



Improving Livability Using Green and Active Modes: A Traffic Stress Level Analysis of Transit, Bicycle, and Pedestrian Access and Mobility

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Access and mobility both bear important implications for street livability and operations. Most times it appears that as one side gains the other side loses. It is therefore worthwhile and imperative to foster conditions that bring about enhancements that balance the needs of both. Attributes such as safety, connectivity, and travel time apply equally to both access and mobility for all transportation modes in a region.

In the United States, until recently, access to transit has been dominated by private-automobile for distances farther than a 5 to 10 minute walk. With the increased use of bicycles, interest has increased in its interaction and synergy with transit.

This research examines transit service and the combined effect of access and mobility on the use of sustainable (transit) and active transportation (bicycling and walking). A travel time metric with transit operational data is used to show how these modes interact under a low stress network classification scheme.

The study investigated the following points: How does access to stations perform under the Low Travel Stress (LTS) Classification Criteria for bicycling? How does the prevailing transit operational characteristics affect the service area under walk and bike access? Using minimum travel time, how far does the service area extend with changes in bike access speed? And finally, could improving the access network for active transportation actually negatively impact transit ridership?

Study Methods

Providing a safe access network is essential for transit patronage via non-motorized modes. Mobility measures were generated using network level data acquired from open data portals from Denver, Colorado and Oakland, California.

Transit access measures were derived using a multi-modal travel network under prevailing operational scenarios for three LTS levels. Measures of stop utilization were derived for the LTS network using total travel time metric.

The relative effectiveness of automobile alternatives (i.e., buses, bicycling, and walking) depends on how well streets are designed to work for these respective modes in terms of safety, comfort and cost, sometimes pitting their relative effectiveness against each other.

Service area maps were generated using travel paths for walk and bike access under one walk and three bicycle speed profiles. The results were compiled into a series of maps depicting patterns of interaction between transit service and walk and bike access modes.

Findings

The relative effectiveness of alternatives to driving (i.e. buses, bicycling, and walking) depends on how well streets are designed to serve the modes. The key research findings are:

- Higher LTS (3 and 4) networks around transit routes are uncomfortable and unattractive for bicycling and walking, severely limiting access and the effective catchment area of the transit service.
- When the two modes share the same network, LTS 1 and 2 can shift the relative attractiveness of once complementary mode pairings (e.g., a bicycle/bus-transit mode choice) toward becoming directly competitive and substitutable with each other (e.g., walk/transit, bicycle/transit to bicycle-only mode).
- Outside a 1 mile buffer area of a transit stop, the bicycle-only mode becomes more attractive, depending on transfer penalty, availability of safe parking, on-board accommodation, cost, as well as the bicyclist's independence and self-determination regarding the characteristics of their trip (on-demand, route choice, trip chaining, opportunity to exercise, etc.).

Policy Recommendations

- **Improve transit mobility by reducing travel time.** Implement transit operational efficiencies such as stop consolidation, transit-only lanes, and transit priority at intersections, in conjunction with pedestrian and bicyclist comfort and safety improvements at transit stops (bulb outs, safe crossings).
- **Improve transit service area safe access for pedestrians and bicyclists over a minimum of one mile network distance.** We recommend planning for LTS 2 levels (LTS 1 is too restrictive on the mobility of transit, and LTS 3 and 4 create uncomfortable environments for bicycling and walking). We recommend accompanying these with enhancements to help integrate networks of pedestrian and bicycle routes throughout the metropolitan area.

About the Authors

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To Learn More

For more details about the study, download the full report at transweb.sjsu.edu/project/1205.html



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