

Model to Understand Bus Ridership Changes at the Hyper-Local Level

(Part 2 of STRIDE Project A2: Changing Access to Public Transportation and the Potential for Increased Travel)

PROJECT OVERVIEW

In 2018, bus ridership in the United States attained its lowest level in recorded history, resulting in fewer dollars to invest back into transit service. In the past, transit agencies have had limited tools to determine how best to improve service in a cost-effective way. They must balance ridership with oftentimes conflicting objectives including equitable access, connection to places of strategic importance, and reliability. In particular, agencies must decide whether to spread service to reach the few or concentrate it to attract the many. In order to allocate service in a manner that maximizes total welfare, agencies need to be able to predict if adding more trips per day would increase ridership. The challenge is that this relationship may not be linear; each trip added to a route may not improve the number of passengers per trip.

RESEARCH GOALS

The goal of the project was to understand how frequency of transit service and demographics impact transit ridership. The research team investigated bus ridership trends in four cities (Portland, OR; Miami, FL; Minneapolis/St. Paul, MN; and Atlanta, GA) between 2012 and 2018. Using Automated Passenger Count data (APC), the team developed a model to look at ridership at the stop level over time.

FINDINGS

In Portland, Miami, and Atlanta, the potential demand was being met on routes that already had a high number of trips. In these cities, there was, however, a demand for more busses on routes that had fewer trips. Minneapolis/St-Paul, on the other hand, had additional, unmet demand on corridors that already had a high number of trips. Therefore, the decision to prioritize service coverage or concentration should be made on a case-by-case basis to attain the best possible compromise.

In addition, researchers found that ridership was declining the most in neighborhoods with a greater proportion of white residents. This could point to some causes of ridership decline nationwide.

Researchers identified specific corridors that would benefit from service changes. Both Atlanta's MARTA and Minneapolis' METRO Transit have used the ridership model to understand where ridership decreases are taking place.

PRODUCT

The **process for cleaning** passenger counter **data** for this type of analysis can be used by agencies to undertake similar analysis. The **ridership model** shows how increasing or decreasing the number of bus trips on a route may affect the number of passengers. It also shows the difference in demographics among neighborhoods where transit ridership is declining the most.

IMPACTS

Transit agencies can use the model to predict the effects of service changes on specific corridors.

WHO BENEFITS?

Regional and local transit agencies

RESEARCH TEAM

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PRODUCT DESCRIPTION

Ridership Model

The research team developed a Poisson fixed-effects model to understand the relationship between the number of trips/day (frequency) and the number of riders on that route (ridership). The model was also used to understand the demographics of ridership change.

Transit agencies in this study provided ridership data at the stop-route-direction-trip level. Automated Passenger Count data (APC) was cross-checked with the General Transit Feed Specification (GTFS), a schedule meta-data standard. Passenger counts were then aggregated by route-segments (groups of seven stops on the same route and direction) and combined with data sources on population and jobs. The *change* in ridership was modeled over time through panel regression. The process is illustrated in Figure 1. This process can be used by other agencies to use APC data for this type of ridership analysis at the local (stop) level.

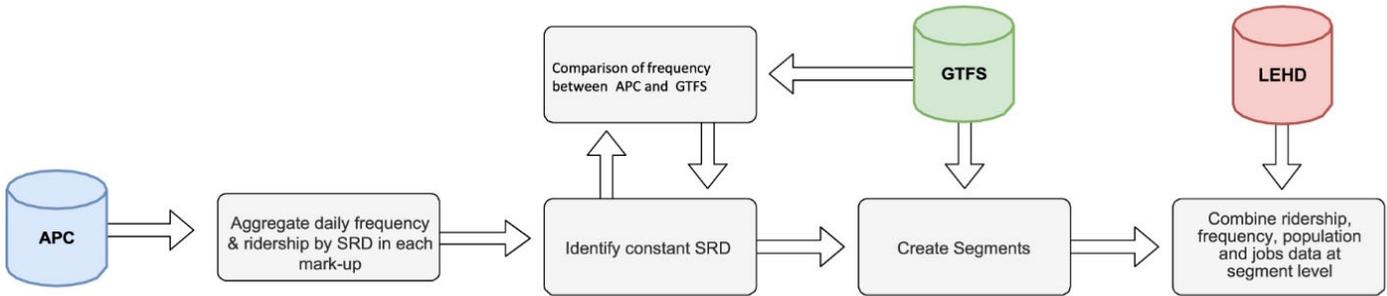


Figure 1. Flow chart describing the data scrubbing and aggregation process.

For more information on Project A2 (Changing Access to Public Transportation and the Potential for Increased Travel), visit the [STRIDE project page](#).

About STRIDE

The Southeastern Transportation Research, Innovation, Development & Education Center (STRIDE) is the 2016 Region 4 (Southeast) U.S. Department of Transportation University Transportation Center headquartered at the University of Florida Transportation Institute (UFTI).