

WHERE'S THE BUS?

SPATIAL ANALYSIS OF BUS TRANSIT NEED & ACCESSIBILITY



INTRODUCTION

Miami-Dade County, Florida is a sprawling metropolitan area built around the car, and the county's metrobus system is not a viable transportation alternative. Buses compete with car traffic and run infrequently. This burdens low-income people who depend on robust transit.

This project aims to understand what social inequities may exist in Miami-Dade County's bus transit system, by conducting suitability analyses of bus transit need (demand) & access (supply).

Spatial questions:

- What is the need (demand) for bus transit in Miami-Dade County?
- What is the accessibility (supply) of bus transit in Miami-Dade County?



METHODOLOGY

For analyses to determine the need (demand) of bus transit:

Using census data, I focused on seven variables that I used as proxies for bus transit need. I normalized the variables by turning them into percentages using the field calculator tool, to arrive at the densities for each variable for each block group. For each variable, I did a polygon-to-raster conversion in order to create a heat map of each of the variable densities. Using the raster calculator, I then created a raster weighted suitability map to determine the need (demand) for bus transit.

For analyses to determine the accessibility (supply) of bus transit:

My analysis focuses on weekday midday bus transit. The variables for supply represent temporal accessibility (average bus frequency rating) and spatial accessibility (bus stop density, bus route density).

For the average bus frequency variable, I used Transit Alliance's bus frequency ratings. For missing routes, I used Miami-Dade County's bus schedule app. I then did an attribute join of the frequency ratings to the bus route layer.

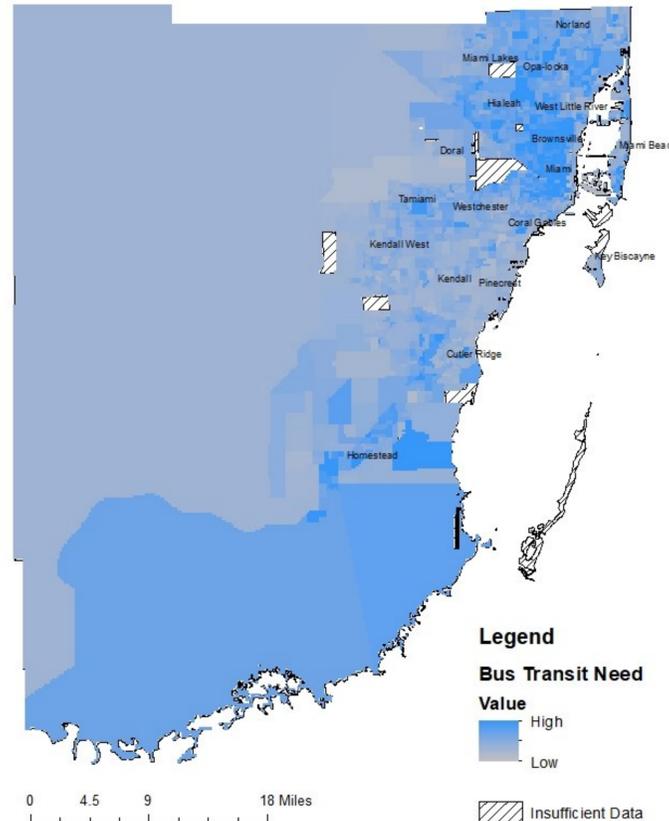
Transit Alliance's classifications of bus frequency ratings:

| Bus frequency | Rating |
|--------------------------|--------|
| Every 15 minutes or less | 4 |
| Every 16 - 24 minutes | 3 |
| Every 25 - 30 minutes | 2 |
| Every 31 - 60 minutes | 1 |

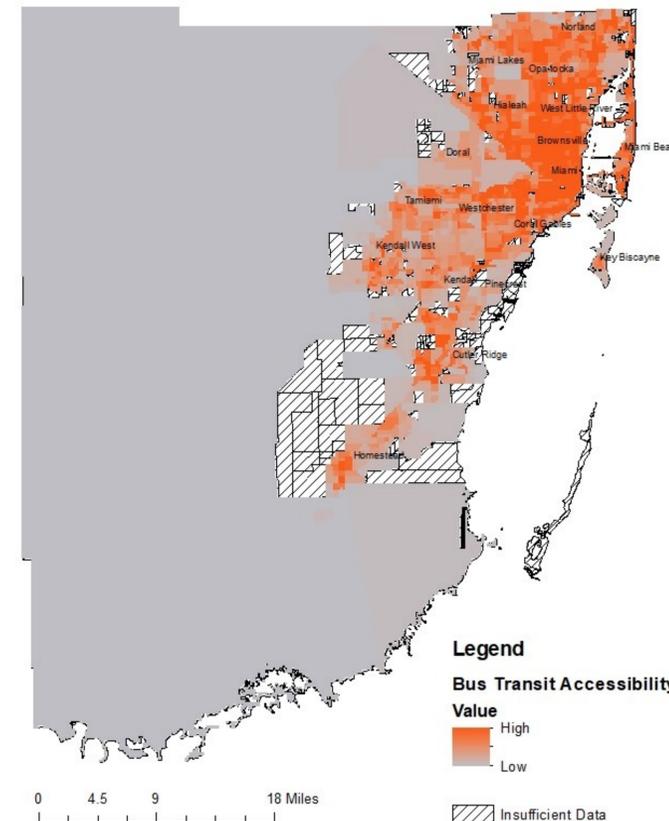
I spatially joined the bus routes layer and the bus stops layer to the block groups layer. I then calculated the density of bus routes and bus stops per square mile.

I converted each variable from polygon to raster. I then used raster calculator to create a weighted suitability of the accessibility (supply) of bus transit.

Bus Transit Need



Bus Transit Accessibility



Weights of variables in the Bus Transit Need map:

| Variable (in densities) | Weight |
|-----------------------------------------|--------|
| Low-income households (\$30k and under) | 25% |
| Zero-vehicle housing units | 20% |
| Elders (65 years and older) | 15% |
| People who carpool to work | 15% |
| People who commute to work by transit | 10% |
| Youth (17 years and younger) | 10% |
| People of color (non-white population) | 5% |

SOURCES

Data: Transit Alliance; Miami-Dade County's Open Data Hub; Miami-Dade County's bus schedule app; Social Explorer; American Community Survey 5-year estimates (2013-2017); ESRI block group shapefile

Graphic: Miami-Dade County; David Balyeat Photography
Works Cited: Jarret Walker + Associates. 2019. "Transit Concepts Report for Miami-Dade County and Transit Alliance." Mamun, S.A. & Lowmes, N.E. 2011. "Measuring Service Gaps: Accessibility-Based Transit Need Index." *Transportation Research Record: Journal of the Transportation Research Board*, No. 2217. pp. 153-161.

LUISA SANTOS

MA, Urban and Environmental Policy and Planning

Fall 2019, UEP 232: Intro to GIS
 December 17, 2019

Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator

CONCLUSION

The resulting raster suitability map for the need (demand) for bus transit in Miami-Dade County significantly overlaps with low-income communities. The map also indicates that there is need for bus transit in communities not concentrated by low incomes but located far from the city center. Considering the carpooler variable, one can see there is demand for more collective forms of transit in these communities, regardless of income.

The resulting raster suitability map for the accessibility (supply) of bus transit in Miami-Dade County indicates that there is considerable overlap between communities that are best served by bus transit and communities with a higher concentration of low-income households and of people of color. Since the impetus behind my research questions was to understand whether more marginalized communities were better or more poorly served by bus transit, it is heartening to see through this analysis that low-income communities of color in the northern parts of Miami-Dade County are well served by bus transit.

Comparing the final suitability maps, there are communities not served by bus who need better access to transit, particularly farther west and south. While people in suburban communities rely on car transit, the map for the bus transit need indicates that people in these communities underserved by bus transit would use alternative transportation methods if they had the option of a more reliable bus system.

This research highlights the importance of social equity for Miami-Dade's public transit system. Further work can include looking at suburban populations to understand these communities' bus-transit use and need, to develop a more comprehensive and integrated system.

