PRECOG: Predictive Risk Model to Combat Overdose Grant

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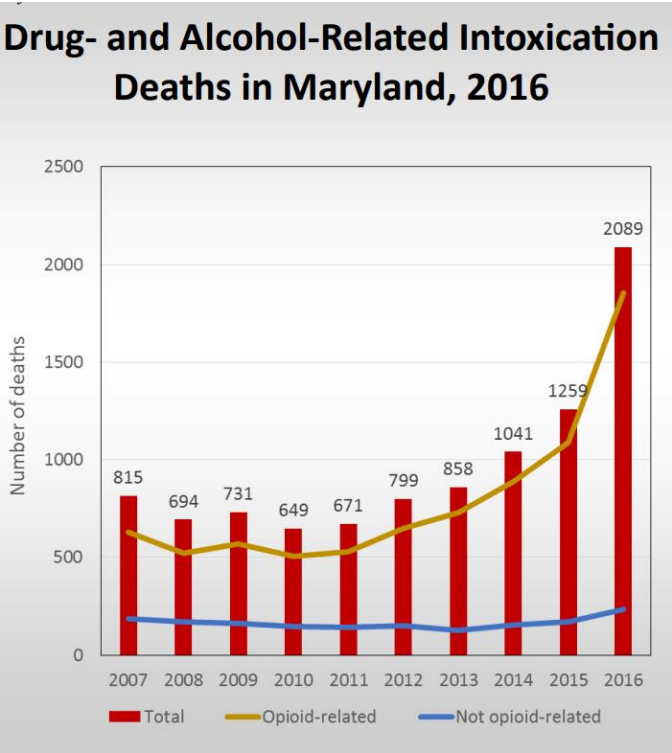
Maryland Overdose Deaths



Source: Maryland Vital Statistics Administration 2016 Annual Drug Intoxication Death Report, June 2017

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Maryland Context

Maryland PDMP established in 2013, captures controlled dangerous substance (CDS) prescriptions dispensed in the state of Maryland

- All providers should have registered by July 1, 2017
- Use mandate effective July 1, 2018

Partnership with Chesapeake Regional Information System for our Patients (CRISP): statewide health information exchange, also serves as PDMP IT vendor for displaying data to clinical users

State of Emergency declared in January 2017 put additional emphasis on collating and utilizing opioid-related data across state agencies

PRECOG

Goal: develop predictive risk model (PRM) to identify Maryland-specific risk factors for overdose, potential points of intervention

Method: create linked, de-identified database of multiple state agency datasets as basis of PRM; undergo iterative development for

Project partners:

- Chesapeake Regional Information System for our Patients (CRISP)
- Johns Hopkins Bloomberg School of Public Health, Center for Population Health Information Technology (CPHIT)

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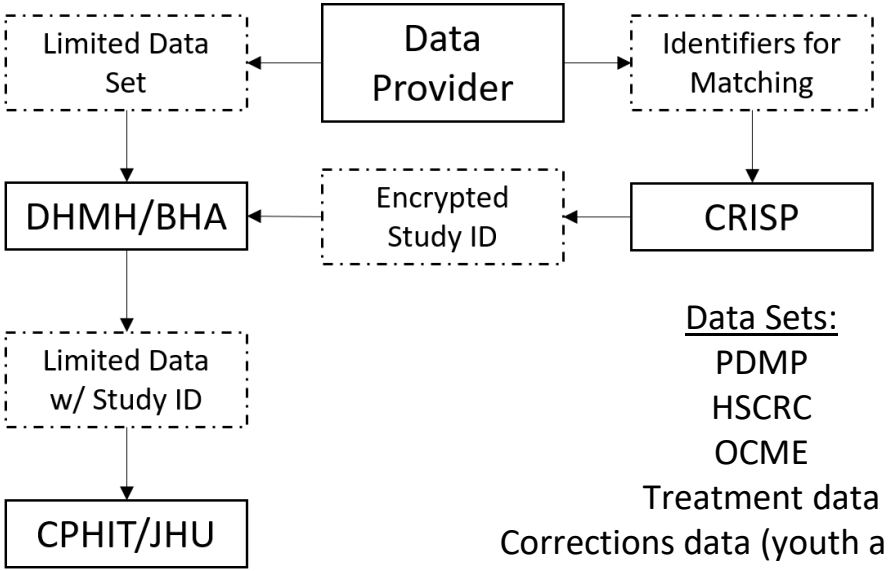
Data Linkage Process



Data Sets:

PDMP

HSCRC

OCME

Treatment data

Corrections data (youth and adult)

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Data Sets

Maryland Prescription Drug Monitoring Program

- Includes dispense data for all controlled dangerous substances (CDS) dispensed in Maryland
- Information on prescription as well as recipient, dispenser and prescriber utilized

Deaths from the Office of the Chief Medical Examiner

- OCME investigates all deaths in the state of Maryland that occur outside of hospitals: includes homicides, suicides, unintentional and undetermined deaths
- Includes information on decedent, location of death, and cause and manner of death
- For unintentional and undetermined overdose deaths, added validated county of residence and coded toxicology information from our Vital Statistics Administration

Data Sets

Hospitalizations and Emergency Department Visits

- Discharge file including ICD-9/10-CM codes
- Interested in the hospitalization histories of those identified as having fatal overdoses, both for non-fatal overdoses and for other conditions

Substance Use Disorder Treatment Claims and Admissions

- Includes information about service dates as well as survey information regarding substances used
- Sourced from both Medicaid claims and state-funded treatment centers

Corrections

- Data from both adult and youth correctional services
- Includes information on offense or complaint, maximum term, finding and parole/probation conditions

Timeline for Model Development

Phase I: Project Development

- Identify data sets of interest
- Initial conversations with other agencies about project and data usage
- Legal frameworks to exchange data (MOUs/DUAs)

Phase II: Data Linkage and Transfer

- Coordinated between CRISP, data provider, and BHA
- CPHIT compiles linked, de-identified data set

Phase III: Predictive Risk Model Development

Developing a Predictive Risk Model

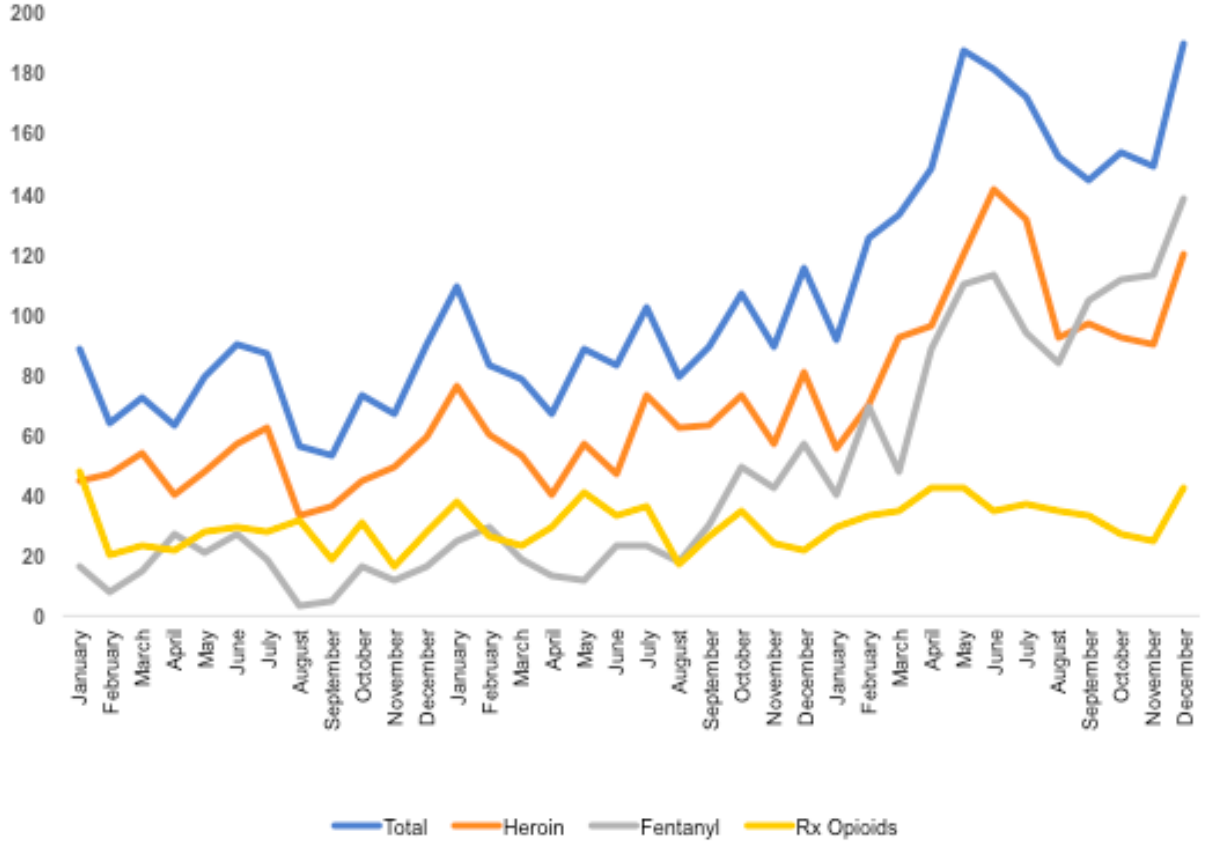
Main goal is case detection: finding individuals at elevated risk for the adverse outcome

- Model performance based on ability to correctly classify "true" cases (i.e., sensitivity and specificity)
- How much better is your diagnostic tool than a random guess?

Model can be developed and validated using regression models

- Outcome is an adverse event (e.g., fatal overdose) and predictors are markers of risk identifiable in each dataset
- We can test how much prediction improves by adding new domains

Changing Opioid Crisis: Fatalities



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Maryland PDMP Data from 2016

Total Prescriptions (N)	7,298,913
Total Individuals with a Prescription (N)	1,625,705
Sex, %	
Male	41.42
Female	58.58
Age, % (N)	
<40	34.62
≥40	65.38
Type of prescriptions, %	
Opioids	53.1
Benzodiazepines	22.73
Days' supply, Mean	
Opioids	58.52
Benzodiazepines	101.23
Number of prescribers among opioid users, %	
1	69.54
2 to 4	27.49
≥5	2.97
Number of pharmacies among opioid users, %	
1	81.5
2 or 3	16.52
≥4	1.98

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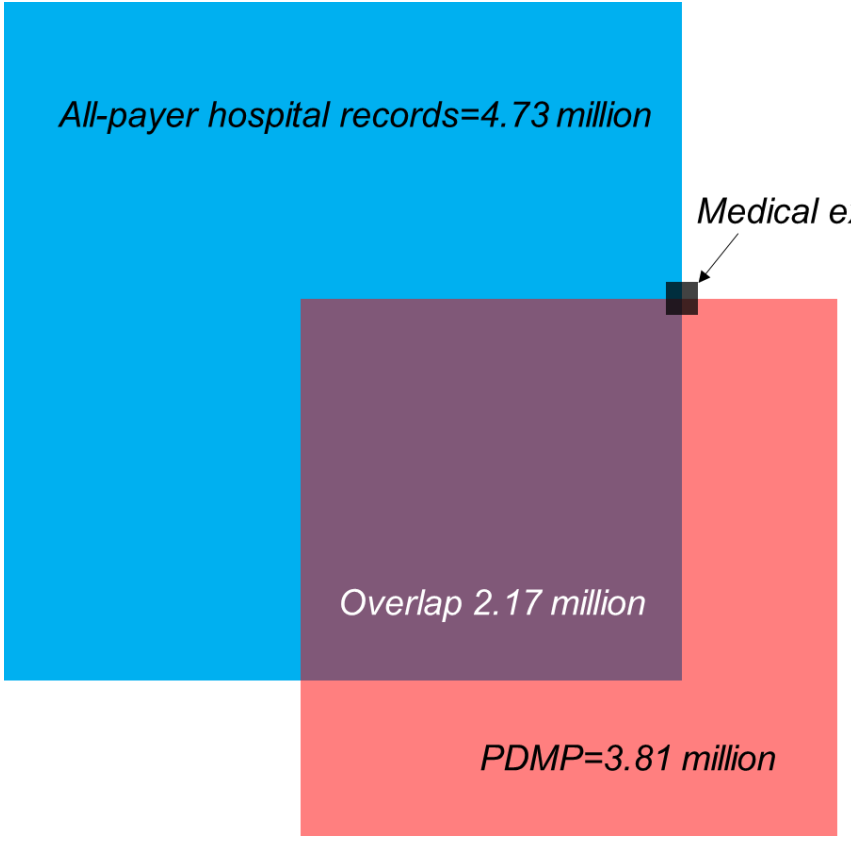
Overlap Between Three Key Study Datasets



*Drawn 10x actual size

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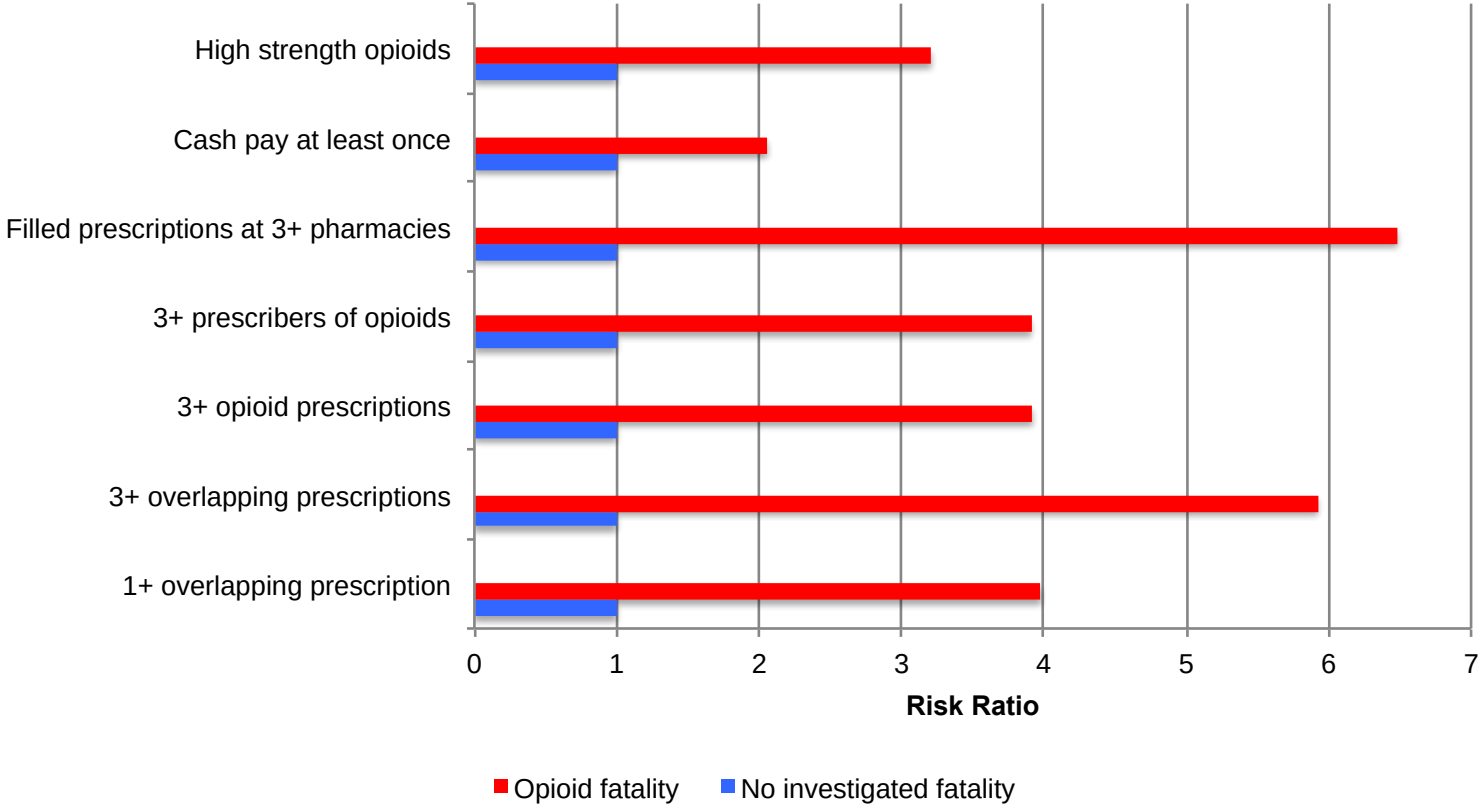
Linked Analysis PDMP and Fatalities



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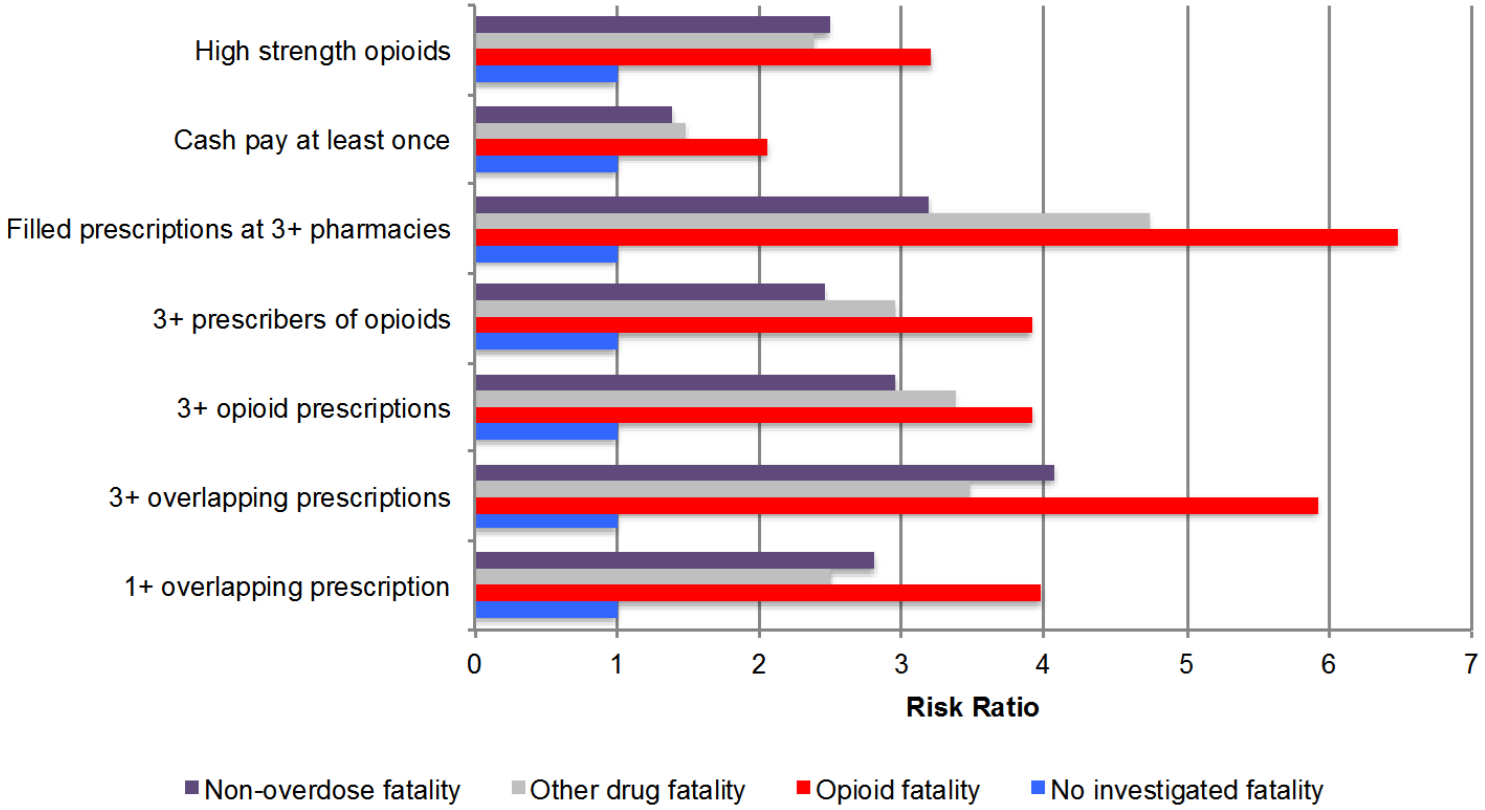
Linked Analysis PDMP and Fatalities



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Summary

- A miniscule proportion of people prescribed opioids fatally overdose, but the fatal overdose population bears a number of prescription-related risk factors

- These risk factors are also predictive of deaths from other overdose drugs and other fatalities (e.g., homicides, suicides, and injuries)

- Hospital records may be another key source of risk factors, as people who fatally overdose are much more likely to be in contact with hospitals

Next Steps

Building on our early work with PDMP, we are about to begin testing regression models to develop our first prediction statistics

- In late 2017, we will continue this process with hospital records looking at non-fatal overdose admissions and other opioid associated events
- In the near future we will also work with criminal justice and addiction treatment data

In addition to exploring risk factors, we will also begin to discuss use cases with clinicians and public health community

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