Developing Public Health Performance Measures to Capture the Effects of Transportation Facilities on Multiple Public Health Outcomes

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Introduction

Active commuting has seen a growth of 300% in some U.S. large cities [McLeod & Murphy, 2014]. This trend improves the public health measures such as safety, physical activity, and air quality and has benefits like reducing vehicular transportation and fuel consumption.

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<tr>
<th>Study</th>
<th>Performance Measure</th>
<th>Affecting Infrastructure Variables</th>
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</thead>
<tbody>
<tr>
<td>Zenker et al., 2006</td>
<td>Pedestrian Intersection Safety Index (PSSI)</td>
<td>Signal and stop control, number of lanes, speed, main traffic AADT, land use</td>
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<tr>
<td>Cartier et al., 2006</td>
<td>Bike Intersection Safety Index (BISSI)</td>
<td>Roadway geometry, traffic control, motor vehicle facilities</td>
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<tr>
<td>Texas Transportation Institute (TTI)</td>
<td>Great Pedestrian Street</td>
<td>Total sidewalk area, curb extension, median width, pedestrian facilities</td>
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<tr>
<td>Wellar, 1998</td>
<td>Walking Security Index (WSI)</td>
<td>No. of lanes, grade, presence of turning lanes, curbs at intersections</td>
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Methods and Materials

Survey details: Performance measures captured and calibrated using expert survey of professionals with transportation engineering, safety and public health expertise.

Fuzzy Technique: The study calculates the element weights for the performance measures with a geometric mean technique using a fuzzy scaling approach and expert feedback (i.e. level of importance as least important, moderately important, important, and most important and they are not given Likert scale weights).

Concordance Technique: A concordance technique is used to evaluate the safety impact of each element. The researchers use data from the expert survey for the concordance analysis, which derives the safety influence of each element.

Conflicts: Surrogate safety performance measure for crashes
- Non-overtaking: Separation distance and vehicle speed, time to react
- Over-taking: Lateral separation and vehicle speed

Air Quality: PMs for evaluating the relationship between air quality along arterials. Performance measures consider the pollutant concentration levels of CO, NO2 and PM10/PM2.5 along the activity route of major urban arterials (independent variables are speed limit and traffic volume).

Conclusion & Future Directions

The study calibrates new public health performance measures using surveys of transportation engineering professionals and formulates the relationship between transportation elements and public health using a fuzzy scaling approach. The safety impact was evaluated using a Concordance Technique. The measures presented in this poster can be used to evaluate transportation infrastructure needs and the impacts of different improvements.

The performance measures developed in this study focus on road segments and intersections. However, the indices can be easily expanded to corridors and transportation networks. Adjusting the indices in this manner enables transportation agencies to evaluate two or more corridors, regions and networks, which in turn help in the investment decision making process, strategic planning, and policy or programming analysis. Future research may consider the operating characteristics, network connectivity and land use; however, these "enhancements" may decrease the current utility of the performance measures for non-expert decision-makers.

The tools can help decision makers evaluate any potentially competing public health objectives. The research team recommends that transportation agencies use the developed safety and physical activity indices as an evaluation tool to assess the impacts of policies and planning.

Research Objectives

Research Objective 1: Investigate performance evaluation strategies that consider the joint effects of transportation facilities on public health factors such as safety, physical activity and air quality.
Research Objective 2: Develop decision making tools for evaluating competing public health objectives.
Research Approach 1: Develop project level performance measures for evaluating the effects of transportation facilities on different public health objectives of safety, air quality and physical activity.
Research Approach 2: Develop easy to apply sketch planning tools to aid decision-makers in evaluating different transportation facilities with respect to multiple public health outcomes.

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