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INTERACT
FLASH REVIEW

TRANSIT ACCESS MEASURES

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Question

This flash review will examine how access to public transit, including bus and subway systems, has been measured in the literature. This flash review is largely based on a slide deck and upcoming publication of a systematic review conducted by Dr. Gillian Booth’s team on transit access. The question of access to transit is relevant for INTERACT as it is the crucial component of the Saskatoon study. Changes in transit access are also potential confounders in observed associations between cycling infrastructure (Victoria) and Arbutus (Vancouver).

Review of measures/methods

The literature review showed 19 different transit access measures of which nine are identified as useful for examining associations between transport systems and physical activity, well-being, and social participation. There are three simple measures of transit access the have been commonly used in the literature and have been shown to be associated with physical activity.

1. Nearest stop: Walking distance to the nearest transit stop
2. Count of Stops in Walking Distance: Number of stops within 1km walking distance buffer
3. Count of Stops in DA: Number of stops with a census geography (DA)

The more detailed transit access measures include a number of different components that could be included in a conceptualization of transit accessibility. These include:

1. Stop Location
2. Transit Routes
3. Service Frequency
4. Mode
5. Vehicle Capacity
6. Residential Population
7. Number of Employees
Table 1. Transit access measures and components encompassing transit access

<table>
<thead>
<tr>
<th>Measure</th>
<th>Stop Location</th>
<th>Transit Routes</th>
<th>Service Frequency</th>
<th>Mode</th>
<th>Vehicle Capacity</th>
<th>Residential Population</th>
<th>Number of Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit Score</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Transport Accessibility Index$^{3,4}$</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Transport Accessibility Level$^{3,4}$</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enhanced Two-Step Floating Catchment Area</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Index of Transit Availability</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Transit Capacity and Quality of Service Manual</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The purpose of the transit access measures varies depending on how the measure is calculated. Some measures are based on estimating the service available in a Census Geography while others attempt to estimate transit accessibility for a specific spatial location (i.e., home address).

Recommendations and conclusions

Based on the review, my recommendation is to use the Public Transport Accessibility Index$^{3}$ and the three simple transit access measures for INTERACT. The Public Transport Accessibility Index assumes that we have access to both stop and frequency data from the Global Transit Feed Specification (http://transitfeeds.com/) or Google (https://developers.google.com/transit/gtfs/). The justification for using the Public Transport Accessibility Index is three-fold:
Method for calculating Public Transport Accessibility index

Step One
- Calculate walking time using network distance to transit and walk speed of 4.8 km/h
- Calculate average waiting time at transit using frequency (AWT = 0.5 x 60/F)
- Calculate total access time as sum of walk time and wait time (TAT = WT + AWT)
- Calculate equivalent frequency, measuring doorstep availability of a route at the POI (EF = 30/TAT)
- Calculate weighted equivalent frequency, the summation of EFs of public transport modes, weighting in favour of the most dominant

Step Two
- Determine population density at Statistical Area level and in 400m catchments around bus and tram stops, 800m around train stations

Step Three
- Calculate index value using a formula combining WEF and population density in a ratio

Summary

Table 2. Summary of recommended metrics for INTERACT

<table>
<thead>
<tr>
<th>Recommended measures</th>
<th>Data requirement</th>
<th>Feasibility/applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Transport Accessibility Index</td>
<td>Geocoded Participants</td>
<td>Given data requirements is computationally intensive.</td>
</tr>
<tr>
<td></td>
<td>Road Network</td>
<td>Assumptions required at step 2 for population counts in non-standard Census polygons.</td>
</tr>
<tr>
<td></td>
<td>GTFS Stops</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Census Data</td>
<td></td>
</tr>
<tr>
<td>Nearest stop</td>
<td>Geocoded Participants</td>
<td>Network analysis</td>
</tr>
<tr>
<td></td>
<td>GTFS Stops</td>
<td></td>
</tr>
<tr>
<td>Count of stops in Walking Distance</td>
<td>Geocoded Participants</td>
<td>Road network buffer + Count of points in polygons</td>
</tr>
<tr>
<td></td>
<td>Road Network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GTFS Stops</td>
<td></td>
</tr>
<tr>
<td>Count of stops in DA</td>
<td>Census</td>
<td>Count of points in polygons</td>
</tr>
<tr>
<td></td>
<td>GTFS Stops</td>
<td></td>
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</tbody>
</table>
References


