

## Assessing the NYC's Single-Family Housing Typology for Urban Heat Vulnerability and Occupants' Health Risk under the Climate Change Emergency

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**Abstract :** Recurring heat waves due to the global climate change emergency pose continuous risks to human health and urban resources. Local and state decision-makers incorporate Heat Vulnerability Indices (HVIs) to quantify and map the relative impact on human health in emergencies. These maps enable government officials to identify the highest-risk districts and to concentrate emergency planning efforts and available resources accordingly (e.g., to reevaluate the location and the number of heat-relief centers). Even though the framework of conducting an HVI is unique per municipality, its accuracy in assessing the heat risk is limited. To resolve this issue, varied housing-related metrics should be included. This paper quantifies and classifies NYC's single detached housing typology within high-vulnerable NYC districts using detailed energy simulations and post-processing calculations. The results show that the variation in indoor heat risk depends significantly on the dwelling's design/operation characteristics, concluding that low-ventilated dwellings are the most vulnerable ones. Also, it confirmed that when building-level determinants of exposure are excluded from the assessment, HVI fails to capture important components of heat vulnerability. Lastly, the overall vulnerability ratio of the housing units was calculated between 0.11 to 1.6 indoor heat degrees in terms of ventilation and shading capacity, insulation degree, and other building attributes.

**Keywords :** heat vulnerability index, energy efficiency, urban heat, resiliency to heat, climate adaptation, climate mitigation, building energy

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