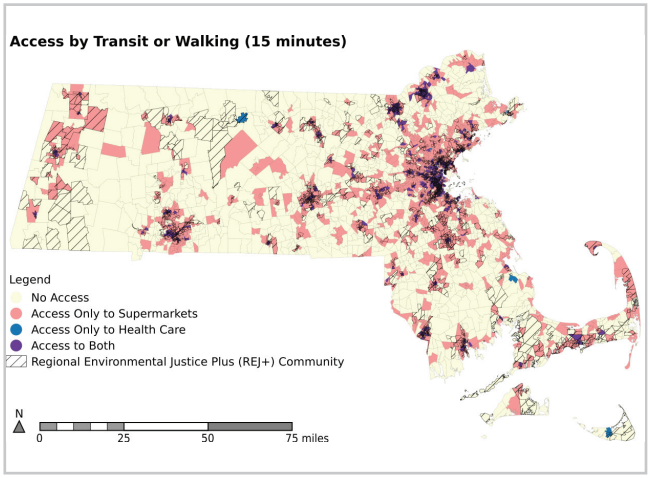
Research Summary

Measuring Access to Improve Public Health – Phase II

Research Need

Access to food, healthcare, education, and recreation are all important for public health. Phase I, which focused on food access, identified three research needs: 1) access metrics should account for walkability, bikeability, and emerging microtransit services; 2) analysis should account for vulnerable populations affected; and 3) access should be measured for other determinants of public health, including healthcare, education, and recreation.



Goals/Objectives

There are four objectives of this research:

1) To develop methods that account for transportation modes and services (such as walkability, bikeability, and microtransit services) and the quality and connectivity of transportation infrastructure in metrics of access based on travel time and/or cost.

2) To present metrics of access and equity that account for the locations of vulnerable or disadvantaged populations and how these align with the transportation system.

3) To identify metrics and tools that serve needs for planning transportation infrastructure and services that provide access to critical locations associated with public health.

4) To recommend metrics and analyses that can be reproduced with available data to be incorporated into a data dashboard or tool that supports ongoing planning and investment decisions.

Methodology

Building on Phase I, which focused on food access in Massachusetts, this project expands the scope to include healthcare, higher education, and parks. The research improves methods to account for walkability (adjusting travel time using the National Walkability Index), bikeability (limiting network to level of traffic stress ≤ 2), and the role of microtransit alongside fixed-route transit. The analysis method generates high-resolution access maps to key destinations. Demographic data are integrated to quantify disparities faced by vulnerable populations. To examine links between access and health, Geographic Weighted Random Forest (GWRF) models relate accessibility and demographic variables to chronic health outcomes including diabetes, heart disease, and obesity. The study concludes with policy recommendations to embed access metrics into planning tools, including dashboards that guide equitable transportation investments and promote public health across the state.

Key Findings

This study represents a significant advancement in understanding and measuring the intersection of transportation access and public health in Massachusetts. The changes to modal access metrics reflect the experience of users and are applied consistently across the state to generate high-resolution access maps by mode and destination type.

Key findings from linking the improved access metrics to demographic data include:

1) Access by car is relatively more equitable than for other modes, so there is a disparity for people that do not have access to a car.

2) There are significant populations with low income or living in zero-vehicle households outside of the Regional Environmental Justice Plus (REJ+) communities, so access gaps are more meaningfully identified by counting the size of vulnerable populations without access.

Key findings from the GWRF models that related access measures to public health data include:

3) Transportation access strongly influences public health, especially in communities with more low-income population and zero-vehicle households.

4) The importance of travel mode varies geographically and by mode. Access to healthcare is strongly linked to diabetes prevalence. Access by active modes (walk, bike) is strongly linked to prevalence of obesity and heart disease.

5) Analysis of the cross-elasticity of health outcomes to modal access measures shows which communities would experience the greatest public health benefit for access improvements.

The proposed methods are designed to be reproducible across communities and over time to track changes.

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Project Information

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Use of Findings

This research provides data-driven methods to identify gaps in access that can be addressed with transportation investments. The results include GIS maps that can be used to identify existing access gaps and communities that are likely to benefit most from access improvements. These outputs can be used by MassDOT to statewide planning and project prioritization or by local agencies and planning organizations to understand needs and justify investments. This study confirms that transportation accessibility is a public health issue. By embedding refined, multimodal access metrics into planning and investment decisions and targeting gaps for vulnerable populations, Massachusetts can promote healthier, more equitable communities statewide.

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