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Spatial and neighborhood-level correlates of lay naloxone reversal events and service availability

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Abstract

Background: The opioid epidemic in the United States continues to surge, reaching record deaths from opioid and fentanyl overdoses in 2020. This study analyzes spatial and neighborhood correlates of free naloxone distribution sites as well as overdose and naloxone reversal events in Baltimore, Maryland, which has one of the highest overdose rates in the country.

Methods: Using data from a randomized clinical trial on HIV prevention among people using substances in Baltimore, Maryland, as well as demographic data from the US Census Bureau, we conducted: (1) exploratory spatial visualizations of census tracts' minimum distance to naloxone distribution sites, (2) univariable Wilcoxon rank-sum tests to compare census tracts on demographic metrics, and (3) bivariable and multivariable negative binomial regression models to assess associations between census tract characteristics and naloxone reversal events.

Results: Valid geographic data were provided for 518 overdose events involving either fentanyl or heroin in this study. Of these, 190 (37%) attempted naloxone reversal events were reported. Exploratory spatial visualization techniques suggest that most distribution sites are appropriately located near populations at high risk of overdose, but study findings also identify areas where drug use and overdoses occur that are located farther from distribution sites. In multivariable analyses, naloxone administration was significantly and inversely associated with distance to the nearest distribution site (incidence rate ratio (IRR)=0.72 per 1000m increase, 95% CI 0.59-0.89, p=0.002).

Conclusion: Study findings emphasize the correlation between proximity to naloxone sites and utilization of resources, highlighting that physical proximity to harm reduction resources may contribute to uptake. Results further underscore that research on service accessibility and utilization must consider the spatial distribution of health services.

Keywords: Naloxone; Opioids; Overdose; Spatial visualization.

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