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Barrier Effects of Freeways for Pedestrian and Bicycle Travel

Adam Millard-Ball, Ben Silverstein, Purva Kapshikar, Sierra Stevenson
UCLA Institute of Transportation Studies
Chris Barrington Leigh, Institute for Health and Social Policy and Bieler School of Environment, McGill University

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Issue

Limited-access freeways physically divide urban neighborhoods, creating "severance" or "barrier effects." In these cases, streets that would otherwise be continuous dead-end at a freeway (see Figure 1). Unless the freeway is elevated or in a tunnel, crossings are limited to dedicated bridges or underpasses, often creating lengthy detours for pedestrians and cyclists and making walking and cycling less feasible for many trips. Previous research shows that high school students in Davis, California, are less likely to bicycle if they have to cross the freeway, partly because the available routes are indirect. Pedestrians and cyclists may find their access to transit impeded by freeways as well.

Even at freeway crossings that do exist, physical severance can be exacerbated by poor or missing sidewalks, lighting, or bicycle lanes, and by fast-moving traffic entering or exiting the freeway. In the case of pedestrian bridges over the freeway, steps or circuitous ramps may hinder mobility as well.

Study Approach

We used OpenStreetMap data to quantify three different measures of street connectivity around every freeway in California: (1) the composite Street Network Disconnectedness Index, which we developed in previous research, (2) the circuity of pedestrian and bicycle routes, and (3) the distance between crossings. We also used Google Street View imagery to audit the quality of a sample of 100 crossings.

We then analyzed the association between our connectivity measures and proximity to a freeway. We compared areas that are within 400 meters (about one-quarter mile) of a freeway to those that are more distant (400 meters to 800 meters). We used Census demographic data to identify correlations with the neighborhood racial demographics.

Research Findings

In this research project, we explored the impact of freeways on severance in California, with a particular focus on Los Angeles County. We found:

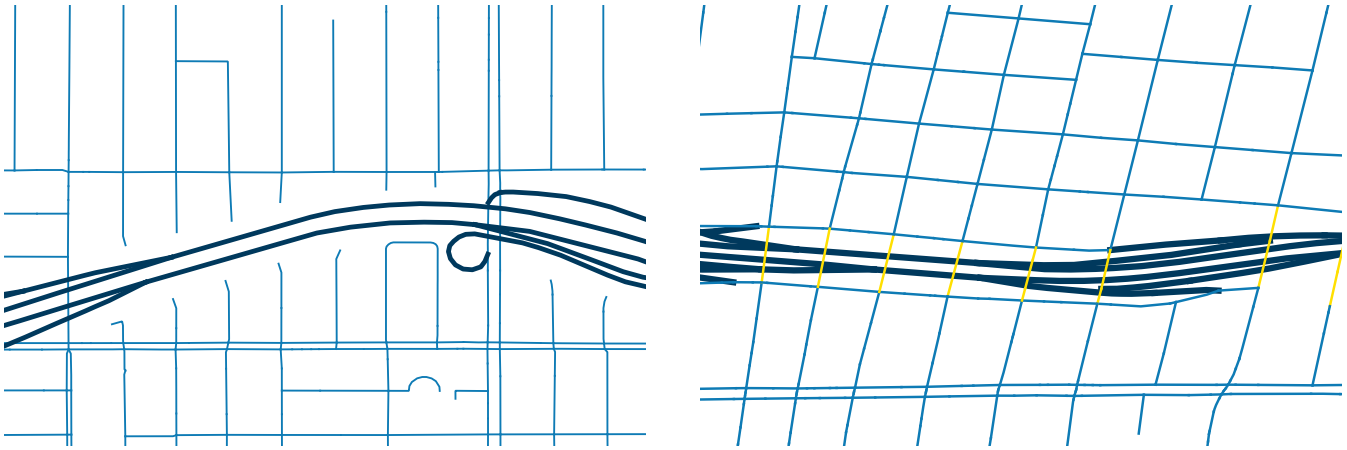

Figure 1. Freeways (darker color) create severance or barrier effects through creating dead-end streets and lengthy detours (left), unless the local street network is continued across freeways via over- or underpasses (right).

- Freeways reduce the connectivity of local street networks in many places, particularly in already established urban areas. However, the effects are surprisingly varied, partly because freeways often run on flatter ground through neighborhoods with grids or other connected street networks.

- Severance is most pronounced in communities of color. The more people of color who live in a neighborhood with a freeway running through it, the less connected the streets and the more circuitous the routes for pedestrians and bicyclists. Moreover, people of color are more likely to live near a freeway. In urban California, 12% of non-Hispanic white people live within 400 meters or one-quarter mile of a freeway, compared to 15%-16% of Black, Asian, and Latino people.

- In some neighborhoods, planners and freeway designers have maintained local connections. In downtown Los Angeles, for example (Figure 2), local streets often continue across the freeway. However, in other parts of the county, crossings are sparse, even where there are dense neighborhoods on either side of the freeway.

- Poor quality crossings exacerbate the severance impacts of freeways. Most freeway crossings are unpleasant or even hazardous for pedestrians and cyclists. They are typically built with freeway access as the main consideration, and safety and connectivity for pedestrians and cyclists as afterthoughts. The sparsity of crossings amplifies this problem: large volumes of traffic are funneled through a small number of under- or overpasses. Moreover, long distances between crossings mean that there is no reasonable alternative to a dangerous route in some neighborhoods without taking a lengthy detour.

Conclusions

- For newly constructed freeways, severance can be reduced by maintaining the continuity of at least some local street connections, rather than dead-ending them at the freeway.

- For existing freeways, building new crossings (e.g., pedestrian or bicycle bridges) can reduce severance, although it can be challenging to design them in a way that creates direct routes as well as real and perceived safety.

- The poor quality of many existing crossings points the way to a lower-cost, more quickly implemented approach than building new bridges or underpasses. Existing crossings can be upgraded through widening sidewalks, adding a buffer between pedestrians and moving traffic, and providing signals or shorter turn radii to slow traffic exiting or entering a freeway.

Figure 2. Distance between crossings, Los Angeles County.

Efforts to address severance, however, should not neglect consideration of the impacts of freeways on air and noise pollution, which are also concentrated in communities of color. Rather than addressing the negative consequences of freeways in a piecemeal fashion (e.g., through pedestrian bridges, sound barriers, and supplying air filters to nearby households), planners and policymakers might look to cities such as Boston and Oslo, Norway, that are undergrounding road infrastructure, or to Seoul, South Korea, and San Francisco that have started to remove some freeways altogether.

More Information

This policy brief is drawn from the "Equity in Street Connectivity and Freeway Severance" research project by the UCLA Institute of Transportation Studies. The project and associated reports can be found at www.its.ucla.edu/project/equity-in-street-connectivity-and-freeway-severance/.

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