Project: Assessment of Mobility and Transit Access to Captive Riders in Suburban and Rural Areas

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Project Purpose

Major public and private facilities that provide for personal and professional services are located in within urban boundaries. Employment centers, educational institutions, medical facilities, as well as retail and entertainment venues are some examples. Rural residents have fewer travel choices per capita and increased transportation barriers. The challenge is to determine (1) the number of people in a given geographic area likely to require a passenger transportation service and (2) the number of trips would likely to be made by those persons if they had minimal limitations on their personal mobility. These two sets of information will help planning agencies in strategizing to provide transit access to captive riders in rural areas. Further agencies would like to obtain information such as: (i) How many residents of my community need passenger transportation service?; (ii) How many trips per year are not being made because of the current lack of passenger transportation service?; (iii) How many transit trips will the average resident make on a transit service in our community?; (iv) With a given annual operating budget, how many passenger-trips per year are we likely to serve?; (v) If there were a commuter bus program from our community to the big city, how many daily passenger-trips would be served?. In this research, we propose to investigate both a macro and micro level analysis to identify transit needs in the rural areas in TN. In addition, we propose to provide a framework for TDOT to maintain five-year transit plan for identifying changing service issues, understanding the changing demographics of a region and assessing the transportation needs of the communities.

Analytical Approach

Two separate analytical approaches are considered urban and rural areas respectively. For urban areas where transit service is available on fixed time basis, a Node Connecting Power that considers information such as the opportunities accessible by transit, the time it takes to reach those opportunities, or the ability to transfer to different routes and modes to reach a broader array of activities is proposed. In a brief, the measure uses frequency, speed, distance, capacity, required transfers, and activity density of the underlying land use served by a transit node, for all modes including buses, light rail, bus rapid transit, and other similar transit facilities. Further transit connectivity is integrated with various socio economic data to assess the equity of transit service to various segments of population categorized by employment, vehicle ownership and income. Figure 1 shows transit connectivity Nashville metropolitan area. For rural area transit connectivity the project team is in the process of developing a methodology to compute transit ridership based on demand response trips.

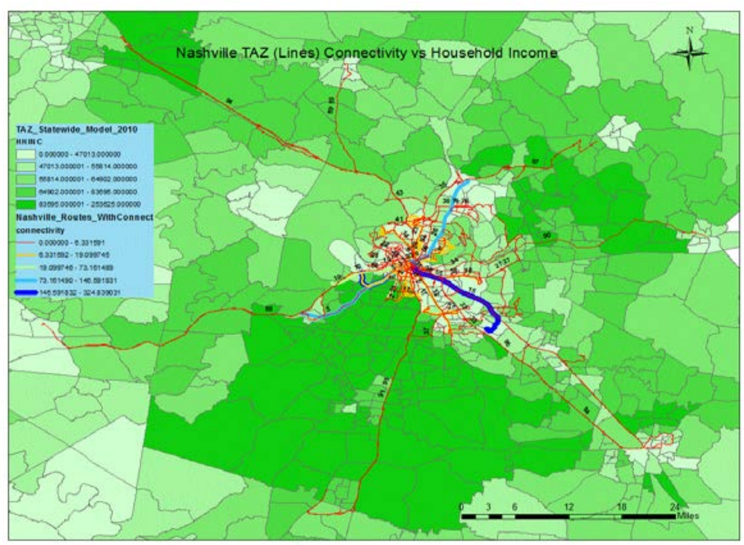

Figure 1. Nashville transit connectivity.

Initial Findings

Using GTFS data from three cities in TN, transit connectivity is computed at the node, line and TAZ level. An example of node level transit connectivity is shown in Figure 2 and 3 for Memphis and Knoxville respectively. This analysis can support agency decision makers when having to choose which areas of the city can be potential locations of investment in new lines or how existing transit lines could be modified in order to incorporate more areas that may be hosting potential captive riders. Taking Memphis as an example, network performance appears to be relatively good for locations and TAZs near the city center, while distant locations especially in West Memphis, but also in North and Northeast Memphis appear to be poorly connected. Figure 1, also suggests that central business districts (i.e., Downtown Memphis) that mostly serve as destinations rather than origins show high network density, while areas located at the outskirts and which are, most likely, commuting origins, are served by a less dense transit network. Taking Memphis as an example, it can be observed that stops located on major corridors (e.g., Poplar Avenue), have higher connectivity than others. Again, one can easily identify stops with low connectivity indices that reside in areas of also low incomes. Similar maps have been developed to assess low connectivity versus areas of low car ownership. By cross-examining such thematic maps simultaneously, the decision maker can, inductively, locate stops that could be further supported if needed, by including them to neighboring lines, or including them in new lines during planning processes and so forth.

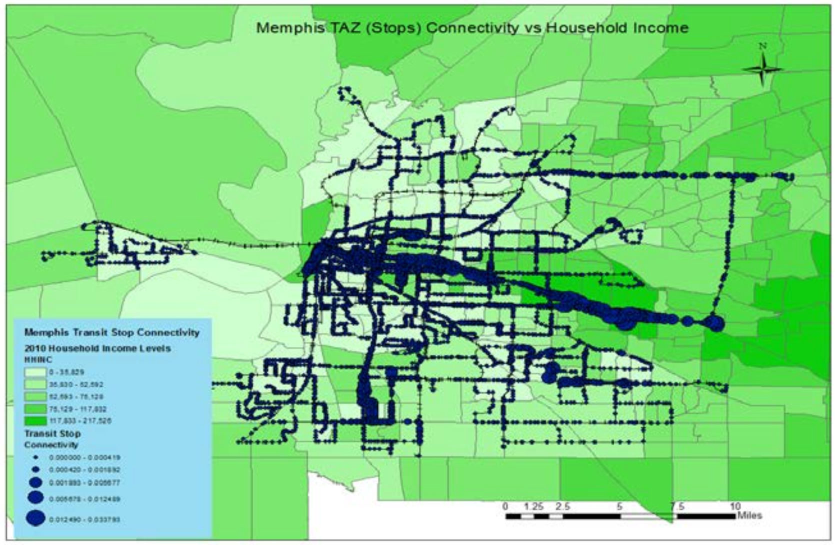

Figure 2. Memphis stop level transit connectivity.

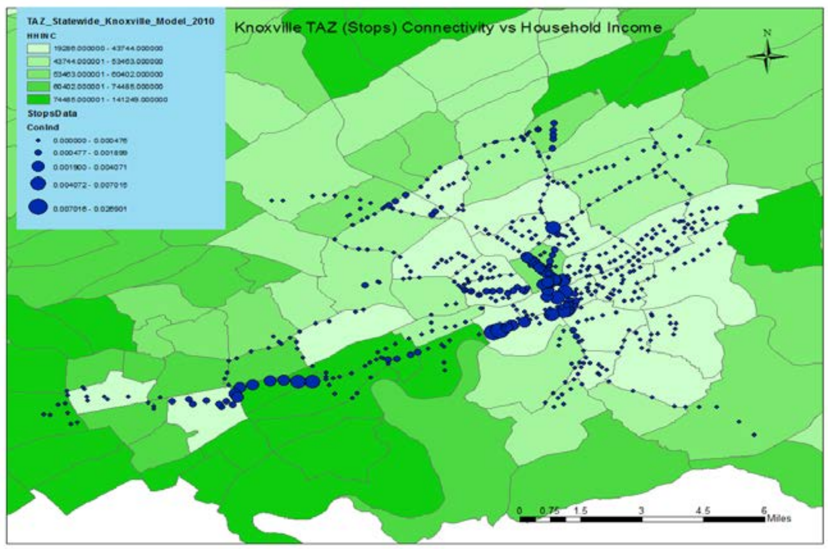

Figure 3. Knoxville stop level transit connectivity.

Project Result Dissemination

Mishra, S., Golias, M., Deligiannis, D., Welch, T., McCloud, C., and Cherry, C. (2017). Assessment of Mobility and Transit Access in Tennessee. Paper submitted for presentation at the 96th Annual Meeting of Transportation Research Board, Washington DC, and publication in Transportation Research Record.