Title: Drug Overdose Anomaly Detection and Response in Michigan Using Biospatial and Emergency Medical Services (EMS) Data

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Introduction: In response to increases in opioid overdoses and changes in the drug landscape, Michigan Department of Health and Human Services (MDHHS) developed and put into action the Drug Anomaly Response Protocol (DARP) to detect and respond to spikes, clusters, and novel threats in drug overdoses. Biospatial alerts inform spike detection and the investigative process.

Objective: The purpose of this poster is to explain how MDHHS uses Biospatial alerts to detect spikes, clusters, and novel threats in drug overdoses and discuss case studies and findings. Attendees will be able to apply Michigan's methods to work done in their own state.

Methods: The Opioid and Emerging Drugs (OED) Unit investigates moderate to high Biospatial alerts for all Michigan counties, concentrating on the Michigan syndrome for probable opioid overdose EMS responses.

OED focuses on detecting spikes, defined as an abnormally high number of overdoses involving a given drug, within a specific time frame and geography, that falls outside the range of normal, as defined by retrospective data; clusters, defined as a group of related overdoses where there was potential drug procurement from a common source; and novel drug threats, defined as a unique substance or mixture that, without action, will result in a spike or cluster.

When an alert is received, OED evaluates why the alert was generated (assessing data quality, abnormalities, and "false alarms"); clustering of person, place, and time in drug overdose events; other comparable data sources; and scope of event. After evaluation and coordination with MDHHS Division of EMS and Trauma, OED assigns a response level to the event: green (within expected range, no response needed); yellow (informative email sent to partners and affected counties); orange (targeted investigation); red (Health Alert Network message sent); or purple (multi-state outbreak). OED uses Biospatial to examine maps, historical counts, and narrative details, as well as raw record downloads for exploratory analyses using R version 3.6.2.

Results: OED will present three types of case studies based on recent events to show the range of alerts and responses since beginning to use Biospatial in the DARP in Summer 2021.

- Clear cut: Spikes—highest 24-hour count of probable opioid overdose EMS responses in two Michigan counties—which resulted in yellow responses.
- Advanced: Clusters and a novel threat—increase in multiple opioid overdose EMS responses (i.e., double and triple overdoses) across several counties in Michigan, including triple overdoses where cocaine laced with opiate was implicated—which resulted in a yellow response, continued monitoring, and clinical implications for EMS agencies within affected counties.
- Complex: Sub-spike counts across several counties over several weeks, in which monitoring continued, but no action was taken.

OED and MDHHS Division of EMS and Trauma work closely in investigation and response to drug overdose anomalies, with EMS providing crucial context, clinical implications, and emergency response communication strategies.

Conclusion: EMS data is timely, allowing near real-time detection of drug overdose anomalies; geographically specific, allowing incidents close in proximity to be identified; and rich in narrative detail, facilitating discovery of novel drug threats and clusters. There are limitations in using EMS data for drug anomaly detection: (1) narratives vary in the level of detail provided, making it difficult to track drug-specific trends; (2) not all EMS responses include point location information, which helps in identifying clusters; (3) records must be deduplicated by person rather than event (i.e., multiple agencies responding to one overdose); and (3) EMS agencies differ in their timeliness of data submission. Despite these limitations, Biospatial alerts are an important tool in identifying and investigating drug overdose anomalies, and the partnership between MDHHS Division of EMS and Trauma and OED continues to evolve in response.