



## Mosaic Research: Principles and Strategies

# Today's Goals

- Understand principles and strategies of mosaic research
- RADARS System data sources in the United States as a case study in mosaic research
- Overview of current United States trends

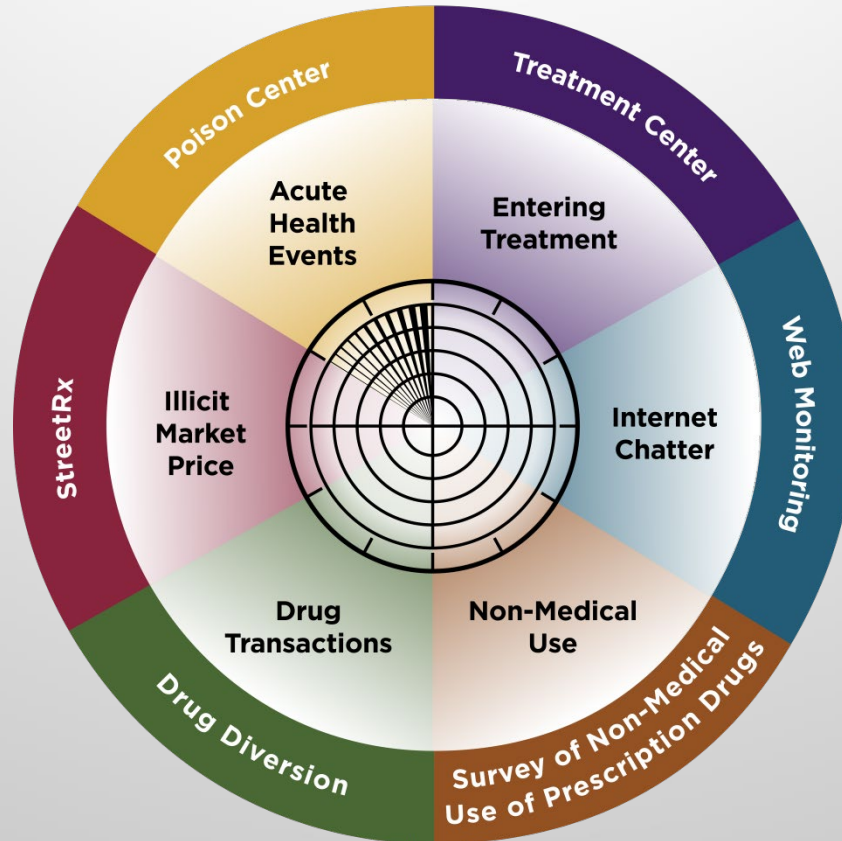
# What is the RADARS<sup>®</sup> System?



- Supported by subscriptions from pharmaceutical manufacturers, government, and non-government agencies for surveillance, research and reporting services
- Property of Denver Health and Hospital Authority, a political subdivision of the State of Colorado
- Denver Health retains exclusive ownership of all data, databases and systems. Subscribers do not participate in data collection nor do they have access to the raw data.



# RADARS<sup>®</sup> System Mosaic Surveillance



# RADARS® System Mosaic Surveillance

RADARS System Program	Abuse	Misuse	Diversion	Other
Poison Center	X	X		X
Treatment Center (Opioid Treatment and Survey of Key Informants' Patients)	X			
Web Monitoring	X	X		X
Survey of Non-Medical Use of Prescription Drugs	X	X	X	X
Drug Diversion			X	
StreetRx			X	X

# Survey of Non-Medical Use of Prescription Drugs

- Population
  - General population of adults via online survey panel
- Type of Cases
  - Non-medical use of prescription drugs
    - Opioids, stimulants, sedatives, benzodiazepines, ketamine, and synthetic cannabinoids

**Non-medical use:** *without a doctor's prescription or for any reason other than what was recommended by your doctor*



# Survey of Non-Medical Use of Prescription Drugs

- Methodology
  - 30,000 surveys, 2 times a year

## Key Measures



Gender, age, income, geographic location, veteran and student status



Use and non-medical use of prescription drugs (product-specific)



Co-ingestants and use of illicit drugs and alcohol



Reason for non-medical use (e.g. treat pain, to get high, curiosity)



Routes of non-medical use



Source of drug acquisition and price paid if purchased through illegitimate channels



History of chronic/acute pain and prescription drug therapy

# Survey of Non-Medical Use of Prescription Drugs

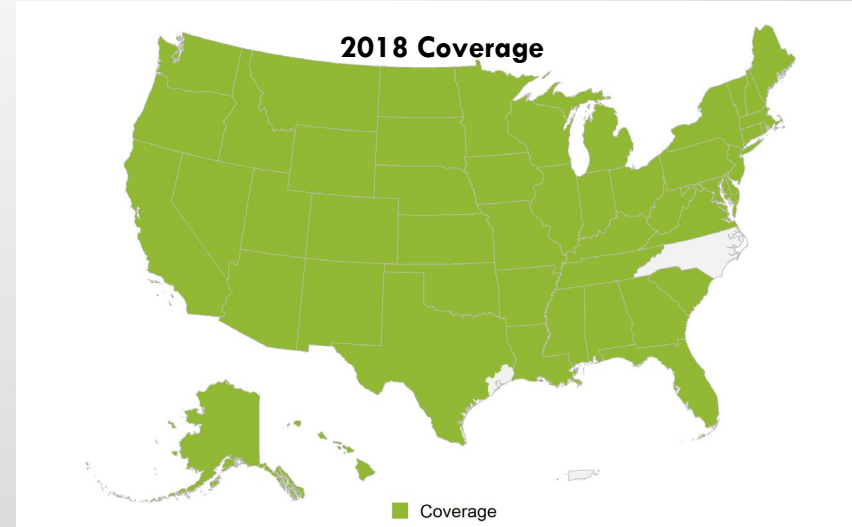
- NMURx Express
  - Ability to follow-up with specific populations for more detailed assessments of motivations/behaviors
  - Identify target population from NMURx, anonymously re-contact for additional survey
  - Gather more info from hard-to-find groups
  - Mixed methods with qualitative and quantitative components





# Poison Center

- Population
  - Young children, adolescents, young adults, adults, elderly
- Type of Cases
  - Spontaneous reports to poison centers
  - Intentional and unintentional exposures
  - Acute medical events associated with one or more prescription drug of interest



# Poison Center

- Methodology

- Data collected by poison centers by normal case documentation
- Data queried for cases involving drugs of interest

## Key Measures



Date of event



Demographics (gender, age)



Reason for exposure (e.g. intentional abuse, misuse, unintentional, suicide)



Drugs/drug products involved in the exposure (product-specific)



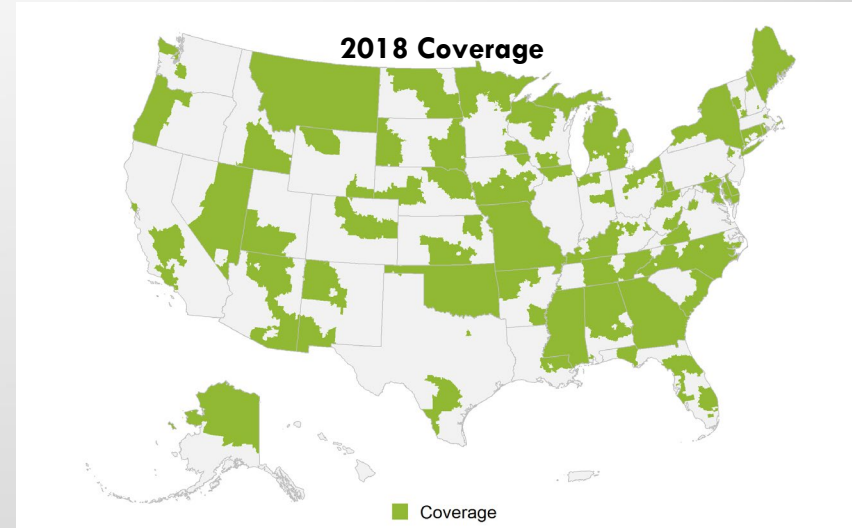
Routes of administration



Outcome (e.g. death)

# Drug Diversion

- Population
  - Law enforcement officials reporting prescription drug diversion
- Type of Cases
  - Surveys of participating agents reporting new cases
  - Specific active ingredients and products



# Drug Diversion

- Methodology

- Law enforcement officials complete standard questionnaire
- Number of new cases opened involving each specific drug or drug product

## Key Measures



#

Number of new cases open (product-specific)

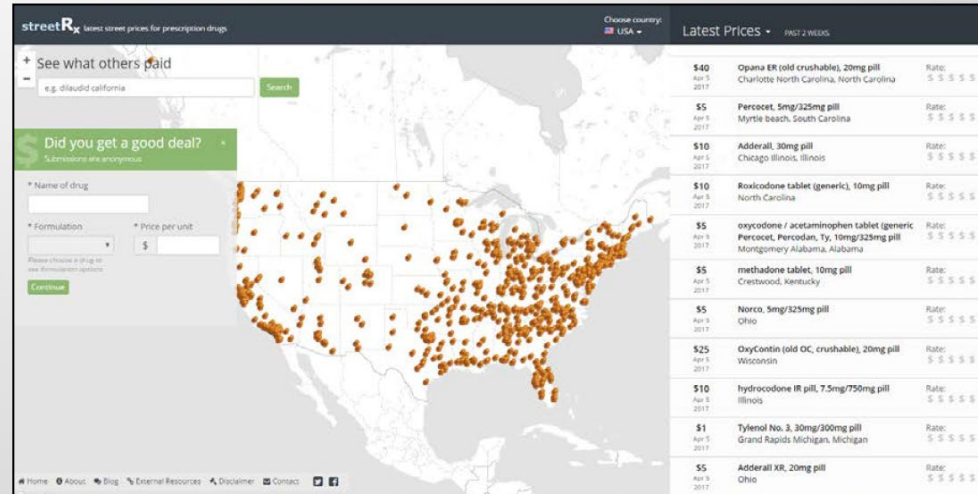


Geographical location of each case

# StreetRx

<http://streetrx.com>

- Population
  - Any person with access to the internet
- Type of Cases
  - Utilize crowdsourcing methodology
  - Report street price paid for specific prescription drug



# StreetRx

- Methodology

- Street price information voluntarily submitted to open access websites

## Key Measures



Date of submission



Geographical locator (country, state/  
province, city)



Drugs/drug products purchased (product,  
formulation, and dosage strength specific)



Amount purchased



Price paid for purchase

# Web Monitoring


- Population
  - Youth and adults posting information on the internet
- Type of Cases
  - Qualitative data
  - Provides context for quantitative measures
  - Monitoring content of blogs, news articles, forums, and public social media accounts

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DOI: 10.1002/pds.4248

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## ORIGINAL REPORT

### Changes in drug use patterns reported on the web after the introduction of ADF OxyContin: findings from the Researched Abuse, Diversion, and Addiction-Related Surveillance (RADARS) System Web Monitoring Program

Suzanne Vosburg  | Colleen Haynes | Andrea Besharat | Jody L. Green

6

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VOSBURG ET AL.

**TABLE 4** Examples of "continue to abuse" posts and specific tamper strategies provided

Examples of posts	Date of post
<ul style="list-style-type: none"><li>Everyone here is a fool. If you cannot figure out how to either inject or snort OxyContin, then just switch to Roxicotin. However, there will always be a way to crush, snort, and inject OxyContin. I have already figured out how to inject these dumb reformulated OxyContin pills. Pharmaceutical companies will never be able to completely make it so a drug cannot be abused and that is all there is to that...</li></ul>	• August 2010
<ul style="list-style-type: none"><li>Yes, you are correct that you cannot snort the reformulated OxyContin pills, with the OP imprint. However, you can find plenty of ways to beat the anti-abuse technology. You should just Google it.</li></ul>	• November 2010
<b>Tampering strategies</b>	
<b>Freezing</b>	
<ul style="list-style-type: none"><li>I put a reformulated 40 mg OxyContin pill in the freezer. After 10 minutes, I crush the pill up using a hose clamp. It then worked the same as the original formulation of OxyContin. I put the dollar bill in my nostril as far as I could and my nostrils were clear. It worked great! I am so happy because I love OxyContin and I did not want to stop snorting it.</li></ul>	• September 2010
<b>Microwaving</b>	
<ul style="list-style-type: none"><li>As others have already stated, either the microwaving or the crisping method work okay...</li></ul>	• September 2010
<ul style="list-style-type: none"><li>You can prepare the reformulated OxyContin pills for snorting. First you should completely scrape the coating off the pill. Then put the pill in the microwave for 30 seconds. You should do this 4 times total. Do not microwave continuously for 2 minutes otherwise you will burn the pill with the oxycodone in it...</li></ul>	• November 2010
<b>Multiple steps/chemistry</b>	
<ul style="list-style-type: none"><li>You can get around the reformulated OxyContin pills. It is a hard process and you should probably know chemistry. You should saturate the pill in 1 molar or hydrochloric acid, and all of the oxycodone will bind to the acid...</li></ul>	• September 2010
<ul style="list-style-type: none"><li>First you should either cut or finely grind the reformulated OxyContin pill and then put it in the oven for 30 minutes at 200 °F. Then disperse in water and you will need to change the oxycodone salt into a free base by changing the pH to 10. Then you can filter using a double coffee filter...</li></ul>	• December 2010

# Web Monitoring



## Key Measures



Number of monthly, weekly, daily mentions (product-specific)



Sentinel events, new trends



Reason for use (e.g. abuse, misuse)



Frequency of pre-identified themes



Routes of administration



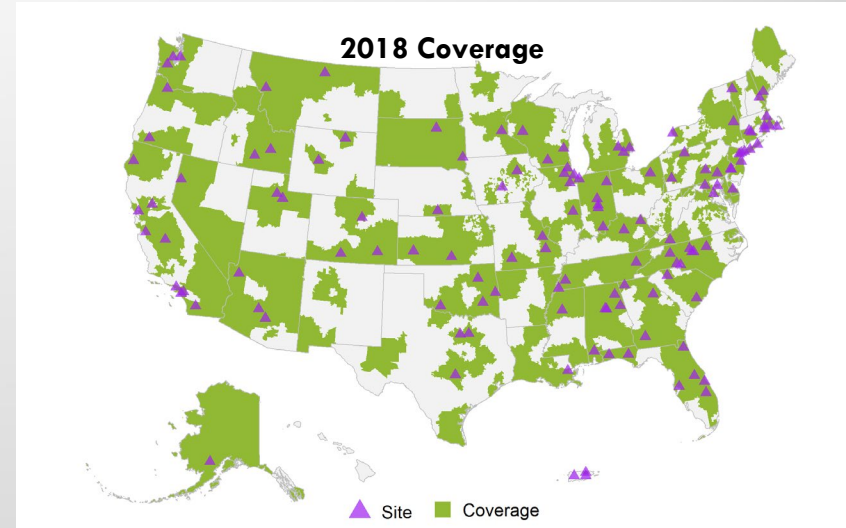
Outcomes (e.g. addiction, overdose, death)

**RADARS**  
SYSTEM



# Treatment Center

- *Opioid Treatment and Survey of Key Informants' Patients Programs*
- Population
  - Opioid dependent persons entering treatment for opioid use disorder
- Type of Cases
  - Self-reported use of prescription or illicit drugs “to get high” in past 30 days



# Treatment Center

- *Opioid Treatment and Survey of Key Informants' Patients Programs*
- Methodology
  - Persons entering treatment complete questionnaire
  - Completed questionnaires sent to central data coordination site for quality review and data entry

## Key Measures



Gender, age, substance abuse treatment history, primary drug used “to get high”, and source of primary drug acquisition



Endorsement of drugs/drug products “to get high” in past 30 days (product-specific)



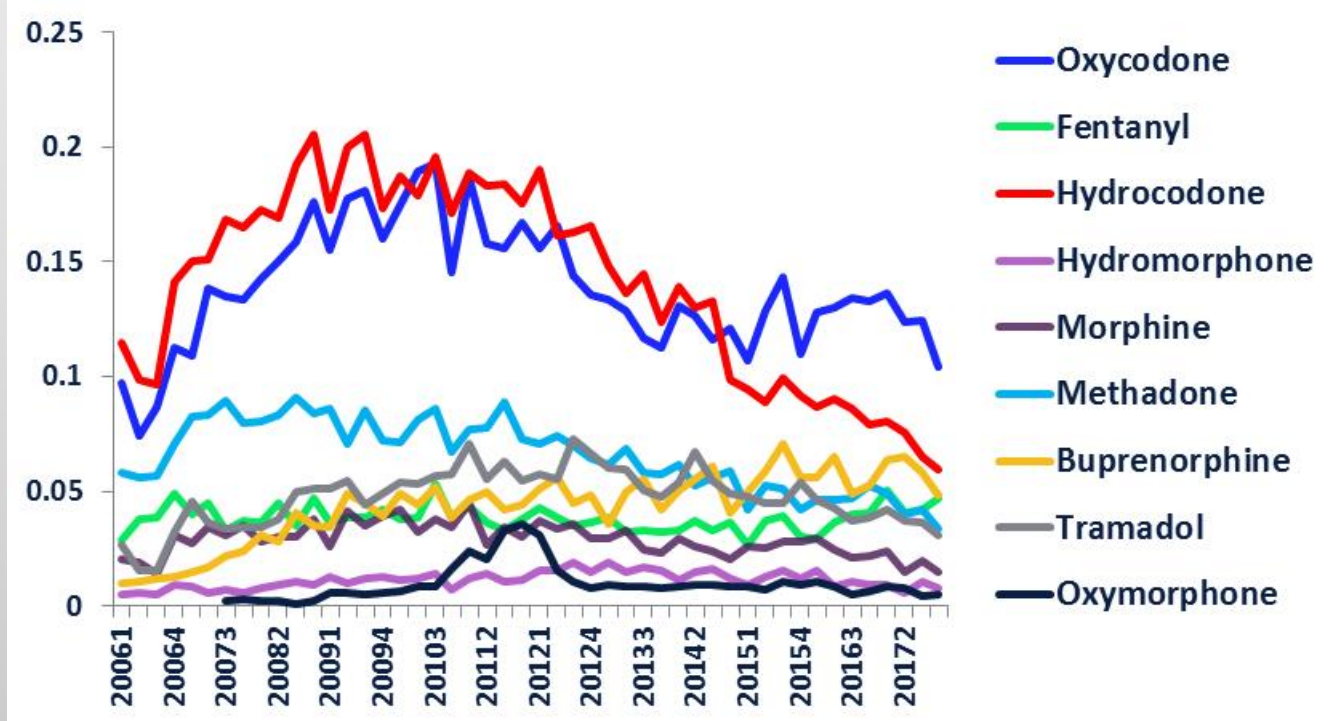
Routes of administration



# **RADARS<sup>®</sup> System Data: Overview**

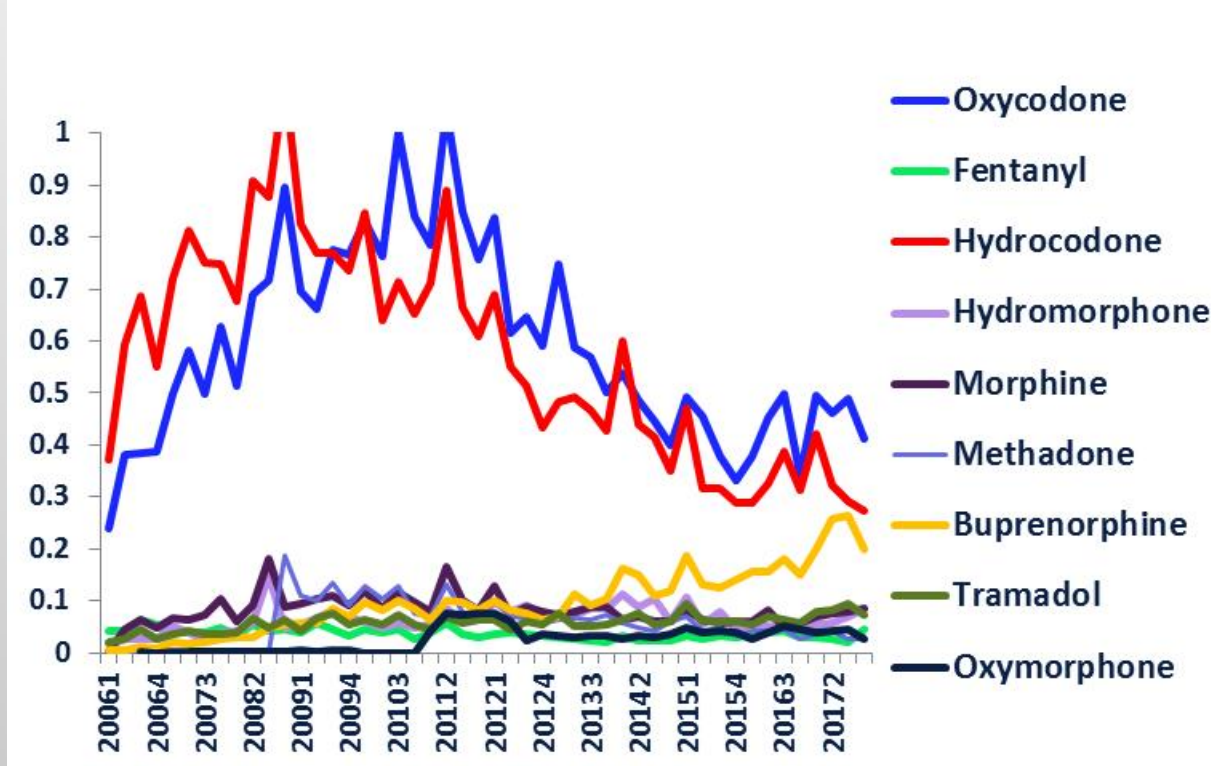
# Poison Center Program

## Intentional Misuse Population Rates, 2006 – 2018

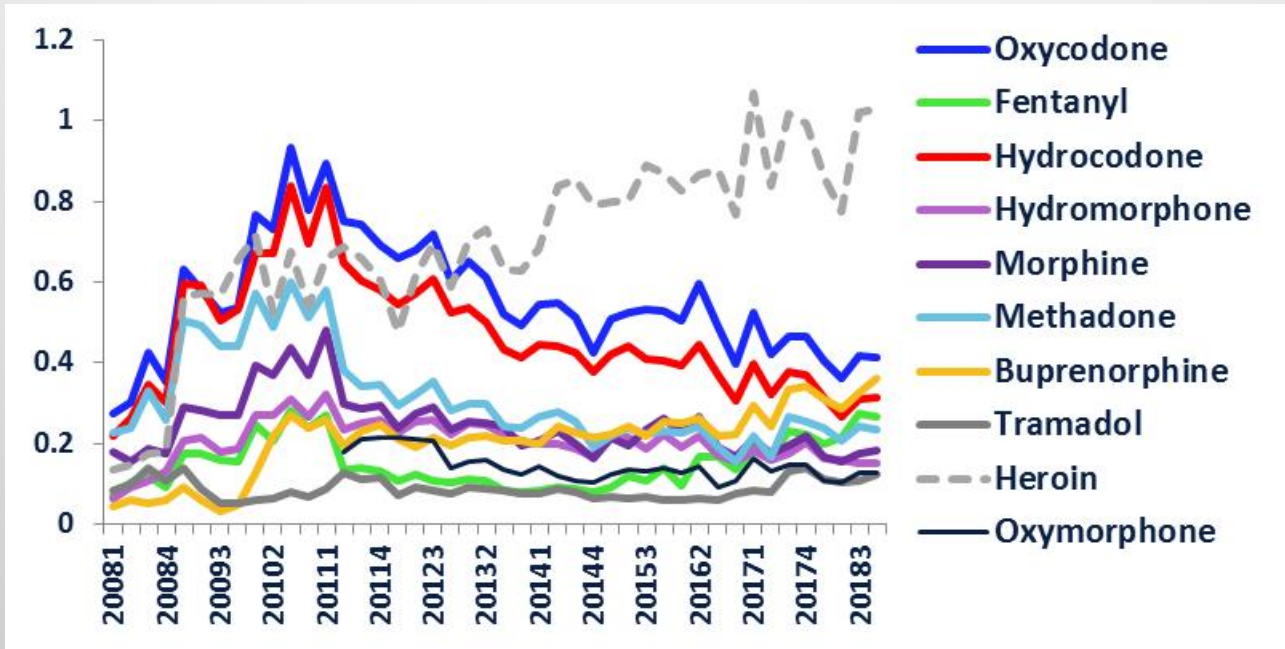


# Drug Diversion Program

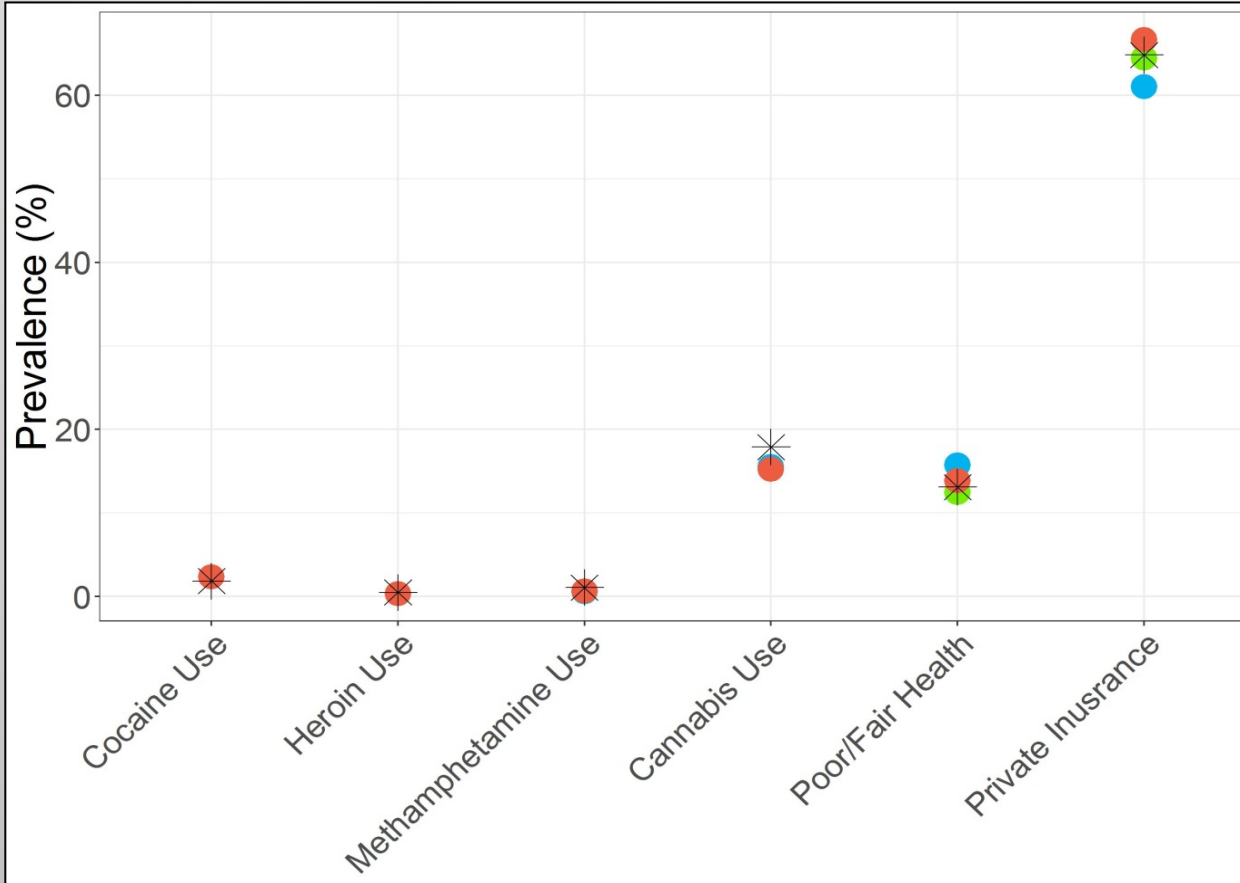
## Diversion Population Rates, 2006 – 2018



# Treatment Center Programs Combined Misuse Population Rates, 2008 – 2018



# NMURx Estimates vs National Probability Surveys



● NHANES  
● NHIS  
● NSDUH  
● Weighted NMURx

**NHIS - National Health Interview Survey**

**NHANES - National Health and Nutrition Examination Survey**

**NSDUH - National Survey of Drug Use and Health**

# Future Considerations

- Mosaic approach with data from multiple sources will be needed for a comprehensive view of misuse, abuse, and diversion
- Cross-country comparisons will allow ability to assess policy impacts across borders
- Focus on medications beyond opioids
  - **ALL** CNS active drugs are misused