Exposed: Environmental Risks Among Older Adults Experiencing Homelessness in Phoenix, Arizona

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Individuals experiencing homelessness are considered highly vulnerable to heat and air pollution due to a lack of stable housing and limited access to cooled spaces (Sanchez, 2011; Van Tol, 2024). This concern is amplified for older adults and those with preexisting health conditions (Vickery, 2018). People experiencing homelessness accounted for 45% of the Maricopa County's 645 heat-related deaths in 2023 (Maricopa County, 2024), and the record-breaking heat in 2024 (70 days with highs above 110°F) is expected to cause a similar number of deaths. While urban homelessness and environmental hazards are studied independently, limited attention has been given to how older adults experiencing homelessness perceive and cope with these dual threats in the context of an intensifying urban climate crisis. **This study seeks to understand how older adults experiencing homelessness perceive and interact with heat and air pollution**.

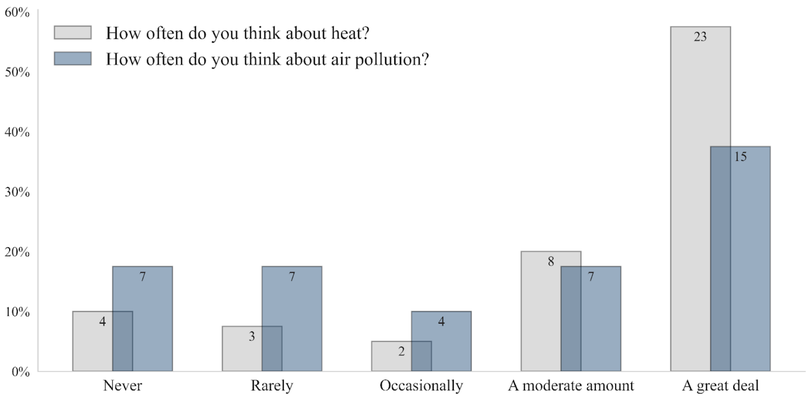
Guiding Questions

1. What are the thermal and air pollution exposures along the routes frequented by older adults experiencing homelessness in Phoenix, Arizona?
2. How do this group's heat and air pollution perceptions align with the measured risks?
3. Do city resources and awareness campaigns about heat and air pollution, aimed at people experiencing homelessness, adequately meet their needs?

Methodology

- Survey assessed heat and air pollution perceptions and resource-availability attitudes among older adults (55+) experiencing homelessness in Phoenix, AZ
- Community 43 co-designed survey (51 questions) in March of 2024
- 40 participants sampled during 2 days in June 2024
- Complementary meteorological data collected using MaRTy (Middel & Krayenhoff, 2019), a mobile cart measuring thermal comfort (i.e., mean radiant temperature, air temperature, relative humidity, wind speed, and wind direction at pedestrian height at 2-second intervals) and remotely sensed particulate matter ($PM_{2.5}$)

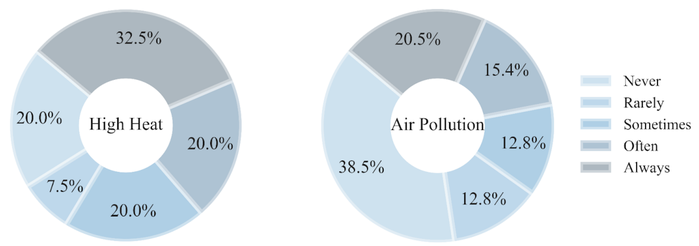
Environmental Risk Perceptions



- 78% (55%) of respondents indicated that they think about heat (air pollution) more than occasionally
- Respondents who selected that they think about both heat and air pollution "a great deal" indicated that they spend an average of 9.4 hours outdoors per day
- Those who claimed that they "never" think about heat or air pollution indicated that they spend an average of 7 hours outdoors per day

- Over half (one-third) of respondents said heat (air pollution) "always" or "often" makes them feel sick
- Just over a quarter of respondents believe high heat exposure rarely or never makes them feel sick, compared to 50% for air pollution
- Only 10 respondents said they can always avoid heat when they want, while 7 said they can always avoid air pollution when they want

Has exposure to _____ ever caused you to feel sick?*



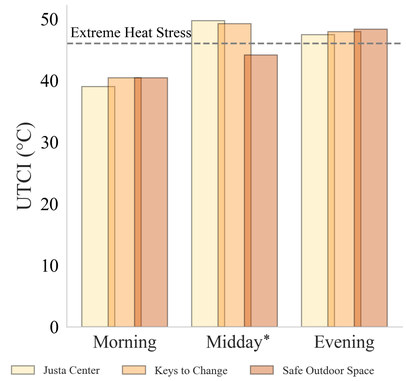
*39 of 40 survey participants responded to these research questions.

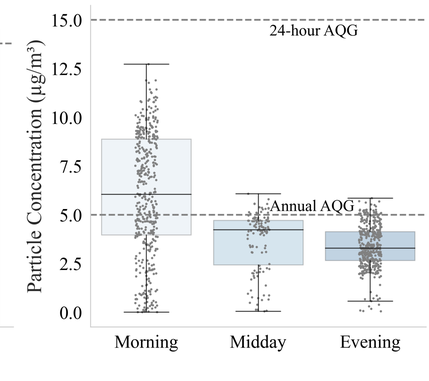
Key Points

1. Heat and air pollution significantly impact travel and health for older adults experiencing homelessness in Phoenix, Arizona
2. Measured thermal exposures exceeded safe thresholds, while particulate matter could pose long-term risks, especially for those with health conditions
3. Expanded transit, health care, and provider operating hours were identified as potential ways to reduce environmental health risks

Environmental Exposures

- Universal Thermal Climate Index (UTCI) was used to quantify human thermal stress by incorporating air temperature, wind speed, mean radiant temperature, and relative humidity into a heat exchange model (Błażejczyk et al., 2013)
- Meteorological data from MaRTy was used, collected at three locations on a typical summer day (August 20, 2024)
- Results show dangerously high UTCI values at midday (1 PM) and evening (5 PM) hours in downtown Phoenix, exceeding the extreme heat risk threshold (46°C, 114.8°F) for several hours and peaking at 49.7°C (121.5°F) at midday





*The lower values at the SOS during the midday transect result from slight cloud cover UTCI is on solar radiation.

- $PM_{2.5}$ levels were estimated for 15-min walking distances around each study location using remotely sensed data
- None of the investigated times exceeded the 24-hour Air Quality Guidance (AQG, see World Health Organization, 2021, pp. 75-88) of 15 µg/m³, but some estimated concentrations surpassed the annual AQG (5 µg/m³)
- Findings suggest that the area may pose risks for individuals highly exposed year-round, given typical Phoenix summer weather
- Negative health outcomes are of particular concern for individuals with pre-existing circulatory and respiratory conditions (Manisalidis et al., 2020), which were prevalent in the surveyed population

References

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All procedures, including informed consent, were approved by the Institutional Review Board of Arizona State University (IRB approval number: STUDY00018399).

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