Introduction

Cities in the United States are becoming increasingly congested due to years of urban growth, growing traffic volumes, and decreasing public transit usage. Compared to other cities, these trends hit Philadelphia, PA especially hard. As one of the largest cities in the United States, Philadelphia is one of the most transit-dependent cities in the US with majority of its transit riders using the bus. Notably, bus ridership in Philadelphia have been undergoing a steady decline in both speeds and ridership in the past several years.

Amid declining bus ridership and decreasing bus speeds, several cities including Philadelphia, have introduced bus/bike lanes as a low-cost solution to combat this problem and to introduce bike infrastructure on old, narrow streets. Combined with enforcement of these lanes, bus/bike lanes are increasingly seen as being successful in increasing bus speeds and bike ridership. Given their success at improving bus service and biking in Philadelphia, have introduced bus/bike lanes, analysis should consider the differing width contexts of one-way and two-way roads for bus/bike lane installation.

Methods and Criteria

Given the relatively new introduction of bus/bike lanes, there is little evidence for what factors must be present to install a bus/bike lane. However, using Philadelphia’s existing Chestnut St. bus/bike lane as an example, streets with the following attributes were selected:

- Road width at least 26 ft.
- Two travel lanes or more
- Speed Limit Under 45 mph

After selecting streets with these attributes, streets were joined with overlapping bus routes using Spatial Join with a 5 ft. search radius. Using SEPTA bus route schedules, SQL selection was used to clean up data to include only major streets with bus routes on them. This join resulted in a layer named "PhiladelphiaPotentialStreets" from which Boolean suitability was conducted for following prioritization factors:

1. Streets in block groups with high bus ridership
2. Streets in block groups with high bike ridership
3. Streets in block groups where high percentages of bus riders face commutes over 35 minutes (city avg. in 2018)
4. Streets with high ridership bus routes
5. Streets with low performing bus routes
6. Streets with low speeds

Factors 1-5 were selected by using select by location and intersect with 2017 Census block group means of transportation and average commute time data. Factors 4-5 were chosen running SQL selections for 2018 SEPTA bus route data. Factor 6 was used by selecting streets by speed limit. Factors were assigned a value (seen below in suitability maps) by adding a field, selecting streets with these attributes, and calculating.

Suitability Maps

- Factor 1: Bike Ridership, where <1.8% = 1, 1.8%-3.5% = 2, and 3.5% = 3 (2018 city avg. = 1.8%) - Chestnut St. Bus/bike Lane: Philadelphia
- Factor 2: Bus Ridership, where <17.2% = 1, 17.2%-35% = 2, and >35% = 3 (2018 city avg. = 23.6%) - Grays Ferry Ave.
- Factor 3: Commutes by bus over 35 min, where under 30% = 1, 30%-70% = 2, and >70% = 3
- Factor 4: Bus Rt. On Time Performance (OTP), where 50-60% = 1, 61-70% = 2, and 71-79% = 3 - Greene St.
- Factor 5: Top Bus Routes by Ridership, where Top 10 = 1, Top 5-10 = 2, and Top 5 = 3 - North 52nd St.
- Factor 6: Streets by Speed Limit, where 45 mph < 1, 1-35 mph = 2, and 35 mph = 3 - 56th St.

Discussion

Through my suitability selection, several streets emerged as potential "priority" corridors for installing bus/bike lanes. These include sections of Grays Ferry Ave in South Philadelphia, Greene St in West Philadelphia, and 57th St. in West Philadelphia. However, some context may be necessary to choose what constitutes the "best" street. For example, this section of Grays Ferry Ave carries significant traffic volumes, is on a bridge with limited visibility for bikers, and is adjacent to a future dedicated bike bridge, which might mean it needs to be prioritized over another street.

Final Suitability & Prioritization Map

To create the final map, I added a field to the "potential streets" shapefile and used Field Calculator to add up all suitability criteria. This field, "COUNTUP" was symbolized, with low numbers indicating low priority streets and high numbers indicating high priority streets.

Data Sources & Citations

Data: OpenDataPhilly, SEPTA GIS Portal, American Community Survey 2017, PASDA, OpenStreetMap
Icons: Bus and city icons created by Freepik on Flaticon.com; Bike icons created by NikiGolubex on Flaticon.com
Pictures: Philadelphia Bicycle Coalition; Google StreetView, 2019
Cartographer: Paul Henjes
UEP 255: Advanced Geospatial Modeling, Fall 2019
Projection: NAD_1983_StatePlane_Pennsylvania_South_FIPS_3402 Feet