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Neighborhood-Level and Spatial Characteristics Associated with Lay Naloxone Reversal Events and Opioid Overdose Deaths

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Abstract

There were over 23,000 opioid overdose deaths in the USA in 2013, and opioid-related mortality is increasing. Increased access to naloxone, particularly through community-based lay naloxone distribution, is a widely supported strategy to reduce opioid overdose mortality; however, little is known about the ecological and spatial patterns of the distribution and utilization of lay naloxone. This study aims to investigate the neighborhood-level correlates and spatial relationships of lay naloxone distribution and utilization and opioid overdose deaths. We determined the locations of lay naloxone distribution sites and the number of unintentional opioid overdose deaths and reported reversal events in San Francisco census tracts (n = 195) from 2010 to 2012. We used Wilcoxon rank-sum tests to compare census tract characteristics across tracts adjacent and not adjacent to distribution sites and multivariable negative binomial regression models to assess the association between census tract characteristics, including distance to the nearest site, and counts of opioid overdose deaths and naloxone reversal events. Three hundred forty-two opioid overdose deaths and 316 overdose reversals with valid location data were included in our analysis. Census tracts including or adjacent to a distribution site had higher income inequality, lower percentage black or African American residents, more drug arrests, higher population density, more overdose deaths, and more reversal events (all $p < 0.05$). In multivariable analysis, greater distance to the nearest distribution site (up to a distance of 4000 m) was associated with a lower count of Naloxone reversals [incidence rate ratio (IRR) = 0.51 per 500 m increase, 95% CI 0.39-0.67, $p < 0.001$] but was not significantly associated with opioid overdose deaths. These findings affirm that locating lay naloxone distribution sites in areas with high levels of substance use and overdose risk facilitates reversals of opioid overdoses in those immediate areas but suggests that alternative delivery methods may be necessary to reach individuals in other areas with less concentrated risk.

Keywords: Naloxone; Opioids; Overdose; Spatial analysis.

Figures

FIG. 1 a Overdose deaths in San…

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