Exhibit D – Research Project Requirement Template

Modeling Spatial Dependency of Active Travel Behavior

Recipient/Grant (Contract) Number: The University of Texas at Austin/Grant # 69A3552344815 and 69A3552348320

Center Name: National Center for Understanding Future Travel Behavior and Demand (TBD)

Research Priority: Improving Mobility of People and Goods

Principal Investigator(s): Chandra R. Bhat

Project Partners: N/A

Research Project Funding: $150,000 ($75,000 Federal + $75,000 matching funds)

Project Start and End Date: 6/1/2025 – 5/31/2026

Project Description: Active transportation, encompassing walking and cycling, presents a multifaceted solution to contemporary societal challenges. The benefits of widespread active transportation extend beyond environmental improvements through reduced vehicle emissions to include economic revitalization of local businesses through increased foot traffic and public health enhancements by providing an accessible form of physical activity that improves cardiovascular health, reduces stress, and promotes overall wellbeing. Existing interventions to increase active travel show limited success across different communities, highlighting the nuanced nature of transportation choices. These decisions emerge from a complex interplay of measurable factors such as traditionally used urban design factors and demographic characteristics, and intangible elements such as social dynamics and personal motivations. Thus, to effectively promote active transportation, planners must move beyond traditional approaches and explore how social networks and peer influences drive individual travel decisions. Rosa and Isler (2024) highlight this research gap, noting the lack of consideration of spatial spillover effects when investigating the factors that influence walking and cycling choices in urban trips.

This research project addresses this gap through five key innovative strategies:

First, we implement an econometric model that captures how walking frequency is influenced by spatial proximity between individuals. Unlike traditional models that focus solely on built environment or sociodemographic factors, this approach recognizes the important role of social dynamics and local cultures. This social influence may manifest through multiple channels, such as discovering walking companions, sharing local route knowledge, and observing others' transportation behaviors. These interactions generate spillover effects over neighborhoods, which our spatial econometric model specifically addresses, enabling a more comprehensive understanding of active transportation determinants.

Second, we recognize the distinct possibility that the distribution of walking trips, conditional on observed exogenous factors, is likely to be skewed toward the right. We also investigate the effects of ignoring the presence of such asymmetry, when it is present, on missed opportunities to promote walking because of underestimated effects of interventions.

Third, this research distinctively models the frequency of walking lasting over 15 minutes per week as the dependent variable, rather than treating active transportation as a binary mode choice. Our frequency-based approach acknowledges that effective policy should encourage regular, habitual usage rather than occasional participation. By examining frequency, we can detect social influence patterns because exposure to regular walkers/cyclists may have stronger effects than awareness of occasional users.

Fourth, we leverage data collected in 2023, providing insights into current active travel patterns in the contemporary transportation landscape. Travel behaviors have undergone significant shifts in recent years, with changes in work arrangements, activity patterns, and attitudes toward various transportation modes. By using recent data collected after major disruptions and as behaviors have somewhat stabilized into new patterns, our research offers timely insights relevant to today's transportation realities.

Fifth, we analyze detailed census tract level data rather than broader geographic aggregations to enable more precise analysis of neighborhood level social dynamics. This granular geographic approach is particularly important because walking and cycling typically occur over short distances where hyperlocal conditions matter significantly.

Through this research, we aim to make both methodological and substantive contributions to the field. Methodologically, we develop a spatial dependency model with an asymmetric error structure that is simultaneously more streamlined and more robust than existing approaches, creating an analytic framework that can be applied across various behavioral studies beyond active transportation. Substantively, we expect to enhance understanding of active travel behavior by disentangling the complex interplay between built environment factors, social influences, and individual characteristics. These insights will provide valuable guidance to policymakers seeking to promote active transportation by identifying what kinds of interventions might be most effective for what kinds of population subgroups and contexts.

US DOT Priorities: "Data-Driven Insight" (DOT RD&T Plan, Page 58-59) forms the foundational theme of our study. We aim to leverage active transportation data through an innovative econometric model that combines spatial dependency with asymmetric error distribution. This approach will provide valuable insights for policymakers seeking to enhance the effectiveness of active transportation promotion strategies. This result supports another goal, decarbonization (DOT RD&T Plan, Page 42) by enabling more precise analysis of factors influencing shifts from motorized to non-motorized travel.

Outputs: The proposed research study shall result in a research paper that will be submitted to a relevant journal. Also, the paper will be submitted and presented at relevant conferences and meetings. The dataset compiled for this project as well as detailed formulations of the analytic models used will also be appropriately documented and made available for public use with the paper.

Outcomes/Impacts: Our research investigation provides a pathway to more accurately quantify how socio-demographic and built-environment factors influence walking/cycling behaviors. Using our results, transportation agencies can identify optimal spatial spillover mechanisms, enabling strategic resource allocation resulting from positive behavior contagion effects through communities. Planners will gain practical guidance for leveraging social networks alongside infrastructure improvements. This includes identifying community influencers, designing programs that facilitate social reinforcement, and developing metrics that capture direct and indirect effects of interventions. This research will strengthen the methodological foundation for active transportation planning, while providing guidance for sustainable mobility initiatives.

This research will generate significant practical and theoretical impacts across multiple domains. It will enable administrators to implement targeted, evidence-based policies promoting walking. These interventions will yield public health benefits through increased physical activity, particularly benefiting vulnerable populations such as older adults who require lower-intensity exercise options. The modal shift from motorized to active transportation can produce other benefits, including reduced emissions and energy consumption, while alleviating congestion through improved demand management. The spatial spillover methodology will contribute to the scientific literature on transportation behavior modeling, creating new analytic frameworks.

Final Research Report: A URL link to the final report will be provided upon completion of the project.