Outdoor Heat Exposure: Assessing Thermal Walkability in Three PASS Neighborhoods

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Abstract

Pedestrians in Arizona face significant risks of heat-related illnesses when exposed to long periods of direct sunlight and high ambient temperatures, making it difficult to walk to places such as bus stops and parks. This problem is exacerbated by a lack of shade, which increases pedestrian heat load in public spaces. Since the thermal environment is significantly influenced by Urban Ecological Infrastructure (UEI), understanding the relationship between UEI and thermal conditions is crucial for developing strategies that enhance walkability and mitigate heat stress. In this research, we used the SOLWEIG model and the "Cool Routes" tool to map hourly daytime Mean Radiant Temperature (MRT) and shade coverage in three PASS neighborhoods (W15, U18, and 711) from 7 AM to 8 PM for a typical clear and sunny summer day to identify high-risk walkable paths. We identified points of interest (POIs) and determined the exposure on routes connecting them to households, categorized POIs into buckets like transits, shops, healthcare, etc., and assessed which types of household–POI routes most often meet the minimum shade goal (≥20% shade coverage). Our analysis reveals that the proportion of routes to public transit (e.g., bus stops and light-rail stations) that meet the minimum shade threshold varies significantly across neighborhoods and times of day. In **W15**, **63%**, **39%**, and **64%** of transit routes meet the threshold at **9 AM**, **12 PM**, and **4 PM**, respectively. In **U18**, the corresponding shares drop to **31%**, **19%**, and **25%**, while in **711,** they are **24%**, **15%**, and **23%**. These findings highlight substantial neighborhood-level disparities in thermally safe access to POIs. In future work, we will evaluate shade coverage across different seasons to identify routes that consistently fail to meet the minimum shade threshold.

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