

## Exploring the heterogeneity of walking trips

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In recent years, there has been a growing emphasis on promoting walking as a sustainable and healthy mode of transportation in urban environments. Walking contributes to public health, reduces traffic congestion, and helps mitigate environmental pollution. This is why many cities have stated ambitious goals towards walking without knowing how to achieve them effectively. Transport models could help identify different scenarios. However, traditional transport models in Norway, independent from their scope, often overlook pedestrians as serious transport users, mainly due to a lack of appropriate data, tools, and knowledge.

This study aims to bridge the gap by examining the heterogeneity of walking trips through a comprehensive framework that considers various influences. By answering the following questions:

- How do utilitarian and recreational walking trips differ in terms of timing (time of day and week), demographics, car usage, weather conditions, duration of the stops, and frequency?
- How do these patterns differ from those found in neighborhoods with varying environmental and built characteristics?

By understanding these diverse factors—ranging from environmental characteristics, such as infrastructure quality and safety, to demographic variables like income and age—we aim to develop a comprehensive understanding of pedestrian behavior. Understanding the heterogeneity is crucial for designing interventions and policies that effectively encourage walking in various urban settings. This ensures that approaches are tailored to address the specific needs and barriers faced by distinct communities.

Through this research, we aim to redefine how pedestrian models are conceptualized, moving beyond one-size-fits-all solutions to embrace the complexity and diversity inherent in urban walking behaviors.

We employed a quantitative research approach to explore the heterogeneity of walking trips. Data collection was conducted across multiple neighborhoods in Trondheim with varying demographic, socio-economic, and urban design characteristics. Quantitative data were collected through GPS tracking, complemented by environmental audits that assessed destination availability, street quality, and safety. We applied advanced statistical modeling techniques, including multilevel regression analyses and latent class analyses, to identify patterns and groupings within the walking behavior data.

Our preliminary results reveal a significant diversity in walking trips, both within and across neighborhoods. We found that environmental factors, such as sidewalk quality and the presence of pedestrian-friendly infrastructure, have a substantial impact on walking frequency. However, these factors are influenced by demographic characteristics, such as age, income level, and car ownership, which vary the impact of the built environment on walking behavior. In some neighborhoods, traditional trip generation models underestimated walking trips due to their inability to account for these complex interactions. Our findings underscore the need for models that incorporate a wide range of contextual factors, including both tangible and intangible elements that influence walking behavior.

This study highlights the complex interplay between environmental and demographic factors that drive the heterogeneity of walking trips, challenging existing one-size-fits-all modeling approaches. By explaining and addressing this heterogeneity, urban planners can design more effective interventions tailored to specific community needs, ultimately fostering an environment that supports and encourages walking. Our research promotes a shift toward dynamic models that effectively capture the complexities of pedestrian behavior, facilitating more informed, equitable, and impactful urban planning decisions.

Proposals for subject placement: Mobility and Behavior, Transport modeling