Abstract

Opioid use disorder and overdose deaths is a public health crisis in the United States, and there is increasing recognition that its etiology is rooted in part by social determinants such as poverty, isolation and social upheaval. Limiting research and policy interventions is the low temporal and spatial resolution of publicly available administrative data such as census data. We explore the use of municipal service requests (also known as "311" requests) as high resolution spatiotemporal indicators of neighborhood social distress and opioid misuse. We analyze the spatial associations between georeferenced opioid overdose events (OOE) from emergency medical service responders and 311 service request data from the City of Columbus, OH, USA for the period 2008-2017. We find 30 out of 21 types of 311 requests spatially associate with OOE and also characterize neighborhoods with lower socio-economic status in the city, both consistently over time. We also demonstrate that the 311 indicators are capable of predicting OOE hotspots at the neighborhood-level: our results show code violation, public health, and street lighting were the top three accurate predictors with predictive accuracy of 0.92, 0.89 and 0.83, respectively. Since 311 requests are publicly available with high spatial and temporal resolution, they can be effective as opioid overdose surveillance indicators for public research and policy

Workflow

We examine the use of 311 service requests as indicators of neighborhood distress and opioid overdose incidents. We identify 311 request types that can serve as robust surveillance indicators for opioid use disorder based on three criteria: (1) spatial association with individual-level opioid overdose events (OOEs); (2) characterize neighborhoods with apparent conditions of socioeconomic distress, and; (3) stability of these relationships with respect to time. We also demonstrate their use in predicting OOE hotspots at the neighborhood level.

Results

Figure 2. Characterizing crosspoint pattern between OOE and animal complaints related 311 calls, 2013. (a) Graph view with 5000m maximum distance; (b) Graph view with 500m maximum distance.

Table 1. Temporal trend of pairwise spatial dependences between OOE and 311 categories, annually, 2008-2017. *p=point; T=census tract; BG=census block group; A=Annually; Q=Quarterly

Figure 3. Spatial distribution and the socioeconomic profiles of the 311 clusters, Columbus, OH. (a) 2010; (b) 2015.

The neighborhoods comprising cluster 1 are most likely to be associated with socioeconomic distress, we define robust 311 indicators as those with high relative frequency in distressed neighborhoods and spatially associate with OOE consistently over time (both conditions met in 2010 and 2015). Based on these criteria, we identify abandoned vehicles, animal complaints, code violation, law enforcement, public health, refuse trash litter, street lighting, street maintenance, traffic signs, and water sewers drains as robust indicators.

Implications

The results from this study support the view that opioid crisis is rooted in social and neighborhood distress. We show such spatial characteristics can be used along with 311 data itself to predict the trends of opioid overdose hotspots when OOE data is not available. Since 311 requests are publicly available and with high spatial and temporal resolution, they can be effective as opioid overdose surveillance indicators for public research and policy. It is worth mentioning that our research is not a predictive policing tool. An appropriate use is to help think strategically about where to allocate outreach programs and resources to at-risk individuals and how to alleviate the underlying social and environmental stressors in our city.

Acknowledgement and Contact

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