, additional analyses were conducted to consider whether differences in ridership frequency and modes of fixed route services used exist based on disability status, as well as any relationships that may exist between fixed route service modes used and frequency of fixed route ridership.

Differences in Frequency of Ridership, Modes Used and Disability Type

This analysis was conducted to gain a better understanding of how disability type might influence the frequency with which an individual with a disability may ride UTA's

fixed route or paratransit services. Several one-way ANOVAs were conducted to evaluate potential statistically significant differences in the role that disability type may play in influencing ridership frequency of UTA's fixed route and paratransit services. The independent variables for each analysis was disability type. Frequency of ridership was the dependent variable as reported by respondents who could indicate frequency on a range from riding "every day or almost every day," which was coded as a 1, to riding "about once a year," which was coded as a 6. Lower mean ridership indicates increased ridership frequency while higher means indicate lower ridership frequency. Descriptive statistics for the fixed route services analysis are presented in Table 27 while Table 28 presents the same information for the paratransit analysis.

The statistical analysis process identified a significant difference regarding disability type and fixed route ridership, $F(6, 226) = 3.484$, $p = .003$. The strength of the relationship between disability type and fixed route ridership frequency was moderate with disability type accounting for 8.5% of the variance in ridership frequency. Follow-

Table 27

Mean Fixed Route Ridership Frequency, Standard Deviation by Disability Type

Disability type	Mean	*SD*
Deafness	3.53	1.81
Physical disability	3.10	1.61
Mental health	2.97	1.55
Other	2.71	1.43
ID/DD	2.30	1.61
Learning	2.28	1.36
Blindness	1.96	1.26

Note. Based on a 5-point scale.

Table 28

Mean Paratransit Ridership Frequency, Standard Deviation by Disability Type

Disability type	Mean	*SD*
Other	4.71	1.38
Physical disability	3.89	2.05
Blindness	3.25	1.71
Learning	2.67	2.08
ID/DD	2.00	1.28

Note. Based on a 5-point scale.

up tests identified a statistically significant differences in ridership frequency between individuals who have physical disabilities, including mobility impairments (M = 3.10, SD = 1.61), and those respondents who were blind or visually impaired (M = 1.96, SD = 1.26; 95% CI [0.13, 2.15][-2.15, -0.13]) (α = .016). Significant differences were also found between survey respondents who were blind or visually impaired and those who indicated they were Deaf or hard of hearing (M = 3.53, SD = 1.81; 95% CI [0.20, 2.93][-2.93, -0.20])(α = .014). Individuals who were blind or visually impaired indicated they rode UTA's fixed route services more frequency than those who indicated they had a physical disability or those who were Deaf or hard of hearing. While individuals who are Deaf or hard or hearing or who have physical disabilities can still operate personal vehicles, individuals who are blind or who have significant visual impairments cannot. It may be that the inability to operate a personal vehicle is the reason for increased ridership frequency among individuals who are blind or visually impaired. No other statistically significant differences were identified for this barrier.

Several one-way ANOVAs were conducted to determine if statistically significant

differences in paratransit ridership frequency exist based on disability type. The results of the statistical analysis process indicated that a statistically significant difference between disability type and paratransit ridership frequency existed, $F(4, 40) = 3.420$, $p = .017$. The strength of the relationship between disability type and paratransit ridership frequency was large with disability type accounting for 25.5% of the variance in ridership frequency. Follow-up tests were conducted using Tukey's HSD to evaluate pairwise differences among the means for various disability types and paratransit ridership frequencies. There was a statistically significant difference between individuals with physical disabilities ($M = 3.89$, $SD = 2.05$) and those with intellectual or developmental disabilities ($M = 2.00$, $SD = 1.28$; 95% CI [0.05, 3.74][-3.74, -0.05])($\alpha = .041$). A statistically significant difference ($\alpha = .018$) was also found between respondents with intellectual or developmental disabilities and those with other types of disabilities ($M = 4.71$, $SD = 1.38$; 95% CI [0.34, 5.09][-5.09, -0.34]). Survey respondents with intellectual or developmental disabilities rode UTA's paratransit service more frequently than did respondents with either physical disabilities or other types of disabilities. Because not every individual who is eligible for UTA's paratransit solely uses this service, it is possible that these differences can be explained by increased fixed route ridership to replace potential paratransit trips by individuals with physical disabilities and other types of disabilities whereas individuals with intellectual and developmental disabilities feel less inclined to use fixed route services in lieu of a trip on paratransit. It is also possible that individuals with intellectual and developmental disabilities are using paratransit services to access day programs to a greater extent that individuals with other types of

disabilities. No other statistically significant differences were identified for this barrier.

Respondents who were blind or visually impaired had the highest frequency (M = 1.96) of ridership for UTA's fixed route services while individuals who were Deaf or hard of hearing had the lowest mean ridership frequency (M = 3.53). For UTA's paratransit service individuals with intellectual or developmental disabilities had the highest ridership frequency (M = 2.00) while respondents with other types of disabilities had the lowest mean ridership frequency (M = 4.71). It appears that the higher mean ridership frequency is very similar between fixed route and paratransit services with respondents for both riding UTA's services, on average, a few times a week. There are, however, clear differences regarding the lower ridership frequency means with individuals riding UTA's fixed route services. While the least frequent riders of UTA's fixed route service rode between once a week and a few times a month on average, the least frequent riders of UTA's paratransit service rode between a few times a month and once a month on average. This difference would seem to indicate that the least frequent paratransit riders – those with other types of disabilities – may have fewer opportunities for community inclusion than do individuals who are Deaf or hard of hearing, which represent the least frequent riders of UTA's fixed route services. It may also be the case that these individuals are able to utilize fixed route services for some or all of their trips, thus reducing their need to take trips on the costlier paratransit service.

Another aim of this line of analysis was to understand whether disability type may influence the modes of UTA fixed route services used. A one-way ANOVA analysis was done to evaluate whether and how disability type may influence the modes of UTA's

fixed route services used. The independent variable in the analysis was disability type while modes of fixed route services used was the dependent variable. This analysis did not identify any statistically significant differences in mode use based on primary type of disability. It appears that the type of disability an individual has does not influence the modes of UTA services they chose to use.

Fixed Route Modes Used and Frequency of Ridership

This analysis was intended to shed light on whether a relationship existed between the modes of UTA fixed route services used and ridership frequency. The independent variable for this analysis was mode of fixed route services used while the dependent variable was ridership frequency. A one-way ANOVA identified a statistically significant relationship between fixed route service modes used and ridership frequency, $F(6, 226) = 6.470$, $p = .000$. The strength of the relationship, as assessed by η^2, was large with modes used accounting for 14.7% of the variance in ridership frequency. Follow-up tests were conducted using Tukey's HSD to evaluate pairwise differences. There was a statistically significant difference in ridership frequency between individuals who rode fixed route bus ($M = 2.35$, $SD = 1.56$) and those who rode FrontRunner ($M = 4.08$, $SD = 1.51$; 95% CI [0.16, 3.31][-3.31, -0.16]) ($\alpha = .021$), as well as those who rode TRAX and FrontRunner ($M = 4.00$, $SD = 1.52$; 95% CI [0.40, 2.90][-2.90 -0.40])($\alpha = .002$). Keeping in mind that lower means indicate higher ridership frequency, survey respondents who rode only fixed route bus rode more often than those who rode only FrontRunner or those who rode both TRAX and FrontRunner. A statistically significant difference was also

found between those who rode only FrontRunner and those who rode fixed route bus and FrontRunner (*M* = 2.48, *SD* = 1.61; 95% CI [0.05, 3.16][-3.16, -0.05])(α = .039), as well as those who rode all modes of fixed route services (*M* = 2.47, *SD* = 1.39; 95% CI [0.26, 2.97][-2.97, -0.26])(α = .009). As with respondents who rode only fixed route bus, those who rode both fixed route bus and FrontRunner, as well as those who rode all fixed route services, used UTA services more frequently that those who rode only FrontRunner. A significant difference in means was found when comparing those who rode fixed route bus and FrontRunner and those who rode TRAX and FrontRunner (95% CI [0.30, 2.74][-2.74, -0.30]; α = .005). Respondents who rode fixed route bus and FrontRunner had higher ridership than those who rode TRAX and FrontRunner. It appears that, although FrontRunner was identified as the most accessible fixed route service, individuals with disabilities are using fixed route bus – the least accessible service – more frequently. This finding may be at least partially explained by the difference in coverage available with these services. While FrontRunner operates from Weber to Utah counties, it only provides service along a narrow corridor while UTA provides fixed route bus service throughout each of these counties and, whereas fixed route bus service is available seven day a week, FrontRunner service is not available on Sundays. A rider interested in getting to the grocery store near their home would need to use fixed route bus to make this trip as FrontRunner likely does not provide the needed connection. Furthermore, even if a trip included use of FrontRunner, it may be that a rider would need to use fixed route bus to connect to the FrontRunner service. Thus, it appears that the increased accessibility of UTA's FrontRunner service may not exceed the value of the geographic coverage

provided by UTA's fixed route bus service. Finally, a statistically significant difference was found between those who rode TRAX and FrontRunner and those who rode all modes of UTA's fixed route services (95% CI [0.58, 2.48][-2.48, -0.58]; $\alpha = .000$). Individuals who used all fixed route modes had higher ridership frequency than those who rode only TRAX and FrontRunner. It appears that the use of fixed route bus either independently or in conjunction with rail services is indicative of higher ridership frequency. No other statistically significant differences were identified for this barrier.

Summary

Various statistical analyses were conducted to better understand the perceived accessibility of UTA's fixed route and complementary paratransit systems, as well as potential barriers individuals with disabilities may face when using these systems. This study's main findings are that individuals with disabilities generally have neutral to somewhat positive (accessible) views of accessibility of UTA's transportation services though there are differences when factors such as disability type, modes of services used in general and specifically regarding fixed route service modes, and frequency of ridership are considered. Despite these neutral to somewhat accessible perceptions, and although there are factors of the UTA system which individuals with disabilities find to be completely accessible, barriers to accessing UTA's fixed route and paratransit services exist generally, and statistically significant differences do exist based on disability type, modes of fixed route services used, and ridership frequency. Implications of these findings for UTA, as well as future research, will be discussed in the next chapter.

CHAPTER V

DISCUSSION

Summary and Implications

This study's three main findings are as follows: (1) individuals with disabilities generally have neutral to somewhat positive (accessible) views of the accessibility of UTA's transportation services though there are differences when factors such as disability type, modes of services used in general and specifically regarding fixed route service modes, and frequency of ridership are considered; (2) despite these neutral to somewhat accessible perceptions, and although there are factors of the UTA system which individuals with disabilities find to be completely accessible, barriers to accessing UTA's fixed route and paratransit services exist generally and statistically significant differences do exist based on disability type, modes of fixed route services used, and ridership frequency; and (3) local and national policy changes may be necessary to resolve some of the barriers that individuals with disabilities face when using UTA's public transportation system. These findings suggest that perceptions of accessibility and the role that potential barriers play in accessing UTA's services are not the same for all members of the disability community and that solutions to ensure access for everyone to UTA's system specifically, and all public transportation systems in the U.S. generally, consider these varying needs. This section will briefly summarize these findings, as well as implications of these findings, and discuss some of the limitations of this study.

Implications for Perceived Accessibility

Regarding the purpose of this study, to better understand perceptions of the accessibility of UTA's services among riders with disabilities living within the UTA service area, this study found that individuals with disabilities generally have neutral to somewhat accessible perceptions of the various UTA services though there were differences at the individual service level. For example, respondents generally felt that UTA's FrontRunner was the most accessible service while fixed route bus was the least accessible UTA service. It should again be noted, however, that "least accessible" indicates that the measure of accessibility was nearly neutral, not necessarily that the service was either somewhat or fully inaccessible. In general, this study found that there were no UTA services which are viewed by the disability community as being somewhat or fully inaccessible to people with disabilities. This finding may imply that UTA's current combination of services and facilities are meeting the minimum requirements set forth by the Department of Transportation ADA Standards. Some important differences in these perceptions were noted when analyzing factors such as disability, general modes of UTA services used, specific modes of fixed route services used, and frequency of ridership. Possible explanations for these differences in perceived accessibility were presented in Chapter IV.

Among the factors considered, service mode used (fixed route, paratransit, fixed route and paratransit, no use of UTA services) and, more specifically, the combination of fixed route service modes used, appears to have the most significant influence on perceptions of the accessibility of UTA's public transportation system. Regarding general

services used (fixed route buses or trains only, paratransit only, buses, trains, and paratransit, or no use of UTA services), respondents who used only fixed route services had the highest perceived accessibility of UTA's fixed route bus and FrontRunner services while respondents who rode only paratransit had the highest perceived accessibility of UTA's paratransit service. On the other hand, respondents who did not use any UTA services had the lowest perceived accessibility of all UTA's services. Regarding combinations of fixed route modes used and high perceived accessibility, respondents who rode only fixed route bus had the highest perceived accessibility of UTA's fixed route bus service. Individuals who rode all fixed route modes had the highest perceived accessibility of UTA's TRAX service. The highest perceived accessibility of UTA's FrontRunner was seen among respondents who rode fixed route bus and FrontRunner. There were also interesting differences regarding lowest perceived accessibility. Respondents who rode only TRAX had the lowest perceived accessibility of UTA's fixed route bus and TRAX services. Respondents who rode both fixed route bus and TRAX had the lowest perceived accessibility of UTA's FrontRunner service.

It appears that individuals with disabilities have a more accessible view of UTA's system than was seen in the national studies conducted by Bezyak et al. (2017) and TransSystems Corporation (2014). The higher perceived accessibility found in the current study may be due to differences in sample demographics. More specifically, while Bezyak et al. noted that their study did not include individuals with intellectual and developmental disabilities, the current study made every effort to ensure that members of this group were included and represented in the study. As this study found, members of

this community generally have among the most positive views of the accessibility of UTA's services. It may be that the lack of representation from the ID/DD community in previous national studies negatively influenced study means. Therefore, it may be that including individuals with intellectual and developmental disabilities in this study positively influenced overall perceptions of accessibility. It is recommended that future studies ensure that all disability types are represented to ensure generalizability. At a local level, it is recommended that UTA continue to support and implement existing accessibility programs to stay ahead of national trends on transportation accessibility. Further research is recommended to better understand the specific components of the UTA system generally, and the FrontRunner service specifically, which make using UTA's public transportation modes more accessible than may be the case for users of other public transportation systems. Because use of UTA services appears to have a positive impact on the perceived accessibility of these services by members of the disability community, it is recommended that UTA consider working more directly with disability service provides and advocacy organization to disseminate information about the breadth of transportation services available. In addition to information about fixed route bus, TRAX, FrontRunner, and paratransit, providing information about travel training program and efforts to addressing accessibility barriers may have a positive impact on perceived accessibility. Previous studies have suggested tools that can be used to improve the marketing and public information for fixed route services (see, for example, Thatcher et al., 2013) which may be useful to UTA.

Implications for Accessibility Barriers

Regarding the second research question, to better understand what, if any, barriers individuals with disabilities face when using UTA transportation services, this study found that there were components of UTA's fixed route and paratransit systems which were fully accessible to individuals with disabilities. At the same time, there were factors which individuals with disabilities identified as making the UTA system inaccessible and create significant barriers to accessing and using UTA's public transportation services. As with perceptions of the accessibility of each UTA service, there were differences in the extent to which several factors were either accessible or inaccessible based on primary type of disability, modes of fixed route services used, and frequency of ridership.

Based on response frequencies, the top five fixed route service factors survey respondents found to make UTA services accessible to individuals with disabilities were: (a) how many days the buses or trains run, (b) ability to get on or off the bus or train, (c) service quality, (d) knowing how to use buses or trains, and (e) having enough accessible seats on the train. For paratransit services the top five factors survey respondents identified as making UTA's paratransit service accessible were: (a) ability to get on or off the paratransit vehicle, (b) driver attitude, assistance or knowledge, (c) personal safety, (d) ability to have my mobility device secured how I like, and (e) ability to fit my mobility device on the paratransit vehicle.

There were also several factors that survey respondents indicated made using UTA's fixed route services inaccessible: (a) the current level of information about potential barriers on the way to the stop/station, (b) stop announcements, (c) sidewalks,

curb ramps, or crosswalks on the way to the stop/station, (d) distance to or from the bus stop or train station, (e) and having enough accessible seats on the train. The finding that potential barriers in the pedestrian environment negatively impact the accessibility of UTA's public transportation system is consistent with previous research studies (Bezyak et al., 2017; Thatcher et al., 2013), which would seem to highlight that the issue of inaccessible pedestrian environments is widespread throughout the U.S. and requires attention not only by UTA, but also by public transportation providers nationwide. For UTA specifically, improvements in the pedestrian environment could have positive implications for use of both fixed route and paratransit services. As noted by Kim et al. (2018), accessibility improvements not only increased fixed route bus ridership, but it may also reduce reliance on UTA's paratransit service as barriers in the pedestrian environment are reduced or eliminated. The 2018 findings of Kim et al., coupled with the findings of the current study, indicate that people with disabilities who do not currently use UTA's service may be more likely to do so when the pedestrian environment is accessible. Furthermore, it appears that accessibility improvements in the pedestrian environment increase ridership among those who already use UTA's fixed route services while encouraging individuals who may be eligible for the costlier paratransit service to choose less expensive (and more inclusive) fixed route options. Based on these findings it is recommended that UTA undertake efforts to understand, catalogue, and communicate information about accessible routes or, potentially, the lack thereof. Once collected, this information could be shared on the UTA website or distributed through resources such as Google Maps. To ensure ongoing compliance with the DOT ADA standards, it is

recommended that UTA take a closer look at current stop announcement protocols to ensure that they align with federal expectations. It is also recommended that UTA actively work to monitor internal and external stop announcements for fixed route bus, TRAX, and FrontRunner services to ensure compliance not only with internal protocols but also with DOT standards. As indicated by the previously discussed literature review, there is limited academic research at the individual transportation district level to shed light on best practices in the above areas upon which UTA might rely for identifying potential solutions. Therefore, it is recommended that additional research be conducted in these areas. The findings from additional research would likely have implications not only for the Utah Transit Authority, but for other public transportation agencies nationwide.

Respondents who rode UTA's paratransit services identified the agency's no-show/late cancellation policy and eligibility process as the factors that made the service least accessible. Additional factors influencing the accessibility of UTA's paratransit service included length of paratransit ride times, information about potential barriers on the way to the service point, and scheduling paratransit rides. As with the top fixed route service barriers, additional research is needed to more deeply understand what specific components of each of the above factors make UTA's paratransit service inaccessible to identify potential solutions.

Disability type appears to play a greater role in identifying statistically significant differences in perceived accessibility among riders of UTA's fixed route services than among those riding paratransit service. On the other hand, frequency of ridership played a

larger role in identifying statistically significant differences in the perceived accessibility of UTA's paratransit services than was seen for UTA's fixed route services. Finally, regarding the relationship between service frequency and perceived accessibility on various potential barriers to using UTA's transportation services, more frequent ridership of fixed route services generally led to higher perceived accessibility while more frequent ridership of paratransit generally leads to reduced perceptions of accessibility. Increasing the frequency of fixed route ridership for individuals with disabilities who already ride fixed route services while also improving overall accessibility of UTA's public transportation systems in a way that would encourage fixed route ridership among those who rely primarily on paratransit may have a positive influence of the perceived accessibility of UTA's fixed route and paratransit services.

The combination of fixed route service modes used appears to have the most significant impact on perceived accessibility on potential barriers for riders of UTA's fixed route services among all factors considered. Whereas six statistically significant differences were found based on primary type of disability and four were found regarding frequency of ridership, differences in modes of fixed route services used resulted in statistically significant differences in perceived accessibility on twelve of 22 barriers. In nearly all cases where there were statistically significant differences, it was those individuals who rode UTA's TRAX service either alone or in combination with fixed route bus who had the lowest or neutral perceived accessibility of the barrier while those who used either other (non-TRAX) modes of UTA's fixed route services or all of UTA's fixed route service modes had the highest perceived accessibility. It appears that use of

UTA's fixed route bus and FrontRunner services either alone or in combination with use of UTA's TRAX service increases perceptions of accessibility while use of UTA's TRAX service alone may decrease perceptions of accessibility. The findings of this study suggest that an increased focus on fixed route accessibility may also increase ridership, including encouraging paratransit riders to use the service. It may be that making the fixed route more accessible would reduce the functional barriers current paratransit riders face regarding use of fixed route services. Not only would this shift be beneficial for riders in the form of reduced fares (because fixed route is generally less expensive than paratransit) and increased independence (because rides would not have to be scheduled in advance), this may also result in reduced costs to UTA because the per ride cost of paratransit is more than the per rider cost on fixed route services.

Implications for Transportation Accessibility Policy

As previously noted in this dissertation, social science research may play an important role in policy development and implementation (Blewden et al., 2010). In fact, publications specifically addressing transportation accessibility for people with disabilities have used research to promulgate policy recommendations (NCD, 2005, 2015). The results of this study may contribute to national transportation accessibility policy discussions, particularly regarding current regulations for stop announcements. For example, survey participants who were Deaf or hard of hearing indicated that the lack of visual stop announcements on UTA's fixed route buses made using the system less accessible for them. Unfortunately, current federal guidelines (49 CFR §37.167(b)(1),

(2); 49 CFR §37.167(c)) only require audible stop announcements. Given the wide range of technologies available for displaying information visually, this feedback from riders of UTA's public transportation system could be used by policymakers to consider updating current ADA standards for public transportation to require audio and visual announcements. Regardless, UTA should implement visual announcements.

Aside from national considerations, there are potential policy changes that could occur at the UTA level which may improve accessibility. For example, UTA could adopt an internal policy incorporating visual display systems on fixed route buses even in the absence of federal regulations requiring this. The ADA guidelines are intended to ensure a minimum level of accessibility; transportation agencies are certainly welcome to exceed federally required minimum accessibility levels. In the same vein, UTA could consider internal policies which incorporate larger priority seating and securement areas in future bus and train purchases. It is recommended that UTA review current accessibility policies in light of the results of this study to determine how internal policies may hinder accessibility and consider making reasonable changes to policy as needed to reinforce the factors that make the system accessible while simultaneously making changes in areas where additional attention is needed.

Limitations

It is recognized that this survey was limited in reaching all potential respondents because the survey instrument was only available for online completion thereby excluding individuals with disabilities who use UTA's public transportation services but do not have access to either a computer or to the Internet. Providing the instrument in

other formats, such as print or focus group formats, may yield different results. Future research should consider using multiple survey formats to ensure that individuals without computer or Internet access are able to participate.

As an extension of potential limitations related to the online-only options for survey completion, this study may be limited by the manner in which information about the survey was distributed. Though emails were sent to specific stakeholders, the majority of survey responses were received following posts on social media particularly those made by UTA on Facebook. In order to see these posts, an individual would both have to have a social media account and would have had to "like" UTA's Facebook page to be notified of posts on the UTA Facebook page. Therefore, it may be that survey participation was limited to only "friends" or users of UTA's social media accounts who may have more favorable views of UTA services than individuals who did not engage with UTA's social media accounts. This lack of interaction may be because these individuals either could not or would not use UTA services and who may, in turn, have less favorable views of the accessibility of UTA services which may have yielded results similar to those seen in the national studies mentioned previously.

It is also acknowledged that the response to the Spanish version of the survey was extremely limited ($n = 1$). It may be that this low response rate was due to the need for a more targeted outreach among Spanish speaking individuals with disabilities. It may also be the case that the online format also limited participation among this group. The lack of targeted outreach among linguistically diverse individuals is acknowledged as a limitation of this study. Future research should consider what factors may influence

reduced participation among linguistically diverse disability communities and incorporate recruitment techniques that will encourage participation among these groups.

Another limitation of this study was the self-selected nature of survey respondents. Furthermore, those who self-selected to participate in the study were at least generally aware of the purpose of the study. It is possible that participants opted to participate in the study because they had either extremely positive (accessible) or extremely negative (inaccessible) perceptions of UTA. Thus, it may be that individuals with somewhat inaccessible, neutral, or somewhat accessible views of UTA services were not represented in the sample. If this was the case, the study results may not be reflective of the full community of individuals with disabilities who use UTA services. This potential limitation could be mitigated in future research by using a broader marketing approach than was used in the current study (e.g., direct mail, presentations to community organizations, etc.).

Finally, although the full sample size (n = 327) was large enough to ensure the reliability of ANOVA statistical analyses which involved all members of the sample (e.g., perceptions of the accessibility of each UTA service mode), it is not entirely clear that the same can be said for statistical analyses which did not compare all sample members. For example, the sample of survey respondents who used paratransit, either alone or in combination with UTA's fixed route services, was small (n = 74) when compared to respondents who used fixed route services, either alone or in combination with paratransit (n = 255). Increasing the sample size of riders of paratransit services, perhaps through direct marketing to current riders, could guard against potential violations of ANOVA

assumptions in future research. Alternatively, future research might consider using multiple statistical analyses process which may be better suited for analyzing data from a small sample.

Conclusion

Transportation plays an essential role in accessing education, healthcare, work, shopping, and other aspects of full social inclusion (Casas, 2007; Rajé, 2003) and social participation (Delbosc & Currie, 2011; Samuel et al., 2013) as well as subjective well-being (Delbosc & Currie, 2011; Ma et al., 2018) and overall quality of life (Samuel et al., 2013). A lack of private transportation options may make some groups, including individuals with disabilities, more dependent on public transportation systems (Wasfi et al., 2007; Penfold et al., 2008). In fact, recent literature supports the idea that people with disabilities are relying on public transportation to meet their transportation needs (Bezyak et al., 2017). Despite increased use of public transportation, people with disabilities continue to report barriers accessing public transportation services. National studies conducted in the U.S. by Bezyak et al. and Thatcher et al. (2013) found that many individuals with disabilities who were interested in using public transportation were unable to do so. Literature on this topic suggests that additional research is needed to understand these barriers (Bezyak et al., 2017), as well as the impacts of these barriers (Bascom & Christensen, 2017), particularly at the regional transportation system level, for which no previous studies regarding perceived accessibility and barriers to access were identified.

Therefore, the purpose of this study was to better understand the barriers and perceived accessibility of UTA's public transportation system for individuals with disabilities living within the UTA service area. In support of this purpose, the following research questions guided this study: 1) To what extent do individuals with disabilities living within the UTA service area perceive the UTA system to be accessible to and usable by people with disabilities? and 2) What barriers, if any, do people with disabilities face when accessing UTA's transportation services? Using an online survey, data was collected from 327 individuals with disabilities, family members of individuals with disabilities, or others who work with individuals with disabilities. Statistical analyses of survey responses identified three study findings.

1. Individuals with disabilities generally have neutral to somewhat positive (accessible) views of the accessibility of UTA's transportation services though there are differences based on disability type, modes of services used in general and specifically regarding fixed route service modes, and frequency of ridership are considered.

2. Despite these neutral to somewhat accessible perceptions, barriers to accessing UTA's fixed route and paratransit services exist, including statistically significant differences based on disability type, modes of fixed route services used, and ridership frequency.

3. Local and national policy changes may be necessary to resolve these barriers.

This chapter provided suggests for the UTA while also highlighting the need for additional research regarding public transportation accessibility.

Though this study found that individuals with disabilities have neutral to somewhat accessible views of UTA's public transportation system, there remain implications for UTA, as well as other regional transportation districts and public transportation policy stakeholders, to better understand what specific components of the

UTA system make its use accessible, including an understanding of how these accessible practices could be generalized to other public transportation providers. This implication is particularly interesting because several national studies that public transportation systems may not be very accessible. At the same time, because there are components of the UTA system which are not fully accessible, it would also be meaningful to more deeply understand these system components so that solutions can be identified for the UTA system, as well as other public transportation systems which may have similar accessibility barriers. As additional empirical research about both the successes and areas for improvement, this study also has implications for the research community.

Overall, while this social research study provides several implications for UTA, other regional transportation districts, public transportation policy stakeholders, and public transportation researchers, it is recognized that this study's focus on electronic data collection and the potential influence of small subsamples underscores the need for additional research on the topics of perceived accessibility of public transportation and barriers to using public transportation services for individuals with disabilities.

REFERENCES

Abdi, H. & Williams, L. J. (2010). Tukey's honestly significant difference (HSD). In N. Salkind (Ed.) *Encyclopedia of research design* (1- 5). Thousand Oaks, CA: Sage.

Accessibility Specifications for Transportation Vehicles, 49 CFR §38.

ADA National Network. (n.d.). *What is the Americans with Disabilities Act (ADA)*? Retrieved from https://adata.org/learn-about-ada

Americans with Disabilities Act (ADA), Pub. L. No. 101-336, 104 Stat. 328 (1990).

Americans with Disabilities Act Amendments Act (ADAAA), Pub. L. No. 110-325, Stat. 122 (2008).

Andrews, D., Nonnecke, B., & Preece, J. (2003). Electronic survey methodology: A case study in reaching hard-to-involved internet users. *International Journal of Human-Computer Interaction, 18*(2), 185-210.

Bocarejo, J. P., & Oviedo, D. R. (2012). Transportation accessibility and social inequality: A tool for identification of mobility needs and evaluation of transport investments. *Journal of Transport Geography, 24*, 142-154.

Bascom, G. W., & Christensen, K. M. (2017). The impact of limited transportation access on persons with disabilities' social participation. *Journal of Transport & Health, 7*(B), 227-234.

Bezyak, J. L, Sabella, S. A., & Gattis, R. H. (2017). Public transportation: An investigation of barriers for people with disabilities. *Journal of Disability Policy Studies, 28*(1), 52-60.

Blewden, M., Carroll, P., & Witten, K. (2010). The use of social science research to information policy development: Case studies from recent immigration policy. *Kōtuitui: New Zealand Journal of Social Sciences Online, 5*(1), 13-25.

Buchanan, E. A., & Hvizdak, E. E. (2009). Online survey tools: Ethical and methodological concerns of human research ethics committees. *Journal of Empirical Research on Human Research Ethics, 4*(2), 37-48.

Capital Area Transportation Authority (CATA). (n.d.). *Curb-to-curb & paratransit*. Retrieved from https://www.cata.org/Routes-Schedules/Find-Bus-by-Service/Curb-to-Curb-Paratransit

Casas, I. (2007). Social exclusion and the disabled: An accessibility approach. *The Professionals Geographer, 59*(4), 463-477.

Christensen, K. M. (2014, January). *The relationship between transportation, density, and the employment of individuals with disabilities*. Paper presented at the Transportation Research Board (TRB) Annual Meeting, Washington, DC.

Clery, E., Kiss, Z., Taylor, E., & Gill, V. (2017). *Disabled people's travel behaviour and attitudes to travel*. London, UK: Department for Transport.

Cohen, B. H. (2001). *Explaining psychological statistics* (2nd ed.). Hoboken, NJ: Wiley.

Colorado State University (CSU) Department of Occupational Therapy. (n.d.). *The access project: Module 1 – Mobility impairments*. Retrieved from http://accessproject.colostate.edu/disability/modules/MI/tut_MI.php

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed method approaches* (2nd ed.). Thousand Oaks, CA: Sage.

Currie, G., & Stanley, J. (2008). Investigating links between social capital and public transport. *Transport Reviews, 28*(4), 529-547.

Dallas Area Rapid Transit (DART). (n.d.). *Paratransit service*. Retrieved from https://www.dart.org/riding/paratransit.asp

De Vaus, D. (2002). *Surveys in social research* (5th ed.). London, UK: Routledge.

Delbosc, A., & Currie, G. (2011). Transport problems that matter: Social and psychological links to transport disadvantage. *Journal of Transport Geography, 19*(1), 170-178.

Federal Communications Commission (FCC). (2018). *About the disability rights office*. Retrieved from https://www.fcc.gov/general/disability-rights-office#block-menu-block-4

Fleischer, D. Z., & Zames, F. (2011). *The disability rights movement: From charity to confrontation*. Philadelphia, PA: Temple University Press.

Friedman, C., & Rizzolo, M. C. (2016). The state of transportation for people with intellectual and developmental disabilities in Medicaid home and community-based services 1915(c) waivers. *Journal of Disability Policy Studies, 27*(3), 168-177.

Frieden, L. (2005). *Access to transportation by people with disabilities: Illustrations of implementation from the United States*. Retrieved from https://ncd.gov/rawmedia_ repository/114ccbf3_c53b_4920_a4bb_f9dc8a224012.pdf

Gravetter, F. J. & Wallnau, L. B. (2010). *Essentials of statistics for the behavioral sciences* (7th ed). Belmont, CA: Wadsworth Cengage Learning.

Green, S. B., & Salkind, N. J. (2008). *Using SPSS for Windows and Macintosh: Analyzing and understanding data* (5th ed.). Upper Saddle River, NJ: Pearson Education.

Hall, R. (2008). *Applied social research: Planning, designing, and conducting real-world research*. Melbourne, Australia: Palgrave Macmillan.

Hess, P., Moudon, A., Snyder, M., & Stanilov, K. (1999). Site design and pedestrian travel. *Transportation Research Record: Journal of the Transportation Research Board, 1674*(1), 9-19.

Jansuwan, S., Christensen, K., & Chen, A. (2013). Assessing the transportation needs of low-mobility individuals: Case study of a small urban community in Utah. *Journal of Urban Planning and Development, 139*(2), 104-114.

Jernigan, K. (2005). A definition of blindness. *Future Reflections: Special Issue – Low Vision and Blindness, 24*(3). Retrieved from https://nfb.org/sites/www.nfb.org/files/images/nfb/publications/fr/fr19/fr05si03.htm

Kampen, J. & Swyngedouw, M. (2000). The ordinal controversy revisited. *Quality & Quantity, 34*, 87-102.

Katzmann, R. A. (1986). *Institutional disability: The saga of transportation policy for the disabled*. Washington DC: The Brookings Institution.

Kim, J. Y., Bartholomew, K., & Ewing, R. (2018). *UDOT research: Impact of bus stop improvements* (Report No. UT-180.04). Salt Lake City, UT: UDOT Research Division.

Learning Disabilities Association of America (LDA). (2012). *What are learning disabilities*? Retrieved from https://ldaamerica.org/advocacy/lda-position-papers/what-are-learning-disabilities/

Lee, R. J., Sener, I. N., & Jones, S. N. (2017). Understanding the role of equity in active transportation planning in the United States. *Transport Review, 37*(2), 211-226.

Liddell, T. M. & Kruschke, J. K. (2018). Analyzing ordinal data with metric models: What could possibly go wrong? *Journal of Experimental Social Psychology, 79,* 328-348.

Lucas, K., & Currie, G. (2012). Developing socially inclusive transportation policy: Transferring the United Kingdom policy approach to the State of Victoria? *Journal of Transport and Health, 2*(4), 610-617.

Ma, L., Kent, J. L., & Mulley, C. (2018). Transport disadvantage, social exclusion, and subjective well-being: The role of the neighborhood environment – evidence from Sydney, Australia. *The Journal of Transportation and Land Use, 11*(1), 31-47.

Martens, K. (2012). Justice in transportation as justice in accessibility: Applying Walzer's 'sphere of justice' to the transit sector. *Transportation, 39*(6), 1035-1053.

Mayerson, A. (1992). *The history of the Americans with Disabilities Act*. Retrieved from https://dredf.org/about-us/publications/the-history-of-the-ada/.

Mayo Clinic. (n.d.). *Mental illness*. Retrieved from ttps://www.mayoclinic.org/diseases-conditions/mental-illness/symptoms-causes/syc-20374968

McCluskey, M. T. (1987). Rethinking equality and difference: Disability discrimination in public transportation. *The Yale Law Journal, 97,* 863-880.

Meeting the Challenge. (n.d.). *Who we are*. Retrieved from http://www.mtc-inc.com/about-us.html

MetroLINK. (n.d.). *ADA paratransit*. Retrieved from https://www.gogreenmetro.com/163/ADA-Paratransit

National Aging and Disability Transportation Center (NADTC). (n.d.). *ADA & paratransit: What is ADA complementary paratransit*? Retrieved from http://www.nadtc.org/about /transportation -aging-disability/ada-and-paratransit/

National Council on Disability (NCD). (2005). *The current state of transportation for people with disabilities in the United States*. Retrieved from https://ncd.gov/rawmedia_repository/afd954e1_161b_4524_ace5_38aefac854cc.pdf

National Council on Disability (NCD). (2015). *Transportation update: Where we've gone and what we've learned*. Retrieved from https://ncd.gov/publications/2015/05042015

National Low Income and Housing Coalition (NLIHC). (2014). *40 years ago: The Rehabilitation Act of 1973*. Retrieved from http://nlihc.org/article/40-years-ago-rehabilitation-act-1973-passed

National Institutes of Health (NIH). (2010). *Fact sheet: Intellectual and developmental disabilities*. Retrieved from https://report.nih.gov/nihfactsheets/ViewFactSheet.aspx?csid=100&key=I

National Planning Commission. (2012). *National development plan 2030: Our future–make it work*. Pretoria, South Africa: Presidency of South Africa.

National Statistics, Department for Transport (DfT). (January 2007). *Health-related travel difficulties: Personal travel factsheet*. Retrieved from http://webarchive.nationalarchives.gov.uk/20091003142339/http://www.dft.gov.uk/pgr/statistics/datatablespublications/personal/factsheets/healthrelatedfactsheet.pdf

National Transit Database (NTD). (2018). *Glossary*. Retrieved from https://www.transit.dot.gov/ntd/national-transit-database-ntd-glossary

Neuman, W. L. (2012). *Basics of social research: Qualitative and quantitative approaches* (3rd ed.). Boston, MA: Pearson Education.

Nondiscrimination on the Basis of Disability in Programs or Activities Receiving Federal Financial Assistance, 49 CFR §27.

Payne, G., & Payne, J. (2004). *Key concepts in social research*. London, UK: Sage.

Penfold, C., Cleghorn, N., Creegan, C., Neil, J., & Webster, S. (2008). Travel behavior, experiences, and aspirations of disabled people. *Report for Department of Transport, United Kingdom*. London, UK: National Centre for Social Research.

Pfeiffer, D. (1993). Overview of the disability movement: History, legislative record, and political implications. *Policy Studies Journal, 21*(4), 724-734.

Proffitt, D. V., Bartholomew, K., Ewing, R., & Miller, H. J. (2019). Accessibility planning in American metropolitan areas: Are were there yet? *Urban Studies, 56*(1), 167-192.

Rajé, F. (2003). The impact of transport on social exclusion processes with specific emphasis on road user charging. *Transport Policy, 10*(4), 321-338.

Richardson, J. T. (2010). Eta squared and partial eta squared as measures of effect size in educational research. *Educational Research Review, 6*, 135-147.

Rosenbloom, S. (2007). Transportation patterns and problems of people with disabilities. In M. J. Field & A. M. Jette (Eds.), *The future of disability in America* (pp. 519-560). Washington DC: National Academies Press.

Samuel, P. S., Lacey, K. K., Giertz, C., Hobden, K. L., & LeRoy, B. (2013). Benefits and quality of life outcomes from transportation voucher use by adults with disabilities. *Journal of Policy and Practice in Intellectual Disabilities, 10*(4), 277-288.

Scotch, R. K. (1989). Politics and policy in the history of the disability rights movement. *The Milbank Quarterly, 67*(Suppl. 2, Pt. 2), 380-400.

Sills, S. J., & Song, C. (2002). Innovations in survey research: An application of web-based surveys. *Social Science Computer Review, 20*(1), 22-30.

Syed, S. T., Gerber, B. S., & Sharp, L. K. (2013). Traveling towards disease: Transportation barriers to health care access. *Journal of Community Health, 38*(5), 976-993.

Technological Education Center for Deaf and Hard-of-Hearing Students (DeafTEC). (n.d.). *For employers: Resources for hiring and integration*. Retrieved from https://www.deaftec.org/content/deaf-definitions

Thatcher, R., Ferris, C., Chia, D., Purdy, J., Ellis, B., Hamby, B., Quan, J., & Golden, M. (2013). *TCRP Report 163: Strategy guide to enable and promote the use of fixed-route transit by people with disabilities*. Retrieved from http://www.trb.org/ Publications/Blurbs/170626.aspx

TransSystems Corporation. (2014). *Transit cooperative research program (TCRP) Project B-40: Final research report to enable and promote the use of fixed-route transit by people with disabilities*. Retrieved from http://onlinepubs.trb.org/ onlinepubs/tcrp/tcrp_rpt_163FR.pdf

Transportation Services for Individuals with Disabilities, 49 CFR §37.

U.S. Access Board. (n.d.a). *About ADAAG for transportation vehicles*. Retrieved from https://www.access-board.gov/guidelines-and-standards/transportation/ vehicles/about-adaag-for-transportation-vehicles

U.S. Access Board (n.d.b). *About the ADA standards*. Retrieved from https://www. access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards

U.S. Access Board. (n.d.c). *About the ADA standards for transportation facilities*. Retrieved from https://www.access-board.gov/guidelines-and-standards/ transportation/ facilities/about-the-ada-standards-for-transportation-facilities

U.S. Access Board. (n.d.d). *About the U.S. Access Board*. Retrieved from https://www. access-board.gov/the-board

U.S. Access Board. (n.d.e). *History of the Access Board*. Retrieved from https://www. access-board.gov/the-board/board-history

U.S. Bureau of Labor Statistics (BLS). (2012). *Persons with disability: Barriers to employment, types of assistance, and other labor-related issues*. Retrieved from https://www.bls.gov/news.release/archives/dissup_04242013.pdf

U.S. Census Bureau. (2016). *2016 American Community Survey: American fact finder – disability characteristics for Davis, Salt Lake, Utah, and Weber counties*. Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/searchresults .xhtml?refresh=t#acsST

U.S. Census Bureau. (2015). *2015 American community survey*. Retrieved from https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src= bkmk.

U.S. Department of Transportation (DOT). (2006). *Americans with Disabilities Act (ADA) standards for transportation facilities*. Retrieved from https://www.access-board.gov/attachments/article/1417/ADAdotstandards.pdf

U.S. Department of Transportation, Bureau of Transportation Statistics (BTS). (2003a). *Freedom to travel*. Washington, DC: Author.

U.S. Department of Transportation, Federal Highway Administration (FHWA). (2017). *Americans with Disabilities Act (ADA)/Section 504 of the Rehabilitation Act of 1973 (504).* Retrieved from https://www.fhwa.dot.gov/civilrights/programs/ ada.cfm

U.S. Department of Transportation, Federal Transit Administration (FTA). (n.d.a). *Are paratransit service providers required to provide service beyond the curb?* Retrieved from https://www.transit.dot.gov/are-paratransit-service-providers-required-provide-service-beyond-curb

U.S. Department of Transportation, Federal Transit Administration (FTA). (n.d.b). *Civil Rights/ADA*. Retrieved from https://www.transit.dot.gov/regulations-and-guidance/civil-rights-ada/civil-rightsada

U.S. Department of Transportation, Federal Transit Administration (FTA). (2015). *Circular FTA C 4710.1.* Retrieved from https://www.transit.dot.gov/ sites/fta.dot.gov/files/docs/ Final_FTA_ADA_Circular_C_4710.1.pdf

U.S. Department of Transportation, Federal Transit Administration (FTA). (2016). *Interpretation of definitions*. Retrieved from https://www.transit.dot.gov /research-innovation/interpretations-definitions

U.S. Department of Transportation, Federal Transit Administration (FTA). (2017). *ADA and the FTA: Improving transit access for people with disabilities*. Retrieved from https://www.youtube.com/watch?v=Wr44TwH5WEg&feature=youtube

U.S. Department of Transportation, Federal Transit Administration (FTA). (2019). *National Transit Database (NTD) Glossary.* Retrieved from https://www.transit. dot.gov/ntd/national-transit-database-ntd-glossary

U.S. Equal Employment Opportunity Commission (EEOC). (n.d.a). *Laws enforced by the EEOC*. Retrieved from https://www.eeoc.gov/laws/statutes/index.cfm

U.S. Equal Employment Opportunity Commission (EEOC). (n.d.b*). EEOC 35th anniversary: Remarks of President George Bush at the signing of the Americans with disabilities act*. Retrieved from https://www.eeoc.gov/eeoc/history/35th/videos/ada_ signing_text.html

Utah Transit Authority (UTA). (n.d.a). *Paratransit services*. Retrieved from https://www.rideuta.com/Rider-Info/UTA-Accessibility/UTA-Paratransit-Services

Utah Transit Authority (UTA). (n.d.b). *Reasonable service modifications*. Retrieved from https://www.rideuta.com/Rider-Info/UTA-Accessibility/Reasonable-Service-Modification

Van Selm, M., & Jankowski, N. (2006). Conducting online surveys. *Quality & Quantity, 40*(3), 435-456.

Wasfi, R. A., Levinson, D. M., & El-Geneidy, A. (2007, January). *Measuring the transportation needs of people with developmental disability*. Paper presented at the 86th Annual Meeting of the Transportation Research Board, Washington, DC.

Zhou, Y. & Skidmore, S.T. (2017). A reassessment of ANOVA reporting practices: A review of three APA journals. *Journal of Methods and Measurement in the Social Sciences, 8*(1), 3-19.

APPENDICES

Appendix A

Informed Consent

Letter of Information

Evaluation of transit system accessibility for individuals with disabilities

Purpose
You are invited to participate in a research study conducted by Dr. Keith Christensen, an Associate Professor in the Department of Landscape Architecture and Environmental Planning and the Center for Persons with Disabilities at Utah State University. The purpose of this research is to better understand the barriers and perceived accessibility of the Utah Transit Authorities' (UTA) public transportation system for individuals with disabilities living within the UTA service area.

This form includes detailed information on the research to help you decide whether to participate in this study. Please read it carefully and ask any questions you have before you agree to participate.

Procedures
Your participation will involve the completion of an online survey which should take less than 15 minutes to complete. Your participation is voluntary and confidential.

Risks
This is a minimal risk research study. That means that the risks of participating are no more likely or serious than those you encounter in everyday activities. The survey is anonymous, confidential, and does not request personal identifying information.

Benefits
Participation in this study may directly benefit you through changes in UTA's services in response to barriers identified through this study. More broadly, this study will help the researchers learn more about transportation system accessibility barriers and may help future populations with similar needs.

Confidentiality
The researchers will make every effort to ensure that the information you provide as part of this study remains confidential. Your identity will not be revealed in any publications, presentations, or reports resulting from this research study.

We will collect your information through Qualtrics, an online survey tool. Your responses will be securely stored in a restricted-access folder on Box.com, an encrypted, cloud-based storage system. Should you provide your email address to participate in the drawing for one of 20 $25 Visa gift cards, your email address will be removed from the database after the drawing is completed.

It is unlikely, but possible, that others (Utah State University, Utah Transit Authority, or state or federal officials) may require us to share the information you give us from the study to ensure that the research was conducted safely and appropriately. We will only share your information if law or policy requires us to do so.

The research team works to ensure confidentiality to the degree permitted by technology. It is possible, although unlikely, that unauthorized individuals could gain access to your responses because you are responding online. However, your participation in this online survey involves risks similar to a person's everyday use of the Internet.

Voluntary Participation
Your participation in this research is completely voluntary. If you agree to participate now and change your mind later, you may withdraw at any time by exiting the online survey. However, as your participation is completely anonymous, we will be unable to withdraw any responses previously given as we will be unable to determine whose

data is yours. If you decide not to participate, the services you receive from the Utah Transit Authority will not be affected in any way.

The researchers may choose to exclude your responses in this research study if you are not an individual with disabilities, family member of an individual with disabilities, caregiver, or others associated with individuals with disabilities living within the UTA service area of Weber, Davis, Salt Lake, and Utah counties in the state of Utah.

Compensation

For your participation in this research study, you will be eligible to participate in a random drawing to receive one of 20 $25 Visa gift cards.

IRB Review

The Institutional Review Board (IRB) for the protection of human research participants at Utah State University has reviewed and approved this study. If you have questions about the research study itself, please contact the Principal Investigator at 435 797-0507 or keith.christensen@usu.edu. If you have questions about your rights or would simply like to speak with someone other than the research team about questions or concerns, please contact the IRB Director at (435) 797-0567 or irb@usu.edu.

Keith Christensen
Principal Investigator
(435) 797-0507; keith.christensen@usu.edu

Informed Consent

By continuing on to the survey, you agree to participate in this study. You indicate that you understand the risks and benefits of participation, and that you know what you will be asked to do. You also agree that you have asked any questions you might have, and are clear on how to stop your participation in the study if you choose to do so. Please be sure to retain a copy of this form for your records.

Appendix B

Recruitment Email

You are invited to participate in a study sponsored by the Utah Transit Authority (UTA) and Center for Persons with Disabilities at Utah State University. The purpose of the study is to better understand the accessibility of UTA's public transportation system for individuals with disabilities. If you are 18 years of age or older, an individual with a disability, family member, or care for an individual with a disability living in Weber, Davis, Salt Lake, or Utah county, please take the time to respond to this survey. The survey will take approximately 15 minutes to complete online at LINK.

Those who complete the survey may elect to be entered into a drawing for one of twenty $25 Amazon gift cards.

Participation is voluntary and your responses will remain anonymous. If you would like additional information, please contact Keith Christensen at keith.christensen@usu.edu or 435 797-0507. Thank you for taking the time to participate.

LINK

Keith Christensen

Utah State University

ATTACH LETTER OF INFORMATION

Appendix C

Survey (English)

Accessibility of Utah Transit Authority's Public Transportation Services for Individuals with Disabilities

Introduction

You are invited to participate in a study sponsored by the Utah Transit Authority (UTA) and Utah State University. The purpose of the study is to learn more about how accessible the Utah Transit Authority's public transportation services are for people with disabilities.

Participation is voluntary and your responses will remain anonymous. Completing this survey indicates you agree to voluntarily participate according to the Letter of information. If you would like additional information, please contact Keith Christensen at keith.christensen@usu.edu or 435 797-0507.

Instructions:
The goal of this survey is to learn more about how accessible the Utah Transit Authority's (UTA) public transportation services are for people with disabilities.

Please participate in this study if:

1. You are a person with a disability, a family member of a person with a disability, or are a disability service provider,
2. You are at least 18 years old, and
3. You live in Weber, Davis, Salt Lake, or Utah counties.

You can complete this survey on your own or can ask for help completing the survey.

1. Which best describes you?
    a. Person with a disability
    b. Family member of a person with a disability
    c. Disability service provider
    d. Other (please describe):
    e. None of the above

2. Are you or the person you are answering for at least 18 years old?
    a. Under 18 years of age
    b. Over 18 years of age

3. What is the primary type of disability that you or the person you are answering for have?
    a. Physical disability, including mobility impairments
    b. Blindness or other visual impairment
    c. Deafness or hard of hearing
    d. Intellectual and/or developmental disability
    e. Learning disability
    f. Mental health disability
    g. Other (please describe)
    h. I do not have a disability

4. Which county do you or the person you are answering for live in?
    a. Weber
    b. Davis
    c. Salt Lake
    d. Utah
    e. None of the above

5. UTA's fixed route service includes buses and trains, like TRAX and FrontRunner, that have set times to pick people up or drop them off at bus stops or train stations. UTA's paratransit service is used by people with disabilities who can't use fixed route services. People using paratransit are usually picked up or dropped off somewhere other than a bus stop or train station, like the curb outside of their home. Does UTA provide both fixed route and paratransit services in your community?
    a. Yes
    b. No
    c. Not sure

6. UTA's fixed route service includes buses and trains, like TRAX and FrontRunner, that have set times to pick people up or drop them off at bus stops or train stations. UTA's paratransit service is used by people with disabilities who can't use fixed route services. People using paratransit are usually picked up or dropped off somewhere other than a bus stop or train station, like the curb outside of their home. Which best describes how you use UTA's services?
    a. I use the buses and/or trains, but don't use paratransit
    b. I use paratransit, but don't use the buses or trains
    c. I use the buses and/or trains and paratransit
    d. I don't use the buses, trains, or paratransit

7. Why don't you use UTA's services?

8. Which fixed route services do you use? (choose all that apply)
    a. Fixed route bus
    b. TRAX
    c. FrontRunner

9. How often do you use UTA's buses or trains?
    a. Every day or almost every day
    b. A few times a week
    c. About once a week
    d. A few times a month
    e. About once a month
    f. About once a year

10. Below are a few things people with disabilities might think about when deciding if UTA's buses or trains are accessible, or easy for someone with a disability to use. Something that is hard for a person with a disability to use would be inaccessible. On a scale of 1 to 5, with 1 being "inaccessible" and 5 being "accessible," how accessible is each of these things when you use UTA's fixed route buses or trains? If an item doesn't apply to you, select "not applicable."
    a. How many days the buses or trains run
    b. The hours that buses or trains run
    c. The number of transfers you will need to make to finish your trip
    d. Cost
    e. Knowing how to use buses or trains
    f. Past experiences riding buses or trains
    g. Service quality
    h. Stop announcements
    i. Personal safety
    j. Distance to or from the bus stop or train station
    k. Sidewalks, curb ramps, or crosswalks on the way to the bus stop or train station
    l. Information about potential barriers on the way to the bus stop or train station
    m. Bus stop or train station accessibility
    n. Ability to get on or off the bus or train
    o. Whether the bus or train's lift, ramp, or bridge plate is working
    p. Having enough accessible seats on the bus, including securement locations
    q. Having enough accessible seats on the train
    r. Ability to have my mobility device secured how I like
    s. Ability to fit my mobility device on the bus or train
    t. Driver attitude, assistance, or knowledge
    u. Attitudes of other riders
    v. Ability to accommodate my service animal

11. How often do you use UTA's paratransit service?
    a. Every day or almost every day
    b. A few times a week
    c. About once a week
    d. A few times a month
    e. About once a month
    f. About once a year

12. Below are a few things that people with disabilities might think about when deciding if UTA's paratransit service is accessible, or easy for someone with a disability to use. Something that is hard for a person with a disability to use would be inaccessible. On a scale of 1 to 5, with 1 being "inaccessible" and 5 being "accessible," how accessible is each of these things when you use UTA's paratransit service? If an item doesn't apply to you, select "not applicable."
    a. How many days paratransit runs
    b. The hours that paratransit services run
    c. Cost
    d. Knowing how to use paratransit
    e. Past experiences riding paratransit
    f. Paratransit service quality
    g. Personal safety
    h. Distance to or from service point
    i. Sidewalks, curb cuts, or crosswalks on the way to the paratransit service point
    j. Information about potential barriers on the way to the service point
    k. Ability to get on or off the paratransit vehicle
    l. Lift not working on the paratransit vehicle
    m. Ability to have my mobility device secured how I like
    n. Ability to fit my mobility device on paratransit vehicles
    o. Driver attitudes, assistance, or knowledge
    p. Attitudes of other riders
    q. Ability to accommodate my service animal
    r. Scheduling paratransit rides
    s. Driver arriving outside of the pick-up window
    t. Length of paratransit ride times
    u. No-show/late cancellation policy
    v. Ability to qualify for paratransit service
    w. Paratransit eligibility process

13. Are there other things that weren't listed in the last question(s) that you think about when deciding if UTA's services are accessible, or easy for someone with a disability to use?
    a. Yes (please specify):
    b. No

    c. Not sure

14. On a scale from 1 to 5, with 1 being “inaccessible” and 5 being “accessible,” how accessible do you think the following UTA transportation services are for people with disabilities?
    a. Fixed route bus
    b. TRAX
    c. FrontRunner
    d. Paratransit

15. What makes each these services accessible for people with disabilities?
    a. Fixed route bus:
    b. TRAX:
    c. FrontRunner:
    d. Paratransit:

16. What would make each of these services more accessible to people with disabilities?
    a. Fixed route bus:
    b. TRAX:
    c. FrontRunner:
    d. Paratransit:

17. On a scale from 1 to 5, with 1 being “unlikely” and 5 being “likely,” how likely would you be to use an autonomous vehicle?

18. Why would or wouldn’t you use autonomous vehicles? Please explain.

19. Do you use ride hailing services such as Uber or Lyft?
    a. Yes
    b. No

20. Why do or don’t you use ride hailing services such as Uber or Lyft? Please explain.

21. Demographic Questions
    a. What is your age?
        i. Less than 20 years old
        ii. 20 – 29
        iii. 30 – 39
        iv. 40 – 49
        v. 50 – 59
        vi. 60 – 69
        vii. 70 or more years old

b. What is your gender?
    i. Male
    ii. Female
    iii. Prefer to self describe:
    iv. Prefer not to answer

22. Would you like to provide your email address to be entered to win one of 20 $25 gift cards?
    a. Yes
    b. No

Thank you!

Thank you for completing this survey. Your response is greatly appreciated.

Appendix D

Survey (Spanish)

Accesibilidad del Servicio de Transporte Público de la Autoridad de Tránsito de Utah (UTA) para individuos con discapacidades

Introducción

Usted ha sido invitado a participar en un estudio patrocinado por la Autoridad de Tránsito de Utah (UTA, por sus siglas en inglés) y la Universidad del Estado de Utah (Utah State University). El propósito de este estudio es aprender más sobre la accesibilidad de los servicios de transporte público de la Autoridad de Tránsito de Utah para personas con discapacidades.

La participación es de carácter voluntario y sus respuestas permanecerán anónimas. Al completar esta encuesta, usted estará aceptando participar voluntariamente de acuerdo con la Carta de Información (Letter of information). Si desea información adicional, por favor comuníquese con Keith Christensen al correo keith.christensen@usu.edu o al 435-797-0507.

Instrucciones:
El objetivo de esta encuesta es aprender más sobre la accesibilidad de los servicios de transporte público de la Autoridad de Tránsito de Utah (UTA) para personas con discapacidades.

Por favor, participe de esta encuesta si:

1. Es usted una persona con discapacidad, miembro familiar de una persona con discapacidad o es un proveedor de servicios para discapacitados.
2. Tiene 18 años o más y,
3. Reside en Weber, Davis, Salt Lake, o condados de Utah.

Puede completar esta encuesta por su cuenta o puede hacerla con la ayuda de alguien más.

1. ¿Cuál opción lo describe mejor?
    a. Persona con discapacidad
    b. Miembro familiar de una persona con discapacidad
    c. Proveedor de servicios para discapacitados
    d. Otro (por favor describa):
    e. Ninguna de las anteriores

2. ¿Tiene usted, o la persona para la cual está respondiendo esta encuesta, al menos 18 años de edad?
    a. Menor de 18 años de edad
    b. Mayor de 18 años de edad

3. ¿Cuál es el tipo de discapacidad primaria que tiene usted o la persona para la cual está respondiendo esta encuesta?

   a. Discapacidad física, incluyendo problemas de movilidad
   b. Ceguera u otra deficiencia visual
   c. Sordera o dificultad auditiva
   d. Discapacidad intelectual y/o del desarrollo
   e. Discapacidades del aprendizaje
   f. Discapacidades asociadas a enfermedades mentales
   g. Otra (por favor describa)
   h. No tengo ninguna discapacidad

4. ¿En qué condado vive usted, o la persona para la cual está respondiendo esta encuesta?
   a. Weber
   b. Davis
   c. Salt Lake
   d. Utah
   e. Ninguno de los anteriores

5. El servicio de ruta fija de la UTA incluye autobuses y trenes, como el TRAX y el FrontRunner, que tienen horarios establecidos para recoger y dejar a las personas en paradas de autobús o estaciones de tren. El servicio de paratránsito de la UTA está diseñado para personas en condición de discapacidad que no pueden hacer uso del servicio de ruta fija. Las personas que hacen uso del paratránsito son generalmente recogidas y regresadas en lugares distintos a las paradas de autobuses o estaciones de tren, como en las aceras de afuera de sus hogares. ¿Ha la UTA proporcionado servicios de ruta fija y servicios de paratránsito en su comunidad?
   a. Si
   b. No
   c. No estoy seguro/a

6. El servicio de ruta fija de la UTA incluye autobuses y trenes, como el TRAX y el FrontRunner, que tienen horarios establecidos para recoger y dejar a las personas en paradas de autobús o estaciones de tren. El servicio de paratránsito de la UTA está diseñado para personas en condición de discapacidad que no pueden hacer uso del servicio de ruta fija. Las personas que hacen uso del paratránsito son generalmente recogidas y regresadas en lugares distintos a las paradas de autobuses o estaciones de tren, como en las aceras de afuera de sus hogares. ¿Cuál de las siguientes opciones mejor describe la forma en la cual hace uso de los servicios de la UTA?
   a. Uso autobuses y/o trenes, pero no uso el paratránsito
   b. Uso el paratránsito, pero no uso autobuses o trenes
   c. Uso los autobuses y/o trenes, así como el paratránsito
   d. No uso ni los autobuses, ni los trenes, ni el paratránsito

7. ¿Por qué no hace uso de los servicios de la UTA?

8. ¿Cuáles servicios de ruta fija utiliza usted? (escoja todas las que apliquen)
    a. Autobuses de ruta fija
    b. TRAX
    c. FrontRunner

9. ¿Con qué frecuencia usa los buses o trenes de la UTA?
    a. Todos los días o casi todos los días
    b. Unas cuantas veces por semana
    c. Alrededor de una vez por semana
    d. Algunas veces al mes
    e. Alrededor de una vez al mes
    f. Alrededor de una vez al año

10. A continuación encontrará algunas cosas en las que podrían pensar las personas con discapacidad a la hora de decidir si los autobuses o trenes de la UTA son accesibles o fáciles de usar para una persona con discapacidad. Algo que sea difícil de usar para una persona con discapacidad sería inaccesible. En una escala de 1 a 5, donde 1 es "inaccesible" y 5 es "accesible", ¿qué tan accesible es cada una de las opciones siguientes cuando hace uso de los trenes o autobuses de ruta fija de la UTA? Si alguna de las opciones no aplica a su caso, seleccione "no aplica".
    a. El número de días que los autobuses o trenes circulan
    b. Los horarios de circulación de los autobuses o trenes
    c. El número de trasbordos necesarios para terminar el viaje
    d. Costo
    e. Conocimiento acerca del uso de los autobuses o trenes
    f. Experiencias anteriores en viajes en autobuses o trenes
    g. Calidad del servicio
    h. Anuncios en las paradas
    i. Seguridad personal
    j. Distancia hasta o desde las paradas de autobús o estaciones de tren
    k. Aceras, rampas o caminos peatonales en la vía hasta la parada de autobús o estación de tren
    l. Información sobre posibles obstáculos en el camino a la parada de autobús o estación de tren
    m. Accesibilidad a la parada de autobús o a la estación de tren
    n. Capacidad para subir o bajar del autobús o del tren
    o. Funcionamiento del elevador, rampa o placa de apriete del autobús o tren
    p. Accesibilidad suficiente de sillas en el autobús, incluyendo ubicaciones de seguridad
    q. Accesibilidad suficiente de sillas en el tren
    r. Capacidad de asegurar mi dispositivo de movilidad como me gusta

s. Capacidad de adaptar mi dispositivo de movilidad en el autobús o tren
t. Actitud, asistencia o conocimiento del conductor
u. Actitudes de otros pasajeros
v. Capacidad de acomodar mi mascota de servicio

11. ¿Con qué frecuencia hace usted uso del servicio de paratránsito de la UTA?
    a. Todos los días o casi todos los días
    b. Unas cuantas veces por semana
    c. Alrededor de una vez por semana
    d. Algunas veces al mes
    e. Alrededor de una vez al mes
    f. Alrededor de una vez al año

12. A continuación encontrará algunas cosas en las que podrían pensar las personas con discapacidad a la hora de decidir si el servicio de paratránsito de la UTA es accesible o fácil de usar para una persona con discapacidad. Algo que sea difícil de usar para una persona con discapacidad sería inaccesible. En una escala de 1 a 5, donde 1 es "inaccesible" y 5 es "accesible", ¿qué tan accesible es cada una de las siguientes opciones cuando hace uso del servicio de paratránsito de la UTA? Si alguna de las opciones no aplica a su caso, seleccione "no aplica".
    a. El número de días que los servicios de paratránsito circulan
    b. Los horarios de circulación de los servicios de paratránsito
    c. Costo
    d. Conocimiento acerca del uso de los servicios de paratránsito
    e. Experiencias anteriores en viajes en paratránsito
    f. Calidad del servicio de paratránsito
    g. Seguridad personal
    h. Distancia hasta o desde el punto del servicio
    i. Aceras, rampas o caminos peatonales en la vía hasta el servicio de paratránsito
    j. Información sobre posibles obstáculos en el camino al punto del servicio de paratránsito
    k. Capacidad para subir o bajar del paratránsito
    l. Elevador no funcional en el vehículo de paratránsito
    m. Capacidad de asegurar mi dispositivo de movilidad como me gusta
    n. Capacidad de adaptar mi dispositivo de movilidad en los vehículos de paratránsito
    o. Actitud, asistencia o conocimiento del conductor
    p. Actitudes de otros pasajeros
    q. Capacidad para acomodar mi mascota de servicio
    r. Programación de viajes en paratránsito
    s. Llegada del conductor fuera del rango de tiempo de recogida
    t. Duración de los viajes en paratránsito
    u. Políticas de cancelación por retraso o no presentación

   v. Capacidad para calificar el servicio de paratránsito
   w. Proceso de elegibilidad del paratránsito

13. ¿Existen otras cosas que no se mencionaron en las preguntas anteriores que usted considere importante al momento de decidir si los servicios de la UTA son accesibles o de fácil uso para una persona con discapacidad?
    a. Si (por favor especifique):
    b. No
    c. No estoy seguro/a

14. En una escala de 1 a 5, donde 1 es "inaccesible" y 5 es "accesible", ¿qué tan accesibles son los siguientes servicios de transporte de la UTA para personas con discapacidades?
    a. Autobuses de ruta fija
    b. TRAX
    c. FrontRunner
    d. Paratránsito

15. ¿Qué hace que cada uno de los siguientes servicios sean accesibles para personas con discapacidades?
    a. Autobuses de ruta fija:
    b. TRAX:
    c. FrontRunner:
    d. Paratránsito:

16. ¿Qué se podría hacer para contribuir a que estos servicios sean más accesibles para personas con discapacidades?
    a. Autobuses de ruta fija:
    b. TRAX:
    c. FrontRunner:
    d. Paratránsito:

17. En una escala de 1 a 5, donde 1 es "poco probable" y 5 es "muy probable", ¿qué tan probable es que usted haga uso de un vehículo autónomo?

18. ¿Por qué haría o no haría uso de vehículos autónomos? Por favor explique.

19. ¿Usa usted servicios de transporte como Uber o Lyft?
    a. Si
    b. No

20. ¿Por qué usa o no usa servicios de transporte como Uber o Lyft? Por favor explique.

21. Preguntas demográficas
    a. ¿Cuántos años tiene?
        i. Menos de 20 años
        ii. 20 – 29
        iii. 30 – 39
        iv. 40 – 49
        v. 50 – 59
        vi. 60 – 69
        vii. 70 o más años
    b. ¿Cuál es su género?
        i. Masculino
        ii. Femenino
        iii. Prefiere auto-describirse:
        iv. Prefiere no responder

22. ¿Le gustaría proporcionar su correo electrónico? En tal caso, le ofrecemos la posibilidad de ganar una de las 20 tarjetas de regalo de $25?
    a. Si
    b. No

¡Gracias!
Gracias por completar esta encuesta. Su respuesta es muy apreciada.

CURRICULUM VITAE

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EDUCATION

Doctoral Candidate, Disability Disciplines (Defense in July 2019)
Utah State University
Dissertation Topic: Public Transportation Accessibility: Perceptions of Riders with Disabilities in Utah
Committee Chair: Keith Christensen, PhD

Master of Human Resource Management, Huntsman School of Business, 2006
Utah State University

Bachelor of Science, Political Science, 2001
Utah State University

EMPLOYMENT

Americans with Disabilities Act (ADA) Compliance Officer, 2016 – present
Utah Transit Authority (UTA) – Salt Lake City, Utah
Ensure compliance with all Titles of the Americans with Disabilities Act (ADA), providing insight and guidance to staff at all levels and within all functional areas of the UTA organization from members of the Board of Trustees and Executive Director to bus and rail operators. Significant accomplishments in this role have included the development and implementation of several organization- and system-wide accessibility trainings, policies, and initiatives; improved relationship with the disability community which have resulted in increased citizen feedback and participation in UTA's Committee on Accessible Transportation (CAT); and increased internal awareness of the various benefits of inclusion.

Clinic Coordinator, 2014 – 2015
EmployAbility Clinic, Utah State University – Logan, Utah
Coordinated all clinic activities related to job placement and development for individuals with disabilities including the oversight of graduate student work, client referral and intake, work with other disability service providers and related agencies, and work with employers.

Employment Specialist, 2012 – 2013
EmployAbility Clinic, Utah State University – Logan, Utah
Worked as part of a clinical team to identify and meet client and employer needs in order to improve employment outcomes for individuals with disabilities as part of their individualized plan for employment.
Regional Organizer, 2012 – 2014
Grassroots Advocacy Partnership (GAP) of Utah – Cache, Rich, & Box Elder Counties, Utah
Worked with elected officials and other decision makers, developed and disseminating information, and organized and contributed to activities related to legislative advocacy for individuals with disabilities.

Human Resource and Safety Manager, 2009 – 2010
Intertape Polymer Group – Tremonton, Utah
Worked as a member of the management team and oversaw all aspects of human resource management and plant safety for 60+ employees.

Human Resources Director, 2006 – 2009
Syracuse City Corporation – Syracuse, Utah
Worked with elected officials, department heads, appointed officials, and subordinate employees to manage all aspects of human resource management for 380+ employees and volunteers, including the oversight of a $3+ million wages and benefits budget.

Human Resource Generalist, 2005 – 2006
TTM Technologies (formerly Tyco Electronics) – Logan, Utah
Oversaw all staffing needs for a workforce of 350+ employees which included resolving issues related to timekeeping, payroll, legal compliance, training, and internal employment policies and procedures.

SELECTED PROFESSIONAL SERVICE

Advisory Board Member (invited)
Utah Employment and Community Integration Training and Technical Assistance Center

Secretary, 2017 – present
Utah Statewide Independent Living Council (USILC)

Steering Committee Co-Chair, 2016 – 2019
Disability:IN Utah (formerly Utah Business Leadership Network, UTBLN)

Member, 2014 – 2017
Governor's Committee on the Employment of People with Disabilities – State of Utah

Director, Diversity, 2015 – 2016
Board of Directors, Bridgerland Society for Human Resource Management (SHRM) –

Northern Utah

Director, Workforce Readiness, 2014 – 2015
Board of Directors, Bridgerland Society for Human Resource Management (SHRM) – Northern Utah

AWARDS

Rosa Parks Diversity Leadership Award, 2018
Women in Transportation, Northern Utah Chapter

Large Employer of the Year, 2017
Governor's Committee on the Employment of People with Disabilities

SELECTED PROFESSIONAL PRESENTATIONS

Alldredge, C. (November 2018). *An Overview of UTA Services Available to Individuals with Disabilities and Support Providers*. Invited presentation at the monthly meeting of the Utah Chapter of the Association of People Supporting Employment First (APSE). Taylorsville, UT.

Alldredge, C. (May 2018). *Understanding and managing disability: What HR professionals need to know before it matters*. Invited presentation at the monthly meeting of the High Desert Human Resources Association. Rock Springs, WY.

Alldredge, C. & Gray, A. (September 2017). *Targeted public engagement*. Invited presentation at the Utah Urban Rural Specialized Transportation (URSTA) annual conference. St. George, UT.

Alldredge, C. (November 2015). *Engaging employers in the vocational rehabilitation process through demand-side consultation*. Invited presentation at the Utah State Office of Rehabilitation (USOR) Annual Conference, Ogden, UT.

Alldredge, C. (September 2015). *Understanding and managing disability: What HR professionals need to know before it matters*. Concurrent session presentation at the Utah Society for Human Resource Management (SHRM) annual Crossroads Conference, Layton, UT.

Alldredge, C. (February 2015). *Improving demand-side consultation: Understanding disability through an employer's lens*. Invited webinar presentation for the Utah Supported Employment Training (USET) program.

Alldredge, C., Schultz, J., Riesen, T., Golden, T., & Bruyère, S. (November 2014). *The advanced employment services (AES) certificate: A collaboration to improve demand-side consultation*. Poster presentation at the National Council on Rehabilitation Education (NCRE) conference, Washington, DC.

Alldredge, C. (October 2014). *The future of employer outreach: Rehabilitation and employment counselors as consultants to employers*. Invited keynote presentation to the Utah State Office of Rehabilitation (USOR), Choose To Work program, Salt Lake City, UT.

Alldredge, C. (June 2014). *Demand-side consultation: Understanding employer perspectives and opportunity for vocational rehabilitation*. Invited presentation to the Pennsylvania Office of Vocational Rehabilitation (PA OVR), Harrisburg, PA.

Alldredge, C. (April 2014). *Disability and employment: Implications for future HR professionals*. Invited presentation to the Utah State University student chapter of the Society for Human Resource Management (SHRM), Logan, UT.

Lewis, M. & **Alldredge, C**. (March 2014). *The employability clinic: A model for education,*
research, and community outreach efforts. Poster presentation at the National Council on
Rehabilitation Education (NCRE) conference, Manhattan Beach, CA.

Alldredge, C. (2013). *Integrating fundamental business principles into rehabilitation counseling*
education to improve employment outcomes. Concurrent session presentation at the
National Council on Rehabilitation Education (NCRE) conference, Washington, DC.

Alldredge, C. (2013). *Workplace diversity: Understanding disability, vocational rehabilitation,*
and resources for employers. Presented at the Bridgerland Society for Human Resource
Management (SHRM) chapter luncheon, Logan, UT.

UNIVERSITY TEACHING EXPERIENCE

Instructor, REH 6160 – Job Placement and Development
Distance Education, Fall 2015
Utah State University

Instructor, REH/SPED 1010 – Disability and Society
Spring 2015
Utah State University

Co-Instructor, REH 6220 – Culturally Valid Rehabilitation Practices
Distance Education, Summer 2013
Utah State University

Teaching Assistant, REH 6120 – Psychosocial Aspects of Disability
Distance Education, Spring 2016
Utah State University

Teaching Assistant, MGT 3250 – Introduction to Human Resource Management
Fall 2014
Utah State University

Teaching Assistant, REH 6160 – Job Analysis, Development, & Placement
Distance Education, Spring 2013 & Spring 2014
Utah State University

Teaching Assistant, REH 6210 – Advanced Assessment
Summer 2013
Utah State University