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Assessing the impact of mobility on heat exposure

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Higher temperatures are linked to elevated mortality risk and reduced economic productivity. In urban centers, human mobility and the urban heat island effect generally result in higher population density and increased temperatures. Yet, existing studies on urban heat exposure rely on static residential population data, thus neglecting population dynamics and their covariation with the spatial distribution of urban temperatures. Here, we evaluate how seasonal and daily mobility modify heat exposure and risk across 80 European cities by combining monthly daytime and nighttime population estimates with high-resolution urban climate simulations. Our findings reveal that, on a daily scale, mobility increases population and summer heat exposure in most cities due to daily commuting behavior. Conversely, commuting to warmer city centers (from colder rural areas) may be advantageous in winter. On seasonal timescales, summer populations decrease in most cities as urban residents travel outward for holidays but heat exposure increases significantly in touristic destinations where population peaks during the June-August period. These results emphasize the significant impact of mobility on the space-time distribution of heat exposure in cities and offer valuable insights for mitigating temperature-related risks in diverse climatic and urban contexts.