

ABSTRACT

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Title: Exploring the Relationship among Transportation and Health Determinants in Diverse Geographic Settings

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Transportation and health are undeniably related. Transportation and its relationship with health are widely recognized as facing unique challenges in different geographic settings. However, research to date has mainly focused on understanding this relationship in urban areas. Remarkably, the importance of promoting physical activity through active travel (i.e., walking, biking, transit) is understudied in places other than urban areas. Increasing awareness regarding the ability of one's surroundings to encourage or inhibit active travel is critical to preparing us for the transformation of transportation habits. This issue takes on added significance considering telecommuting and the advent of autonomous vehicles.

The overall goal of this dissertation is to examine the complex relationship between transportation and transport-related health determinants in diverse geographical settings (i.e., urban core, suburban, large rural towns, and rural areas) from an active travel perspective. To that end, four interdependent studies were conducted to address the following research questions: (i) Does the relationship among built environment, access to infrastructure, and physical activity differ across diverse geographic settings? (ii) What is the relationship among car usage, self-perceived health, and physical activity in rural areas? (iii) Which are the most significant determinants of the association between transportation and health in rural areas? (iv) What are the potential public health implications of adopting Autonomous Vehicles (AVs) in urban areas?

First, the differences between various geographic settings regarding the built environment, access to infrastructure, and physical activity levels were assessed using individual-level data in the contiguous United States (U.S.). This dissertation employed behavioral and social science techniques (Structural Equation Modeling – Multi-group Analysis) to estimate how statistical constructs varied across multiple geographic settings. This dissertation concluded that the likelihood of being physically active through active transportation, facilitated by the built environment and access, does not decrease linearly with the level of rurality defined in this study. For example, the association between physical activity levels and factors such as built environment, and access to infrastructure were positively associated in urban settings. The contrary

was found in rural areas. This conclusion called for a deeper study of this relationship in rural areas.

To that end, this dissertation further examined physical activity and its connection with socioeconomic determinants, perceived health, and car usage in rural areas. Given that this relationship is described as non-linear, using statistical techniques such as path analysis allowed quantifying the direct and indirect effects among variables. This study concluded that high car usage and poor self-perceived health are mediators of physical activity levels. Therefore, efforts from both the transportation and health domain are needed to promote active travel in rural areas.

Based on these results as well as informed by transportation and health literature review, a conceptual framework was created by considering socioeconomic, personal, and physical transport-related health determinants. Structural equation models helped elucidate the complex relationships among determinants. The model results confirmed significant pathways among the various transport-related health determinants. As such comprehensive solutions need to be contemplated in future interventions to promote active travel. Interventions such as town center revitalization, investments in heavy transit, and better broadband access that facilitate technology-enabled mobility services could significantly impact health outcomes in rural areas. Completing this objective fulfilled a pronounced research gap that has only been addressed using qualitative research.

Finally, this dissertation examines how access to technologies, such as AVs, could impact the urban built environment and its potential to promote or inhibit active travel. Two urban settings were considered as a case study since urban areas might be the first to experience AV deployment. This dissertation used cluster analysis and ordered probit models to understand AV adopters' individual and location-based characteristics. Our results suggest that AV implementation based only on the propensity to adopt might have adverse health outcomes (i.e., obesity). This dissertation points out the need for place-based interventions to enhance active travel and decrease the "obesogenic" environment that could arise in the AV era.

Overall, the author concludes that the impact of transportation on public health cannot be seen as a "one exposure- one outcome- one solution" approach, and all-inclusive planning is needed to generate changes and prepare for transportation innovations to come. In view of the above, this dissertation proposed the ABC PATH framework that offers guidance to improve the population's health from transport-related changes comprehensively. The results of this research can help different organizations, such as planning organizations and rural health associations, advance community health and well-being through transportation investments.