Drug overdoses, geographic trajectories, and the influence of built environment and neighborhood characteristics

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Key Takeaways

- Group-based trajectory analysis classified block groups in Passaic County, New Jersey according to drug overdose trends from 2015 through 2019
- A mixed-effects panel negative binomial regression model examined environmental and neighborhood characteristics associated with annual overdose counts
- Block groups were classified across 3 groups: low and stable, low with moderate increase, and elevated and increasing
- All but 1 of the elevated and increasing block groups were spatially contiguous within a single city
- Concentrated disadvantage exhibited the largest effect size in the regression models
- Most variables positively associated with overdose levels were built environment measures

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Research Summary:

Drug overdose has emerged as a national public health emergency in the United States over the previous decade. Prior spatial analyses have generated important insights into the problem of drug overdoses. However, spatial analyses of drug overdoses typically incorporate cross-sectional designs that are unable to measure the developmental trends of high overdose areas. Cross-sectional designs are further unable to account for within unit differences over time, which can bias estimates of independent variable effect.

The current study sought to address gaps in the literature through a spatial analysis of drug overdoses in Passaic County, New Jersey from 2015 through 2019. This study is an outgrowth of an action research partnership between a multi-university research team and the Paterson, NJ Coalition for Opioid Response and Assessment (COAR). The mission of COAR is to develop data-driven, multi-agency responses to the overdose crisis in City of Paterson, NJ. COAR stakeholders anticipated county-wide resources would need to be mobilized to successfully address the opioid crisis in the Paterson. As such, COAR's analysis efforts began with an assessment of overdoses throughout the entirety of Passaic County.

We first conducted a group-based trajectory analysis to classify block groups according to their overdose trends. To our knowledge, this is the first application of group-based trajectory analysis in the drug overdose literature. A mixed-effects panel regression model then identifies the built environment and neighborhood characteristics associated with overall overdose levels. Overdose data were provided by the New Jersey State Police (NJSP), which tracks state-wide drug overdoses as part of the national Overdose Detection Mapping Application Program (ODMAP).

The group-based trajectory analysis identified three groups with distinct drug overdose trends: low and stable (72% of block groups), low with moderate increase (24% of block groups), and elevated and increasing (4% of block groups). Areas in the elevated and increasing group accounted for the majority of overdoses with an average of 76.2 incidents over the five-year period. The year-to-year average in overdose events increased dramatically among this small number of block groups, from an average of 1.75 in 2015 to an average of 26.5 in 2019. The block groups in this trajectory grouping were highly clustered, with all but one spatially contiguous within the City of Paterson. This indicated overdose prevention resources could be highly focused within the geographies suffering from the most disproportionate levels of drug overdose.

In the regression analysis, concentrated disadvantage exhibited the strongest effect. This suggests that recent policy proposals to substantially increase investment in community institutions and general community wellbeing as a public safety strategy may also support overdose prevention efforts. Nonetheless, most statistically significant variables positively associated with overdose counts were built environment measures (liquor stores, health care facilities, vacant parcels, and public land parcels). These findings suggest certain types of land usage may provide targets for proactive social outreach efforts or may benefit from place-based policy solutions such as vacant lot greening.