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The Intersection of Energy and Justice: Modeling the Spatial, Racial/Ethnic and Socioeconomic Patterns of Urban Residential Heating Consumption and Efficiency in Detroit, Michigan

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Highlights

- Identifies spatial patterns of heating energy consumption and efficiency.
- Develops models to predict heating consumption and energy use intensity (EUI).
- Bivariate analyses identify racial and socioeconomic relationships with heating EUI.
- Low socioeconomic and racial/ethnic minority households had higher heating EUI.
- Mapping heating consumption & EUI could facilitate efficient policy interventions.

Abstract

Residential energy conservation and efficiency programs are strategic interventions to reduce consumption and increase affordability. However, the inability to identify and distinguish between high energy consumers and highly energy inefficient households has led to ineffective program targeting. Additionally, little is known about the spatial, racial and socioeconomic patterns of urban residential energy consumption and efficiency. Publicly available data from the U.S. Energy Information Administration and the U.S. Census Bureau are used with bottom-up modeling and small-area estimation techniques to predict mean annual heating consumption and energy use intensity (EUI), an energy efficiency proxy, at the census block group level in Detroit (Wayne County), Michigan. Using geographic information systems, results illustrate spatial disparities in energy consumption and EUI. Bivariate analysis show no statistical relationship between race/ethnicity and energy consumption; however, EUI is correlated with racial/ethnic makeup; percent White (-0.28), African American (0.24) and Hispanic (0.16). Income and housing tenure reveal inverse relationships with consumption and efficiency. Though areas with higher median incomes and homeownership exhibited higher consumption (0.28 and 0.56, respectively), they had lower EUIs (-0.48 and -0.38, respectively). This study provides evidence supporting approaches for conservation and energy efficiency program targeting that recognizes the significance of race, ethnicity, place and class.

Key Words:

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