The Health and Transportation Nexus

A Unified Model Integrating Multiple Mechanisms for Collaborative and Equitable Planning

Yingling Fan, University of Minnesota
Technical Advisory Panel

Abdullahi Abdulle, Transportation Equity Planning Coordinator
MnDOT Office of Transportation System Management

Amber Dallman, Bicycle and Pedestrian Coordinator
MnDOT Office of Transit and Active Transportation

Brent Rusco, Senior Engineer
MnDOT Office of Research and Innovation

Carol Zoff, Environmental Planning and Design Unit Supervisor
MnDOT Office of Environmental Stewardship

Christine Neary, Tribal Transit Coordinator
MnDOT Office of Transit and Active Transportation

David Elvin, Principal Planner
MnDOT Metro District

Kelly Corbin, Planner
MnDOT Bikes Unit

Leif Halverson, Project Coordinator
MnDOT Office of Research and Innovation

Lindsey Bruer, Planning Director
District 8

Nissa Tupper, Sustainability & Public Health Planner
MnDOT Sustainability & Public Health Division

Patrick Hollister, Planner
PartnerSHIP 4 Health

Sara Dunlap, Principal Planner
MnDOT Operations Div Admin
“The street is the river of life of the city, the place where we come together, the pathway to the center.”

—William H. Whyte
Transportation - a unique social determinant of health

- Social determinants of health (SDoH) are non-medical factors that influence health equity and health outcomes.
  - Conditions in which people live, learn, work and play;
  - Shaped by the complex and interrelated social structures and economic systems

- Transportation
  - Its physical presence directly shapes the social and physical environments in myriad ways.
  - Mobility and accessibility determine the types of places where people can live, learn, work, and play in their everyday life
Transportation shapes physical and social environments and determines mobility and accessibility.
Critical Theories in Sociology


• Critique of society and culture: sexism, racism, and classism are prevalent in everyday life.

• Necessary to study the lived experience of real people to reveal and challenge power structures.

• Necessary to make the perspectives of socially marginalized groups, rather than those of the dominant culture, the central axis around which discourse revolves.

• Extend to transportation planning: much of our transportation systems are socially constructed by the dominant groups.
Transportation as an unavoidable everyday life component presents oppression and exclusion in subtle and ordinary ways.
Lived experience by race, gender, & class
Transportation-Related Well-being gaps by gender, race, & class
## Health and Transportation Nexus – Literature Review

### 8 Frameworks

<table>
<thead>
<tr>
<th>Framework</th>
<th>Author/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health in Transportation Corridor Planning Framework</td>
<td>Federal Highways Administration</td>
</tr>
<tr>
<td>Metropolitan Area Transportation Planning for Healthy Communities</td>
<td>Federal Highways Administration</td>
</tr>
<tr>
<td>A Research Roadmap for Transportation and Public Health</td>
<td>Transportation Research Board</td>
</tr>
<tr>
<td>The Transportation Prescription</td>
<td>Prevention Institute &amp; Policy Link</td>
</tr>
<tr>
<td>Recommendations for Improving Health through Transportation Policy</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>Transportation and Health: Policy Intervention for Safer, Healthier People and Communities</td>
<td>SafeTREC at the University of California Berkeley</td>
</tr>
<tr>
<td>Transport, Environment and Health</td>
<td>World Health Organization Regional Office for Europe</td>
</tr>
<tr>
<td>Health Impact Assessment of Transport Initiatives</td>
<td>Public Health Scotland</td>
</tr>
</tbody>
</table>

### 3 Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>Author/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation Health Impact Assessment Toolkit</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>Transportation and Health Tool (THT)</td>
<td>US Department of Transportation</td>
</tr>
<tr>
<td>Integrated Transport Health Impact Model (ITHIM)</td>
<td>CEDAR at the University of Cambridge</td>
</tr>
</tbody>
</table>
Health in Transportation Corridor Planning Framework

- Reduce Obesity Rates
- Decrease Vehicle Emissions
- Benefit the Aging and Lower Income
- Promote More Bicycle Trips
- Promote More Pedestrian Trips
# Key Domains of Frameworks and Tools

<table>
<thead>
<tr>
<th>Key Domains/Themes</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
<th>F6</th>
<th>F7</th>
<th>F8</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active transportation</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>11</td>
</tr>
<tr>
<td>Environmental pollution</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>11</td>
</tr>
<tr>
<td>Traffic safety</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>11</td>
</tr>
<tr>
<td>Access to destinations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Equity</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Public transportation</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Mental health and wellbeing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Climate change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Resilience to disasters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
Word Frequency Analysis
Existing frameworks describe the transportation-related domains affecting health and equity, what about the mechanisms through which transportation-related domains affect health and equity?
The Environment Health Mechanism

- Emphasizes the protection of people from environmental hazards.
- Intrinsically linked to social equity and justice issues—transportation externalities disproportionately affect areas where the most disadvantaged reside.

**PATHWAYS TO HEALTH**

**BENEFICIAL TO HEALTH**
- Green Spaces and Aesthetics
- Physical Activity
- Access
- Mobility Independence

**DETRIMENTAL TO HEALTH**
- Contamination
- Social Exclusion
- Noise
- Urban Heat Islands
- Motor Vehicle Crashes
- Air Pollution
- Community Severance
- Electromagnetic Fields
- Stress
- Greenhouse Gases
The Behavioral Health Mechanism

- Supported by a growing body of evidence documenting how land use and transportation can support or hinder healthy behaviors such as physical activity and healthy diet.

- A heavy emphasis on obesity and the associated chronic diseases such as cardiovascular disease, respiratory illness, Type 2 diabetes, and poor mental health.
Why integration?

- Without considering both behavior and exposure-based pathways, the overall health impacts of transportation are likely to be misestimated.

- Increased regional investments in active transportation
  - Regionally desirable increases in physical activity
  - Increased risk of injury and increased exposure to pollutants through longer travel time and higher inhalation rates
The Social Exclusion Mechanism

- The intersection of transport and social disadvantage.

- Inaccessibility affects all domains of life, e.g., services and goods, social networks, and decision making.
Innovations in the Social Exclusion Framework

- Recognize that the transportation-health connections operate in multiple life dimensions, including economic opportunities, daily activity participation, and civic and political engagement.
  - Social exclusion involves “the lack or denial of resources, rights, goods and services, and the inability to participate in the normal relationships and activities, available to the majority of people in a society, whether in economic, social, cultural or political arenas.”

- Emphasizes the interactions between transportation disadvantage and social disadvantage, acknowledging multiple, intersecting deprivations.
  - It moves away from the traditional systems-based transportation service provision approach towards a more people-oriented and needs-based social policy approach that focuses on accessing key life-enhancing opportunities.

- Relates the problems back to how the policy decisions and practices of local authorities and agencies may have systematically excluded certain individuals and/or communities from the benefits.
  - It raises questions about systemic inequity in the distribution of transportation and non-transportation resources.
A Unified Model of the Health and Transportation Nexus

Integrating the social determinants of health framework with three pathway frameworks: environmental health, behavioral health, and social exclusion.
Integration

• All five dimensions of social determinants of health are relevant to transportation and health.
  • The neighborhood and built environment provide safe, multimodal routes for convenient access to healthy destinations, including education and healthcare.
  • Transportation not only provides access for one to obtain a good paying job for economic stability, but also the means for people to interact with the community and stay connected socially.

• The social determinants of health interact with transportation and operate on health and equity outcomes via three major mechanisms.

• The three mechanisms can overlap and interact with one another to moderate the effects of social determinants of health on health and equity outcomes.
  • For example, traffic accidents can be studied from both the environmental and behavioral health perspectives.
  • Social inclusion affects the types of environmental exposure to health risks and the environmental contexts for behavior and therefore interacts with environmental and behavioral health mechanisms.
States in which their DOTs are pioneers in linking transportation to health

- California-Caltrans
- Massachusetts-MassDOT
- Minnesota-MnDOT
- Rhode Island-RIDOT
- Oregon-ODOT
- Washington State-WSDOT

Strong integration of public health components into long-range transportation plans

Dedicated programs to initiate interagency collaboration and promote collaborative health and transportation planning
Recommendations

01 Continue to foster partnerships across all agencies and stakeholders outside of Department of Health

02 Develop MnDOT's definition of health and how it relates to transportation

03 Develop scoring and evaluation matrix for project selection and project evaluation

04 Ensure MnDOT staff is well-versed and trained in transportation and health concepts
Thank you.

- Email: yingling@umn.edu
- Twitter: @yinglingfan