



# The generators of paratransit trips by persons with disabilities



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## ABSTRACT

Identifying the generators of paratransit trips by persons with disabilities is important to comprehend the current demand patterns and forecast future demand. Only a handful of studies have been conducted so far to identify the generators of paratransit trips and most focused on the home end of the trips. Given some of the inconsistencies in past studies and the scarcity of studies on the generators of trips away from home, this study attempts to identify the generators of paratransit trips beginning and ending at clients' homes and away from home. It uses an extremely large dataset consisting of 1.91 million trips made by NJ TRANSIT's Access Link clients, socioeconomic data from the American Community Survey, employment data from the Longitudinal Employer-Household Dynamics, and establishment data from Dun and Bradstreet. The analytical methods include an ordinary least squares model (OLS) and several spatial generalized linear mixed models (GLMM) to identify the characteristics of census block groups associated with Access Link trip generation at home and away from home, Geographic Information System (GIS) analysis to identify the types of establishments located in the immediate vicinity of drop-offs, and a multinomial logit model (MNL) to examine the relationship between the characteristics of the establishments in the vicinity of drop-offs and the characteristics of the dropped-off clients. Together, the various analyses provide useful insights about paratransit trip generators at the macro and micro levels. Some implications of the findings are discussed.

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## 1. Introduction

Paratransit service complementary to the Americans with Disabilities Act (ADA) is provided by transit agencies nationwide to their registered clients at a fairly high cost. Citing the cost differential between paratransit trips and fixed-route trips, a recent report by the United States Government Accountability Office (GAO, 2012) emphasized the importance of improving the efficiency of paratransit service by making decisions based on quality data and analysis. The high cost of ADA paratransit service has been the subject matter of other studies as well (Simon, 1998; Chia, 2008; Palmer et al., 2008; Gupta et al., 2010). However, despite the high cost of service, some researchers have concluded that the benefits from ADA paratransit service exceed the associated costs (Nguyen-Hoang and Yeung, 2010).

Yet all transit agencies nationwide are under pressure to optimize costs of paratransit service because of its growing demand. One way to optimize costs of paratransit service is to fully comprehend the current and future demand for trips.

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Appropriately forecasting demand for service can assist agencies in allocating resources to service contractors, re-aligning service regions, and determining location of facilities. An integral part of demand analysis for paratransit service is the identification of the trip generators, whether they are defined as space (e.g., census tracts) or establishments (e.g., medical facilities).

In order to identify the generators of paratransit trips, this research examines the characteristics of census block groups and finer geographic locations that generate paratransit trips by analyzing data for the service area of Access Link, the ADA-complementary paratransit service provided by NJ TRANSIT. While most past studies focused on the home end of paratransit trips, this study attempts to identify the characteristics of the areas where the paratransit clients live as well as the characteristics of the areas and specific locations they visit. The study first identifies the generators of Access Link trips at a macro level by analyzing data at the census block group level. Subsequently, it focuses on the establishments located in the immediate vicinity of drop-off sites to identify the generators of Access Link trips at a micro level.

Access Link provides curb-to-curb service to certified clients in 18 of New Jersey's 21 counties. The service is provided in all locations within the areas designated as urban core and within 3/4 mile of transit stations and local bus routes outside of the urban cores. The entire service area of Access Link is divided into six regions. As of February 2013, Access Link had a total of 30,117 certified clients and 8699 active clients, defined as clients who used the service during the past six months. Its service has grown substantially over the years. Between December 2009 and February 2013, monthly ridership of Access Link increased from approximately 69,000 to 83,247.

Although the activities that generate ADA paratransit trips could be identified by conducting a survey of users about trip origins, destinations, purpose, and frequency, the literature review for this research revealed that client surveys to gauge demand for such service have been conducted only occasionally. This may be because of the high cost of surveys. The literature review showed that many studies pertaining to the demand for ADA paratransit used trip data from transit agencies. Since many transit agencies collect data on exact locations of pick-ups and drop-offs through global positioning systems (GPS), the collected data can be conveniently used to identify the generators of paratransit trips.

Like several other studies on demand for ADA paratransit, this study is also primarily based on trips made by certified clients. In addition to the Access Link trip data, it uses several other datasets, including the 2006–2010 American Community Survey (ACS), the 2010 Longitudinal Employer-Household Dynamics (LEHD), and geocoded establishment data from Dun and Bradstreet. It uses an ordinary least squares model (OLS), several spatial generalized linear mixed models (GLMM), a multinomial logit model (MNL), and other statistical methods to identify relationships of variables with Access Link trips. A detailed description of the methods is provided in the Data and Methods section.

## 2. Relevant literature on demand for ADA paratransit

One of the earliest studies to explore the methods to estimate demand for ADA-complementary paratransit service was by [Koffman and Lewis \(1997\)](#). The study makes reference to two studies – one for King County Metro, Washington State, and the other for New York City Transit Authority – where surveys were conducted to gauge the demand for paratransit service. From the description of the studies, it appears that the New York survey was geared towards predicting ridership as a function of service area, fares, eligibility policy, advance reservation policy, fare, etc., whereas the King County survey aimed at estimating the number of potential users and their willingness to travel at different fare levels. None of the surveys appeared to have placed emphasis on identifying trip generation for potential origins and destinations.

In recent years, two Transit Cooperative Research Program (TCRP) reports have specifically focused on the estimation of ADA paratransit demand ([Koffman et al., 2007](#); [Bradley and Koffman, 2012](#)). In the first of these studies, [Koffman et al. \(2007\)](#) used a statistical model with data from 28 agencies in 15 states to predict ADA paratransit ridership. The study concluded that six variables are associated with paratransit ridership. According to the study, demand for paratransit is positively associated with the size of the service area population, but negatively associated with fare, proportion of population below poverty level, the width of the pick-up window, the proportion of applicants that are conditionally eligible to use paratransit, and the practice of determining eligibility on a trip-by trip basis (instead of determining eligibility for all trips). The statistical analysis in the study did not find any association between paratransit demand and the proportion of elderly persons, incidence of disability in the population at large according to census, availability and quality of fixed-route transit, or ethnicity of population.

The second TCRP report, by [Bradley and Koffman \(2012\)](#), applies sketch planning and regional planning approaches with survey data from 800 ADA paratransit users from the Dallas–Fort Worth area of Texas. The study includes both aggregate and disaggregated models. The aggregate model showed that the proportion of elderly persons in census tracts is positively associated with paratransit registration, but the disaggregate model showed that elderly clients are likely to make fewer trips than younger clients. On the whole, it can be expected from the study that an increase in number of elderly persons will increase the demand for paratransit, although the elderly registrants might use the service less often than younger persons with disabilities. Other relevant results of the study indicate that higher income and lower poverty in census tracts together with lower poverty among registrants would decrease the number of trips, larger household size in census tracts would decrease the number of trips, increase in travel time would decrease the number of trips, and greater pedestrian access to activities would decrease the number of trips.

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