Impacts of Bicycle Infrastructure and Network Characteristics on Bicycle Traffic over Time in 12 US Cities

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ABSTRACT:

Previous studies have shown that cycling has increased in the US as a sustainable mode of transportation. However, little is known of whether the existing bicycle infrastructure and bikeable urban street networks have induced bicycling demand, and by how much. The current literature on cycling shows that findings on the effectiveness of different types of bicycle facilities are inconclusive. In addition, it relies on cross-sectional research design and predominantly focuses on determinants of bicycling in a single city. Drawing on geospatial bikeable street network data and repeated counts of bicycle traffic from 2004 through 2016, this study attempts to address these limitations by moving beyond single-city case studies to examine the effect of different types of bicycle facilities and bikeable street network characteristics on bike traffic volume over time in 12 US cities. First, we measured geospatial network centralities using Geographic Information System (GIS) tools. Next, we used fixed effects regression to quantify the effect of bicycle infrastructure and network characteristics on bicycling during morning and afternoon peak periods at street segments and intersections. Our model results suggest that bicycling increased by 6 to 14 percent per year on average, with off-street facilities largely contributing to the increase in bike traffic over time during afternoon peak periods. Additionally, minor facilities such as bicycle boulevards and sharrows were associated with higher levels of cycling at intersections during afternoon peaks. We also found that closeness centrality had a negative effect on bicycle traffic at intersections and segments while betweenness centrality exhibited no statistically significant impact on bicycling over the 13-year study period. Findings from our study could help inform decision-making on the reallocation of investments in bicycle infrastructure. Our results could also help policymakers and urban planners evaluate the existing bicycle networks and design well-connected city-wide bicycle networks.

KEYWORDS: *geospatial analysis, GIS, network analysis, cycling, longitudinal analysis*

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