**Supplementary Material for the Article:**

**This material supplements, but does not replace, the peer-reviewed paper in**

***Drug and Alcohol Dependence*.**

Non-fatal opioid-related overdoses among adolescents in Massachusetts 2012-2014

Avik Chatterjee1,2, Marc R. Larochelle3,4, Ziming Xuan5 , Na Wang6 , Dana Bernson7, Michael Silverstein8, Scott E. Hadland4,8 , Thomas Land7 , Jeffrey H. Samet3,4,5, Alexander Y. Walley3,4,7, Sarah M. Bagley 3,4,8

1 Boston Health Care for the Homeless Program, Boston, MA

2 Division of Global Health Equity, Department of Internal Medicine, Brigham and Women’s Hospital, Boston, MA

3 Clinical Addiction Research and Education Unit, Section of General Internal Medicine, Department of Medicine, Boston University School of Medicine and Boston Medical Center, Boston, MA

4 Grayken Center for Addiction, Boston Medical Center, Boston, MA

5 Department of Community Health Sciences, Boston University School of Public Health, Boston, MA

6 Biostatistics and Epidemiology Data Analytics Center, Boston University School of Public Health, Boston, MA

7 University of Massachusetts School of Medicine, Worcester, MA

8 Division of General Pediatrics, Department of Pediatrics, Boston University School of Medicine and Boston Medical Center, Boston, MA

**Correspondence**

Avik Chatterjee, MD, MPH

Instructor, Harvard Medical School

Physician, Boston Health Care for the Homeless Program

780 Albany St

Boston, MA 02118

Phone (617) 256-0286; Fax 857-654-1100

avc031@mail.harvard.edu

**MATRIS Opioid Overdose Algorithm**

Suspected drug overdose EMS incidents were identified through a three stage process.

*Stage 1: Limit to emergency responses*

* In order to include only emergency responses and exclude incidents between health facilities, only EMS incidents involving 911 calls were included in the analysis.

*Stage 2: Identify EMS incidents that are not suspected drug overdose visits*

In order to reduce false positives, an EMS incident was not classified a drug overdose visit if it met any of the following criteria:

* Do not classify as a drug overdose when the EMS transport is not related to an emergency, but involves transporting a patient or a Section 12. (Note: These transports are listed incorrectly as 911 responses)
  + “section 12” or “sec 12” (narrative, chief complaint, secondary complaint)
  + “transport only” (chief complaint, secondary complaint)
* Do not classify as a drug overdose when EMS incident is primarily related to a traffic issue/crash
  + “traffic” (chief complaint, secondary complaint)
* Do not classify as a drug overdose when EMS incident is primarily needed to address withdrawal symptoms or help a person detox
  + “withdraw” (chief complaint, secondary complaint)
  + “detox” (chief complaint, secondary complaint)
* Do not classify as a drug overdose when the EMS incident is responding to a suspected alcohol poisonings
  + The words “poison” occurs AND either of the following two words are present “Alcohol” and “etoh” (chief complaint)
* Do not classify as a drug overdose if the only reason the incident was selected was the narrative and the patient denied using illegal drugs.
  + “denies illegal drug” (Narrative)
  + “denied illegal drug” (Narrative)

*Stage 3: Prioritizing criteria*

* Each potential case is checked against 18 possible opioid overdose case definitions as specified in Appendix Table 1.

Appendix Table 1.Overdose Case Definition for Massachusetts EMS analysis. Cases are considered opioid overdose if they meet any of the following definitions assessed sequentially in order of priority designation.

|  |  |
| --- | --- |
| **EMS Variable** | **Criteria for Suspected Opioid Overdose** |
| Chief Complaint (CC) | **Priority 1:** Heroin, Herion, Opio, Opiat, Narcan, Nalox, Methadone or Opoid |
| Secondary Complaint (SC) | **Priority 2:** Heroin, Herion, Opio, Opiat, Narcan, Nalox, Methadone or Opoid |
| Narrative Report (NR) | **Priority 3:** Must find one word from **both** lists below.   * **List1:** Heroin, Herion * **List2:** Overdo, OD, O.D, O/D, Drug intox   **Priority 9:** Must find one word from List1 **and** List2 and **no** words from List 3   * **List1:** Heroin, Herion * **List2:** inject, snort, sniff, ingest, took, consum, shot, shoot, smok, swallow, intranasal, done, doing, abusing, using, used * **List3**: deny, denies, denied   **Priority 10:** Must find one word from **both** lists below.   * **List1:** Heroin, Herion * **List2:** needle, syringe, hypodermic, paraphernalia   **Priority 11:** Must find one word from List1 **and** List2 and **no** words from List 3   * **List1:** Heroin, Herion * **List2:** today, recent * **List3:** deny, denies, denied   **Priority 14:** Must find one word from **both** lists below.   * **List1:** Heroin, Herion * **List2:** admit, admission   **Priority 15:** Must find one word from **both** lists below.   * **List1:** known ivda, known ivdu * **List2:** needle, syringe, hypodermic, paraphernalia   **Priority 16:** Must find one word from **both** lists below.   * **List 1:** rigor, lividity, pulseless, nonviable * **List2:** needle, syringe, hypodermic, paraphernalia |
| Administered Naloxone + NR | **Priority 4:** Two conditions must be met:   * Naloxone administered **and** * NR contains: heroin, herion, Overdo, OD, O.D, O/D, Over do, Drug Intox,   **Priority 12:** Two conditions must be met:   * Naloxone administered **and** * NR contains: methadone, methodone, opio, opiate, subox, sabox, fentanyl, phentanyl, vicod, oxycod, oxycont, oxys, ms04, Percocet, percoset, hydromorph, pain meds, tramadol, codeine, dialuaudid, dilaudid, morphine |
| NR + CC | **Priority 5:**  Two conditions must be met:   * NR contains: Heroin or Herion, **and** * CC contains one of the following: alter, ams, overdose, over dose, drug abuse, drug use, drug ingestion, od, o.d, substance use, substance abuse, sick person, unresponsive, unconscious, man down, ingestion/poisoning, breathing problem, confusion, respiratory distress, respiratory arrest, iv drug, needle   **Priority 8:** Two conditions must be met:   * NR contains: methadone, methodone, opio, opiate, subox, sabox, fentanyl, phentanyl, vicod, oxycod, oxycont, oxys, ms04, Percocet, percoset, hydromorph, pain meds, tramadol, codeine, dialuaudid, dilaudid, morphine * CC or NR contains: Overdo, OD, O.D, O/D, Over do   **Priority 17:** Two conditions must be met:   * NR contains: needle, syringe, hypodermic, paraphernalia * CC contains: Overdo, OD, O.D, O/D, Over do |
| Response to Naloxone + CC | **Priority 6** Two conditions must be met:   * Positive response to Naloxone was indicated **and** * CC contains one of the following: alter, ams, overdose, over dose, od, o/d, o.d, aloc, change in mental, unresponsive, unconscious, change in responsiveness |
| NR+ PI | **Priority 13** Two conditions must be met:   * NR contains: methadone, methodone, opio, opiate, subox, sabox, fentanyl, phentanyl, vicod, oxycod, oxycont, oxys, ms04, Percocet, percoset, hydromorph, pain meds, tramadol, codeine, dialuaudid, dilaudid, morphine **and** * PI = “poisoning/drug ingestion” |
| NR + PI + CC | **Priority 7** Two conditions must be met:   * NR contains Narcan, Nalox **and** * CC contains: Overdo, OD, O.D, O/D, Over do **or** * PI = poisoning/drug ingestion, obvious signs of death, or substance/drug abuse   **Priority 18** Two conditions must be met:   * NR or CC or PI contains: cardiac, respiratory, cardioresp, arrest **and** * NR contains: needle, syringe, hypodermic, paraphernalia |

**APCD Anxiety/Depression Diagnosis Codes**

Subjects were categorized as having anxiety or depression in each month in the APCD if they had one or more claims with one of the following ICD-9 or ICD-10 diagnosis codes:

* Anxiety
  + ICD-9 Codes: 300.X
  + ICD-10 Codes: F41.X
* Depression
  + ICD-9 Codes: 296.2X, 206.3X, 296.99, 300.4, 311, 625.4
  + ICD-10 Codes: F32.X, F33.X, F34.1, F34.8X

**SAS PROCedures**

* Proc FREQ used for descriptive statistics
* Proc MEANS used to identify median and interquartile range for receipt of MOU