UCLA
Policy Briefs

Title
Using Data Science for Equity at SFMTA

Permalink
https://escholarship.org/uc/item/8zw854cc

Author
Caro, Ryan

Publication Date
2022-07-12

DOI
10.17610/T6430B

July 2022

Using Data Science for Equity at SFMTA

● ● ●

Ryan Caro, MURP

Issue

During the COVID-19 pandemic, the San Francisco Municipal Transportation Agency (SFMTA) made significant cutbacks to transit service. As the agency has reinstated service, the Board of Directors asked staff to conduct equity analyses, specifically to calculate the number of jobs available via transit to residents of nine previously identified "equity neighborhoods": Treasure Island, Chinatown, Tenderloin/SOMA, Western Addition, the Mission, Bayview, Visitacion Valley, Outer Mission/Excelsior, and Oceanview/Ingleside. These equity neighborhoods have higher-than-average concentrations of people of color, low-income families, households without vehicle access, and affordable housing. SFMTA is interested in exploring different ways to use data science to automate these analyses.

This research uses open-source data science methods to calculate the number of jobs accessible to residents of the equity neighborhoods, by transit, within 30, 45, and 60 minutes. In building this model, the researcher examined the comparative strength and efficiency of different types of calculations, as well as how well equity neighborhoods act as a proxy for identifying the disadvantaged populations in San Francisco.

Study Approach

Building off of the methodology behind TransitCenter's Equity Dashboard, the researcher used Python and OpenTripPlanner to calculate access to jobs within a range of travel times. First, he downloaded transit schedules from all Bay Area agencies and combined them into a model of transit service. By repeatedly querying this model, he found the travel time between every census tract in the equity neighborhoods and every other census tract in the Bay Area at 8:15 a.m. on a weekday. He then summed the number of jobs available within a 30-, 45-, and 60-minute commute. This process was then repeated with OpenTripPlanner's one-to-many method which calculates the time from one origin to all destinations at once, allowing for a comparison between travel time models. The resulting analysis highlighted changes in job access at different commute times and compares the equity neighborhoods to the disadvantaged demographic groups as a whole.

Research Findings

- Equity neighborhoods are a poor proxy for the disadvantaged populations that SFMTA wants to prioritize, as they leave out between one-third and one-half of each of the target demographic groups (Black residents, Latinx residents, residents below 200% of the federal poverty line, and households without vehicle access).

- All demographic groups studied, while more concentrated in the equity neighborhoods than the city overall, also had equal concentrations outside of equity neighborhoods.
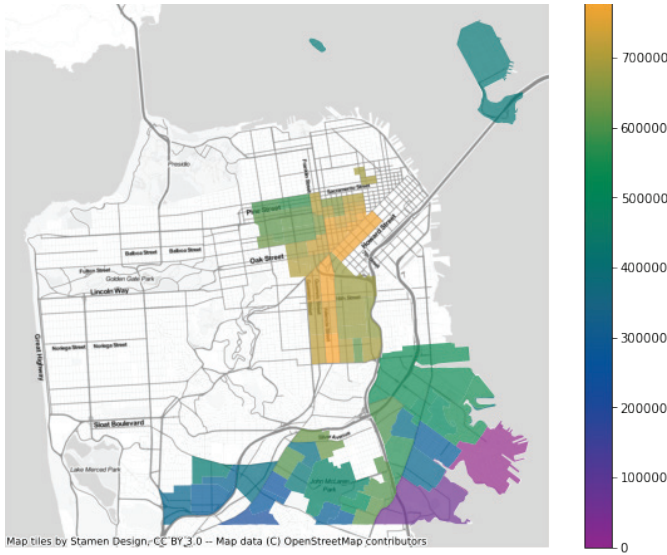
Figure 1. Number of jobs accessible within a 45-minute transit commute to residents of equity neighborhoods at 8:15 a.m. on a weekday.

- For 30-minute commutes, job accessibility is driven by proximity to downtown San Francisco. For 45- and 60-minute commutes, job accessibility is driven more by proximity to Bay Area Rapid Transit (BART) stations. Job access via transit is much higher in the central neighborhoods of Chinatown, Tenderloin/SOMA, Western Addition, and the Mission, than in Treasure Island, Bayview, Visitacion Valley, Outer Mission/Excelsior, and Oceanview/Ingleside (see Figure 1).

- While one-to-many calculations are about 100 times faster than point-to-point measurements, they are not accurate enough for SFMTA to use in their equity analysis.

Recommendations

- Rather than using equity neighborhoods, SFMTA should use an equity index that weights each part of the city by the number of disadvantaged people. This equity index will prioritize service to all those who need it, regardless of what part of the city they live in.

- In order to optimize transit service for job access, SFMTA needs to run this process dozens or hundreds of times for every minute of service time, and will need significantly more computational power than it currently has. This will most likely need to come from a team of academics or consultants.

- Because census tracts in less dense parts of the Bay Area are quite large, SFMTA should use more granular geometries, like census block groups, to refine this analysis.

- Though this process can redistribute current service to make it more effective in allowing members of disadvantaged groups to access jobs, SFMTA is missing key information on what time San Franciscans travel to and from work. This data would help the agency to improve its service.

Caro, R. (2022). Using data science for equity at SFMTA (Master's capstone, UCLA). Retrieved from: https://escholarship.org/uc/item/374794nn.

Klumpenhouwer, W., Allen, J., Li, L., Liu, R., Robinson, M., Da Silva, D. L., Farber, S., Karner, A., Rowangould, D., Shalaby, A., Buchanan, M., & Higashide, S. (2021). A Comprehensive Transit Accessibility and Equity Dashboard. *Findings*, July.