Abstract

Characterizing personal exposure to air temperature is critical to understanding exposure measurement error in epidemiologic studies using fixed-site exposure data and to identify strategies to protect public health. To date, no study evaluating personal air temperature in the general population has been conducted in a low-and-middle income country.

We used data from the CHAI study consisting of 50 adults monitored in up to six non-consecutive 24 h sessions in peri-urban south India. We quantified the agreement and association between fixed-site ambient and personal air temperature, and identified predictors of personal air temperature based on housing assessment, self-reported, GPS, remote sensing, and wearable camera data.

Mean (SD) daytime (6 am–10 pm) average personal air temperature was 31.2 (2.6) °C and mean nighttime (10 pm–6 am) average temperature was 28.8 (2.8) °C. Agreement between average personal air and fixed-site ambient temperatures was limited, especially at night when personal air temperatures were underestimated by fixed-site temperatures (MBE = −5.6 °C). The proportion of average personal nighttime temperature variability explained by ambient fixed-site temperatures was moderate ($R^2_{mar} = 0.39$); daytime associations were stronger for women ($R^2_{mar} = 0.51$) than for men ($R^2_{mar} = 0.3$). Other predictors of average nighttime personal air temperature included residential altitude, ceiling height, and household income. Predictors of average daytime personal air temperature included roof materials, GPS-tracked altitude, time working in agriculture (for women), and time travelling (for men). No biomass cooking, urban heat island, or greenspace effects were identified.
R^2_{mar} between ambient fixed-site and personal air temperature indicate that ambient fixed-site temperature is only a moderately useful proxy of personal air temperature in the context of peri-urban India. Our findings suggest that people living in houses at lower altitude, with lower ceiling height and asbestos roofing sheets might be more vulnerable to heat. We also identified households with higher income, women working in agriculture and men with long commutes as disproportionately exposed to high temperatures.

Keywords

Heat, GPS, Remote sensing, Wearable camera, Greenspace, Urban heat island