24. Statistical Containers and the Spatiality of Heat: How Spatial Aggregation Changes Who Counts as Heat-Exposed in Bologna

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Heat exposure maps combine thermal and demographic information to describe a population and to target interventions. When population is available only for aggregated units, the choice of geography can change the exposure assigned to individual residents. We quantify this effect, distinguishing the aggregate estimate of exposure from the identification of exposed residents. For Bologna, we link register data for 390,337 residents to the building where they live and use a Landsat 9 scene acquired during a heat wave in August 2025. Exposure is computed at building scale and recomputed after aggregating population into grids from 30 to 1,000 m, each in 16 configurations, census tracts and statistical areas. Mean population-weighted exposure is stable: the bias does not exceed 0.13 °C in any of the 98 partitions. The temperature assigned to an individual departs from the building-scale reference by 0.37 °C on average at the census tract and by 0.81 °C at the statistical area. Identification is affected most: at the census tract, where the city mean is off by only 0.007 °C, 25.8 % of the residents classified as exposed at building scale are no longer identified; at the statistical area, 69.8 %. At constant resolution, the configuration of units alone moves the number classified as exposed across a range of 20 % of its mean at 250 m. The stability of an aggregate exposure estimate does not imply stability in the identification of exposed individuals. The spatial unit should therefore be chosen for the scale of the phenomenon and the use of the map.