

# Researched Abuse, Diversion, and Addiction Related Surveillance (RADARS® System)

## Introduction and Selected Results

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# Outline

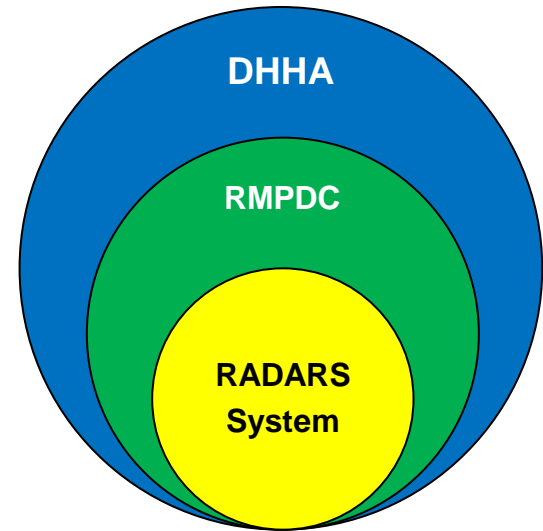
- Background
- Overview of Methods
- Results
  - Trends in opioid misuse, abuse and diversion
  - Role and value of denominators
  - Abuse deterrent formulations
- Outstanding issues and questions

# **RADARS System Background**

# What is the RADARS® System?

## History

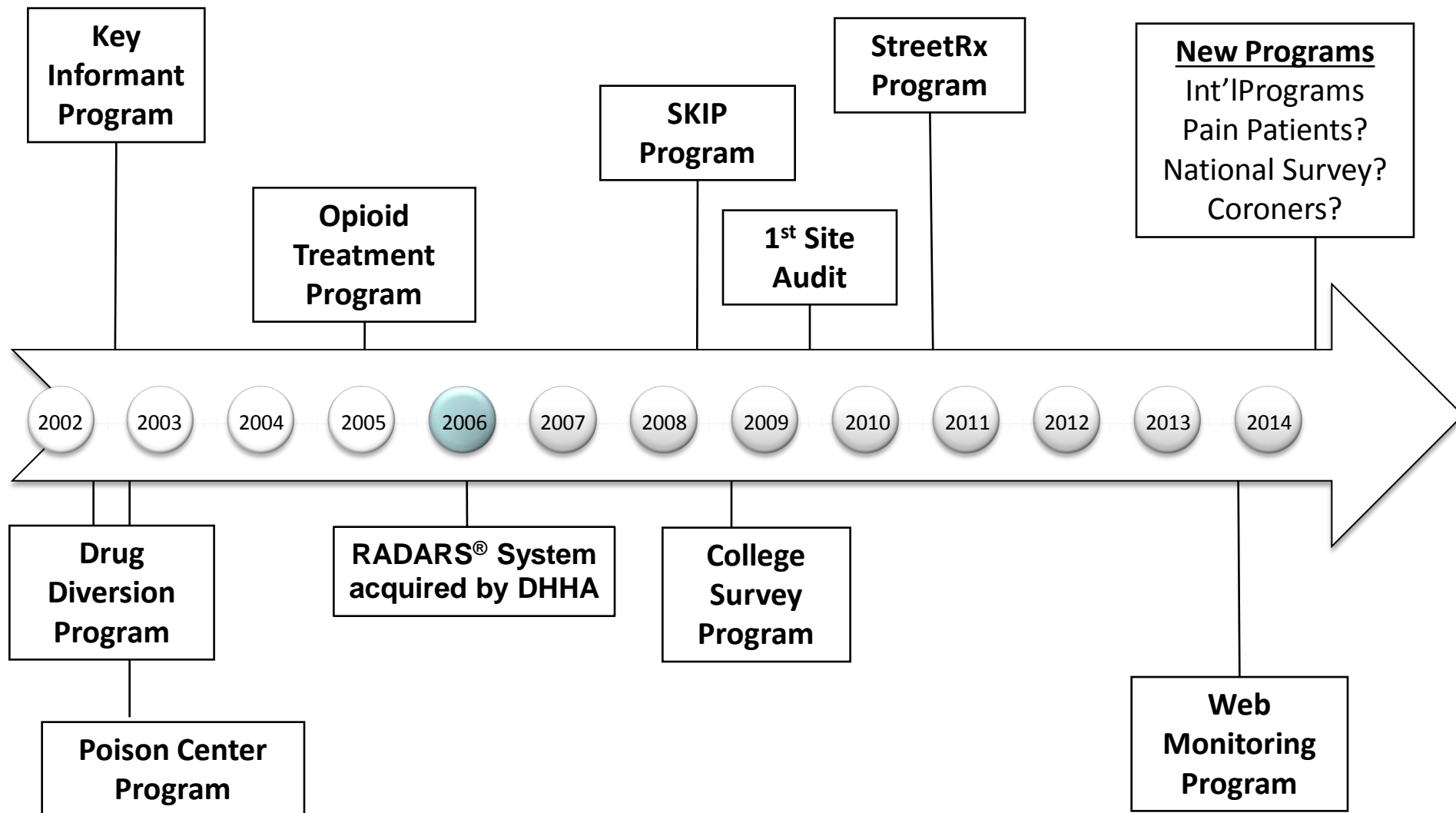
- 2002, Purdue Pharma
- 2006, Denver Health and Hospital Authority
  - Denver Public Hospital for 150 years
  - State sanctioned independent authority
- Most companies with an opioid product on the US market are subscribers.



## Conflict of Interest Statement

- Most manufacturers of prescription opioids or stimulants subscribe to RADARS System.
- RADARS System is the property of Denver Health and Hospital Authority, a political subdivision of the State of Colorado.
- Subscribers receive information, but do not participate in developing the System, data collection, or analysis of the data. They do not have access to the raw data.
- Employees are prohibited from personal financial relationships with any other company.

# RADARS System Timeline



# Mosaic Surveillance of Prescription Drug Abuse

## Acute Health Events

49 Poison centers  
46 states  
456,610 cases  
491,874 opioid mentions

## Drug Transactions

Criminal Justice  
260 agency; 49 states  
145,090 cases with  
146,786 opioid mentions

## Entering Treatment

Opioid Tx Program  
66 programs; 34 states  
41,031 cases with  
183,573 opioid mentions

## Entering Treatment

SKIP  
109 practices, 45 states  
10,214 cases with  
64,678 opioid mentions

## New Initiates

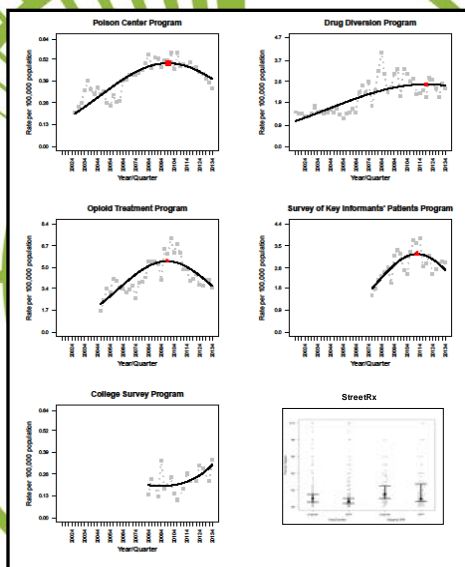
College Survey  
2000 students, 50 state  
3,564 cases with  
11,871 opioid mentions

## Illicit Market Price

StreetRx.com  
Users/Buyers, 50 states  
8,441 price entries for  
an opioid

## Web Monitoring

> 150 million sites  
monitored  
> 35,000 posts  
coded for analysis



# RADARS System Strengths

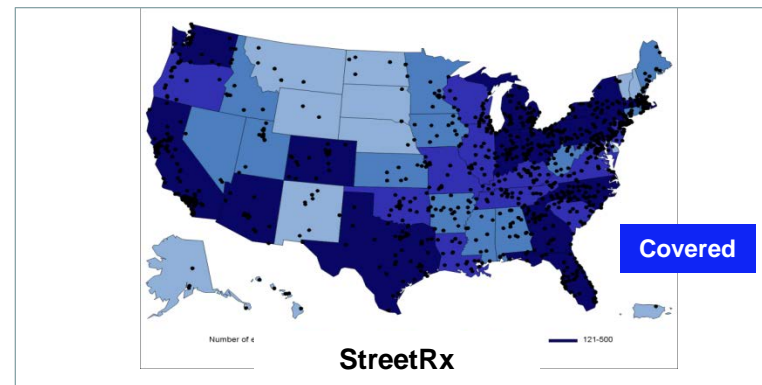
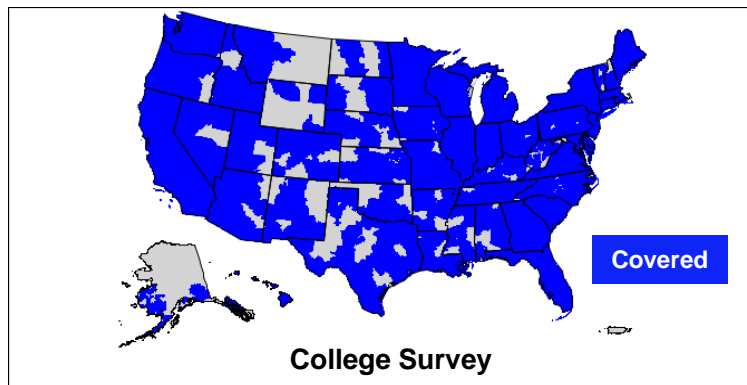
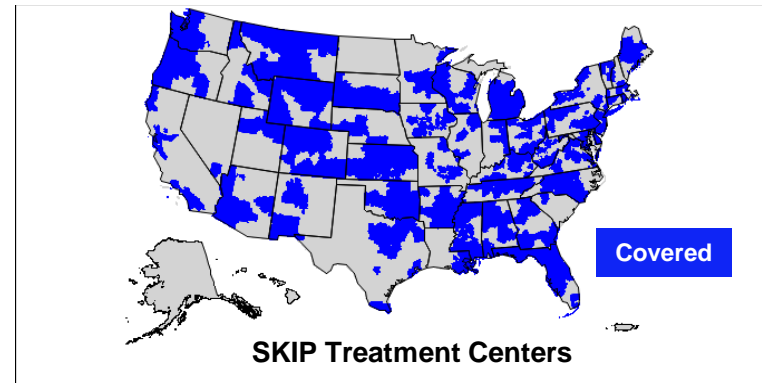
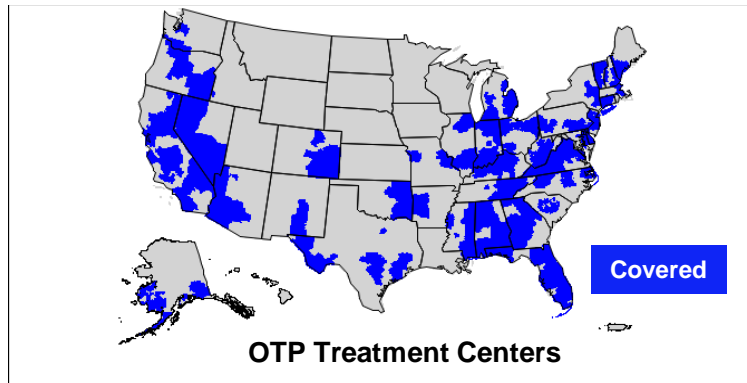
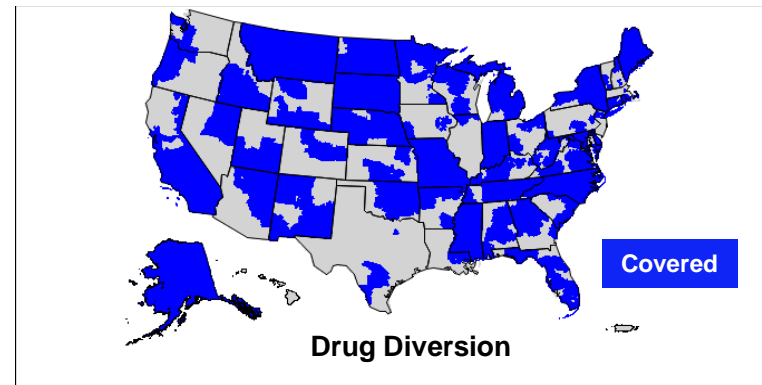
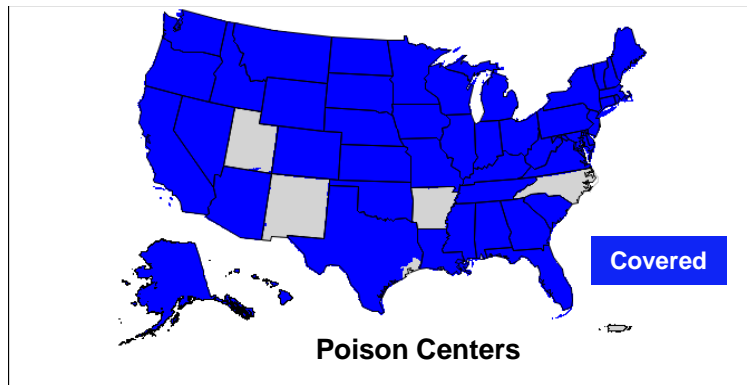
- Product specificity
  - Specific product identity provided
  - Can categorize by common characteristics (ADF, IR, ER, etc.)
  - Dosage strength in some programs
- Geographic specificity
  - Any combination of 3 digit ZIP codes
- Timeliness – current data to 2014 Q1
  - Real time data available in Poison Center, Survey of Key Informant Patients programs
- Unique data sources
  - Difficult to access populations: children, diverters, alternate routes of use, etc.
  - Abuse related risks - Medical outcome including death
- Detailed custom surveys can be performed in Drug Diversion and Survey of Key Informant Patients Programs

# RADARS System Limitations

- De-identified data: source can't be verified, additional information cannot be obtained.
- Self-reporting: PC, OTP, SKIP, CS, StreetRx, Web Monitoring
- Spontaneous reporting: PC, StreetRx, Web Monitoring
- Geographical coverage is not universal, but is widespread



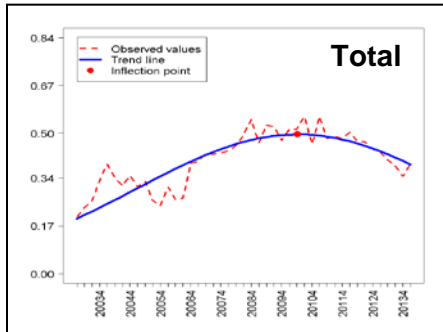
# RADARS System Coverage, 2013



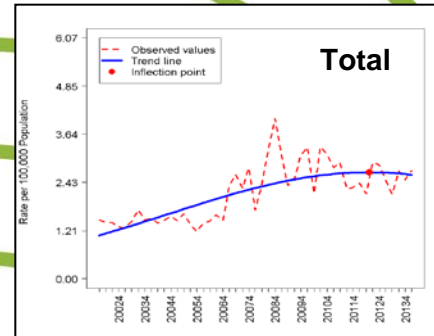
# Bending the Curve

# Opioid Analgesic Trends in the United States, 2014 Q1

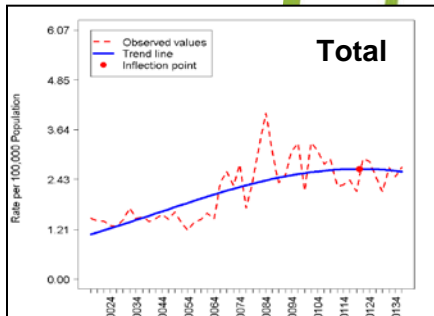
## Poison Center Program



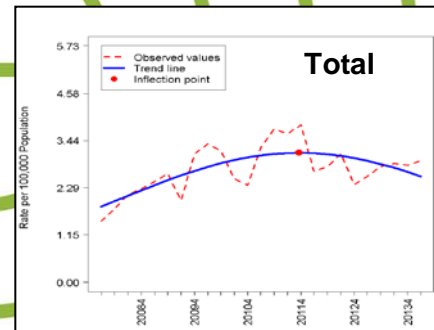
## Drug Diversion Program



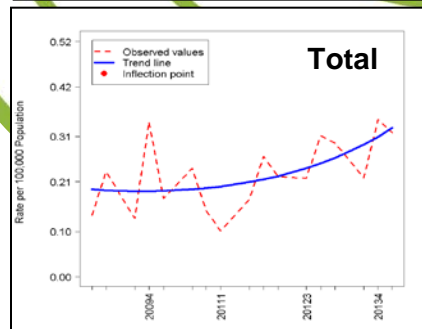
## Opioid Treatment Program



## Survey of Key Informant Patients



## College Survey Program

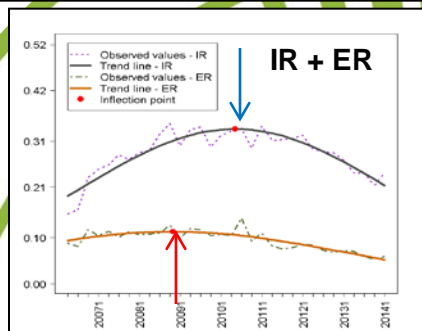
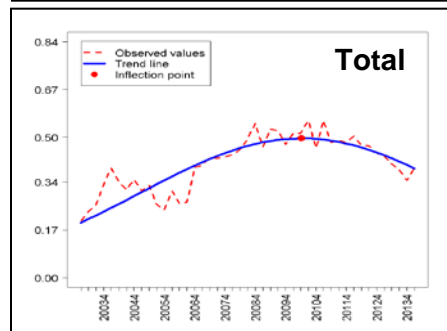


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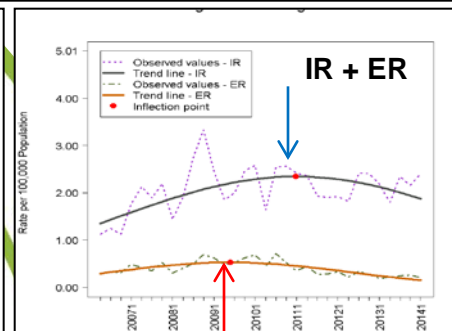
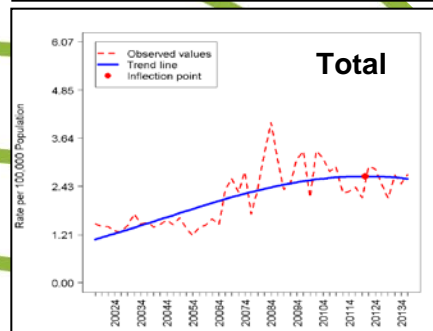
Analgesic group:  
oxycodone, hydrocodone,  
hydromorphone, fentanyl,  
morphine, and tramadol

# Opioid Analgesic Trends in the United States, 2014 Q1

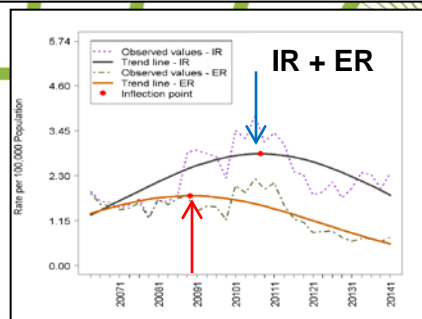
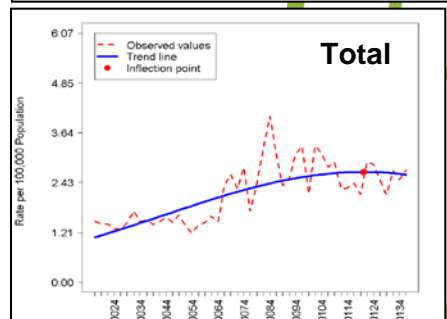
## Poison Center Program



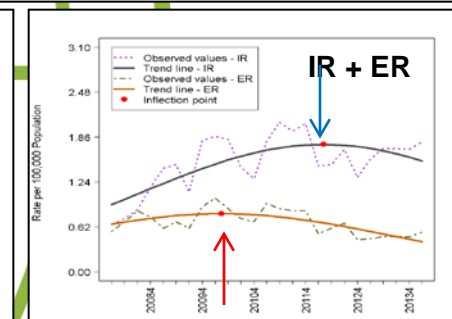
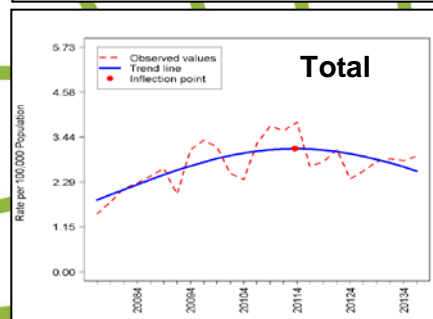
## Drug Diversion Program



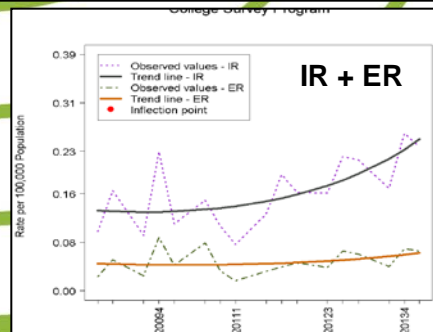
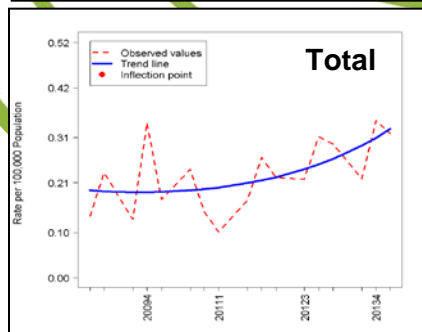
## Opioid Treatment Program



## Survey of Key Informant Patients



## College Survey Program



Analgesic group:  
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# Denominators

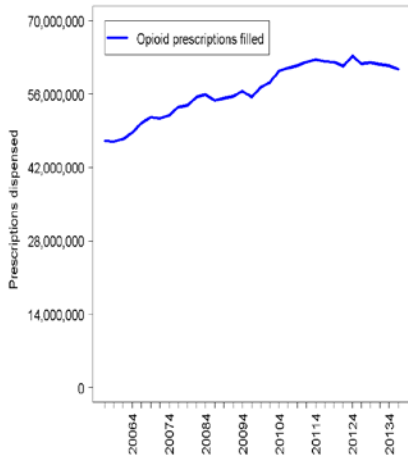
# Denominator Options to Calculate Rates of Abuse, Misuse and Diversion of Prescription Drugs

Denominator	Source	Definition	Can tell us...	Limitations/ Considerations
<b>Population</b>	US Census	Population of the areas covered by program	Overall public health burden	Does not account for drug availability, which vary in the volume of drug produced
<b>Unique Recipients of Dispensed Drug (URDD)</b>	IMS Health	Number of <u>people</u> filling a prescription during specified time	Risk per person who fills a prescription	Measures patient volume, does not measure drug volume
<b>Prescription Counts</b>	IMS Health	Number of <u>prescriptions</u> dispensed during the specified time	Risk per prescription dispensed	Does not account for variability in how much drug is dispensed (e.g. 3 days vs. 30 day supply or 5 mg tablets vs. 80 mg tablets)
<b>Dosage Units Dispensed</b>	IMS Health	Number of prescriptions multiplied by the number of dosage units dispensed	Risk per dosage unit dispensed	“Dose” is not the same across prescriptions (e.g. “take 1-2 tablets...”); dosage units within the same form can vary (e.g. tablets can be 10 mg v. 80 mg); not applicable to liquid products
<b>Milligrams Dispensed</b>	IMS Health	Dosage units multiplied by the content (mg) of each unit dispensed	Risk per unit weight dispensed	One milligram is not equivalent across all active ingredients; dosage units are not applicable to liquid products
<b>Morphine-equivalent Milligrams Dispensed</b>	IMS; conversion factors	Mg dispensed multiplied by the morphine-equivalent conversion factors	Risk per “standard” potency unit dispensed	Morphine equivalence conversion factors may vary by source; morphine equivalence measures are a difficult concept to convey to most audiences

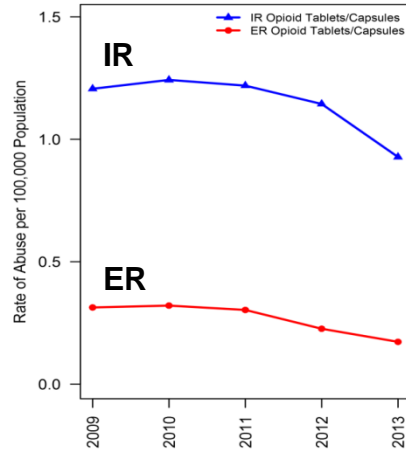
# Poison Center Intentional Abuse Rates

## IR vs. ER Opioid Solid Dosage Units, 2009-2013

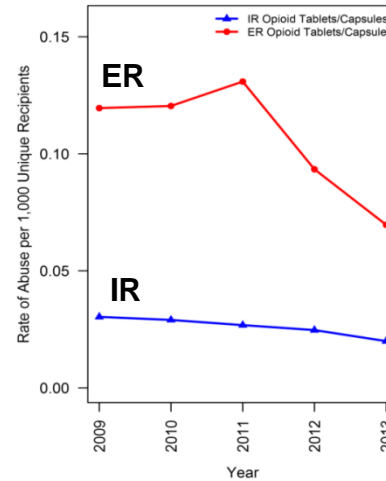
**Number Rx**



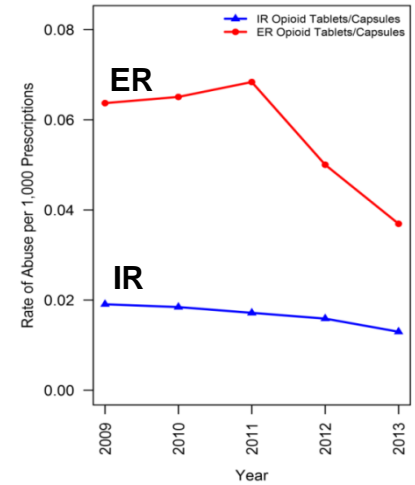
**Population**



**Unique Recipients (URDD)**



**Prescriptions**

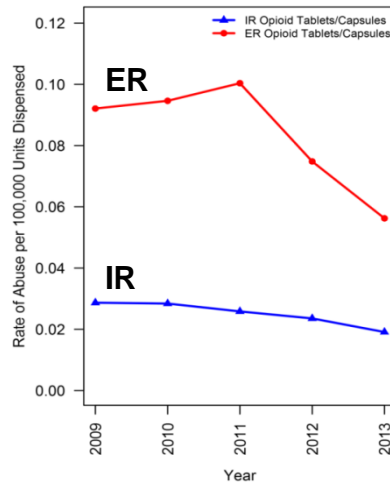


### Conversion Factors

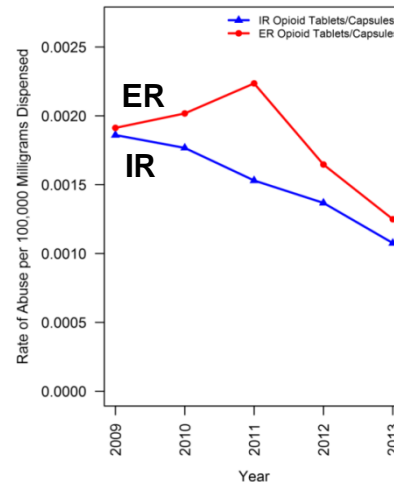
Hydrocodone	1
Hydromorphone	4
Methadone	3
Morphine	1
Oxycodone	1.5
Oxymorphone	3
Tramadol	0.1

Von Korff, 2008

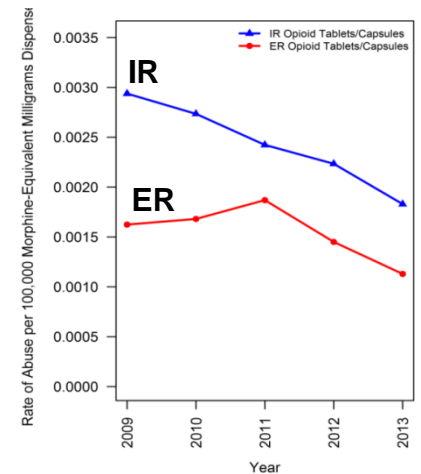
**Units Dispensed**



**Milligrams Dispensed**



**Morphine-equivalent dispensed**

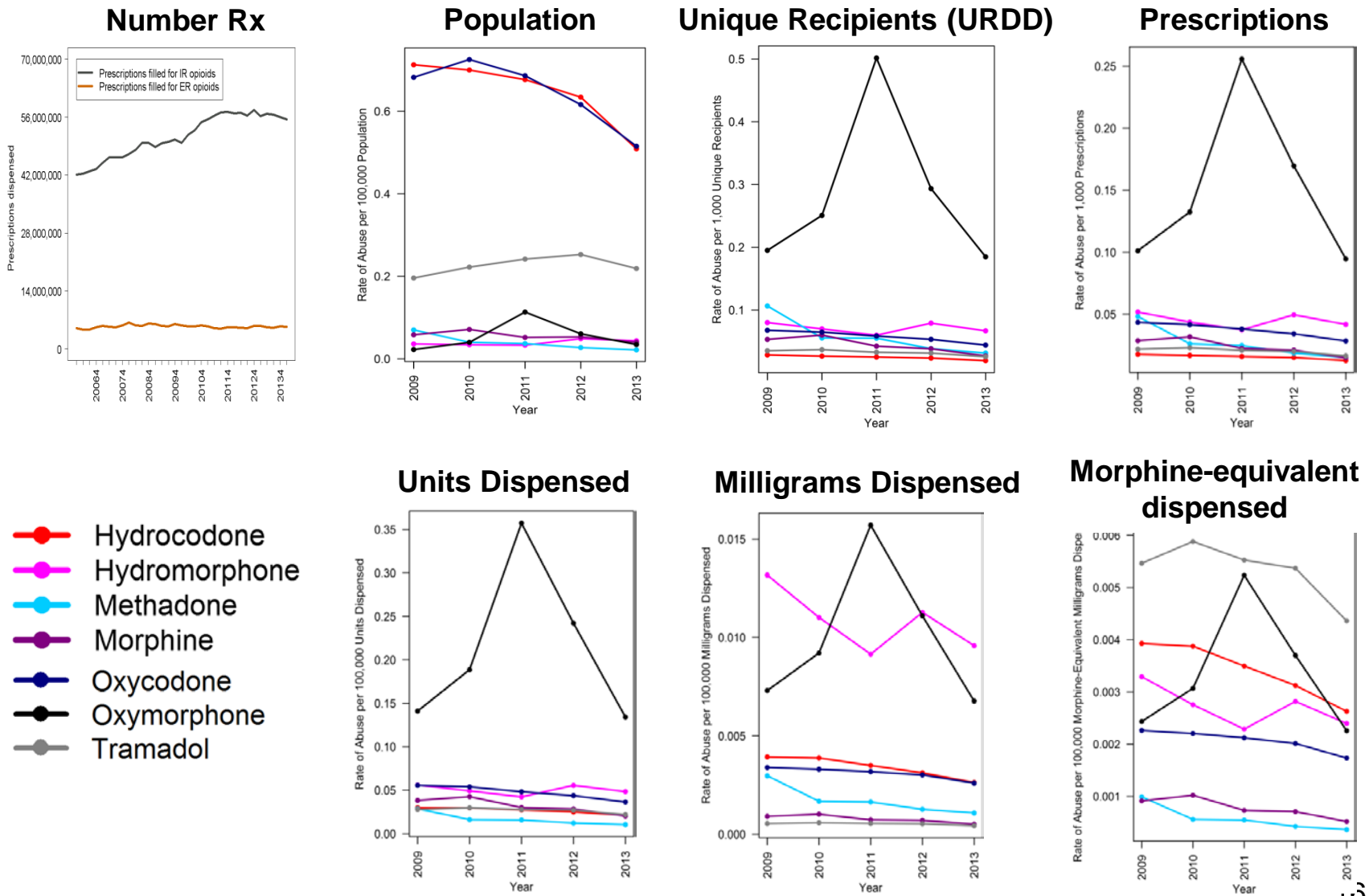


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# Poison Center Intentional Abuse Rates

## API Opioid Solid Dosage Units, 2009-2013



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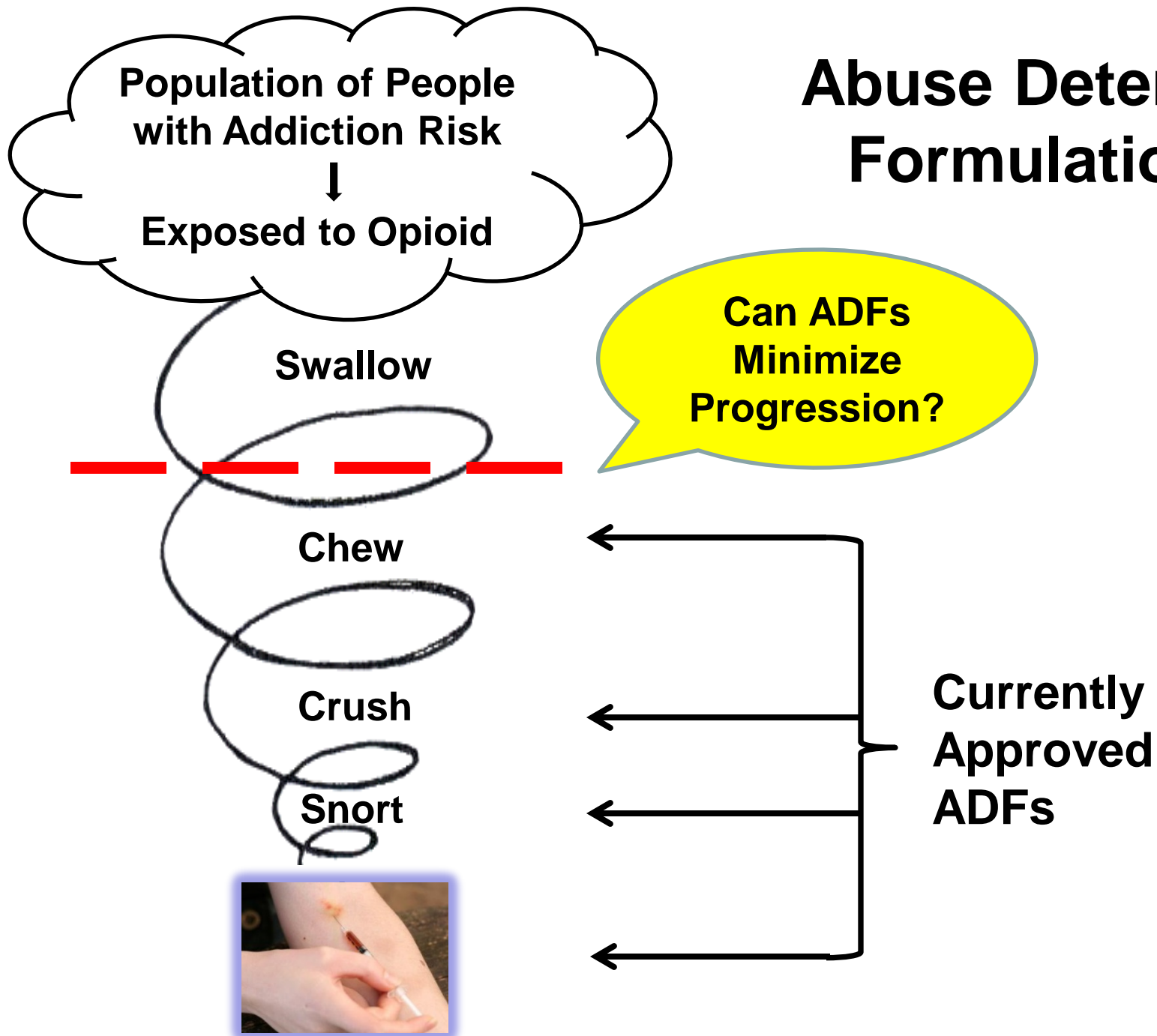


# Denominators

- Selection of denominator depends on the question to be answered
  - Example – Responsible prescriber should decrease number of scripts to some degree and number of tablets per Rx. Which denominator?
- Units dispensed a problem when non-tablet units are involved
- We need to understand the conditions for selecting a denominator.
- What process could provide this information to sponsors and regulators internationally?

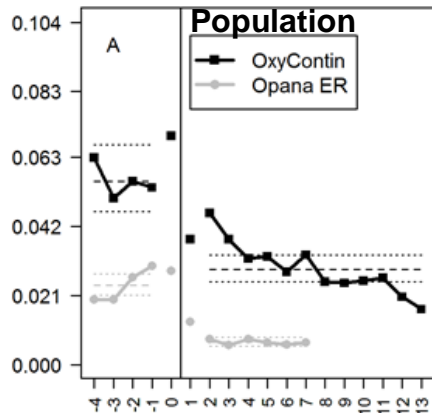
# Abuse Deterrent Formulations

# Abuse Deterrent Formulations

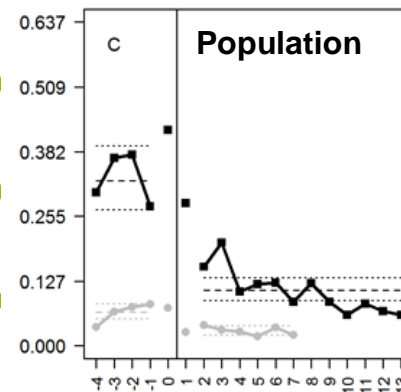


# Mosaic Surveillance on Opana ER and OxyContin

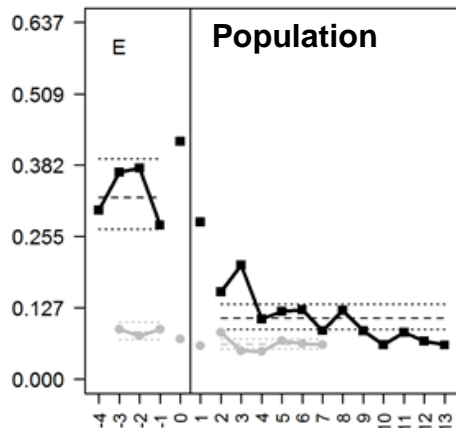
Poison Center Program



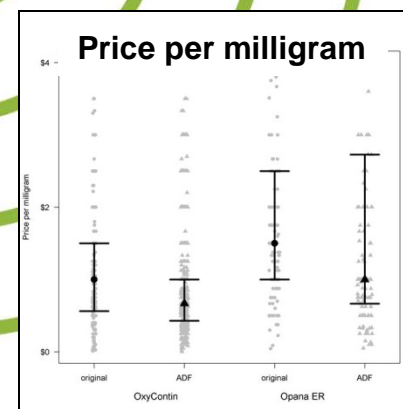
Drug Diversion Program



Treatment Programs COMBINED



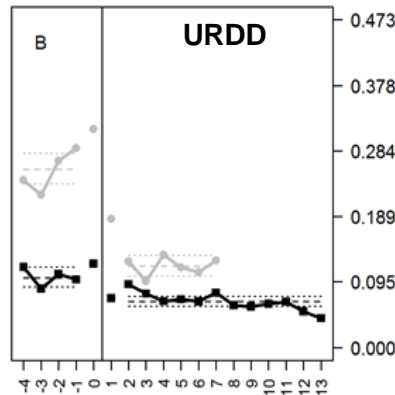
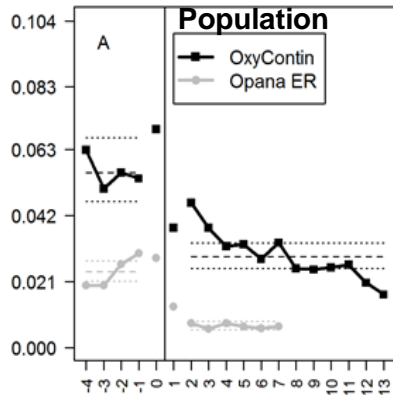
StreetRx



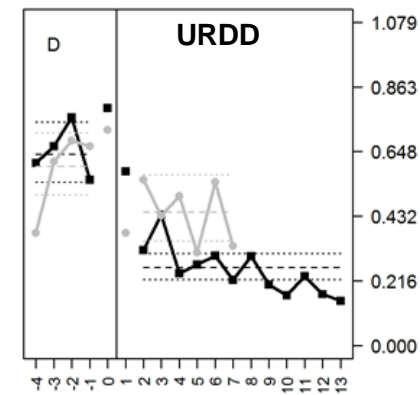
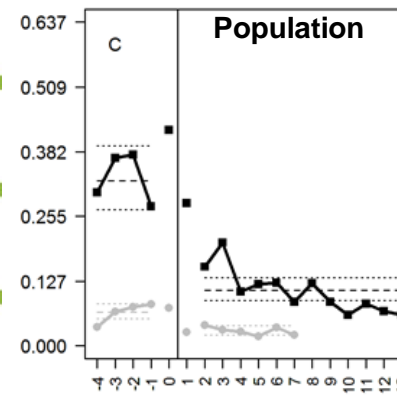
**Confidential**

# Mosaic Surveillance on Opana ER and OxyContin

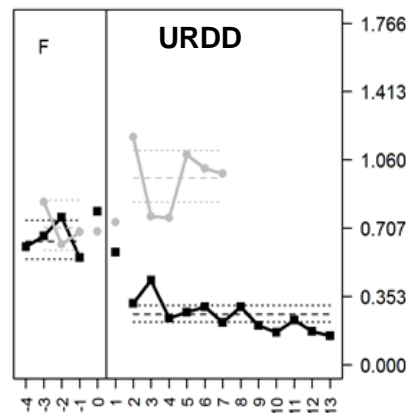
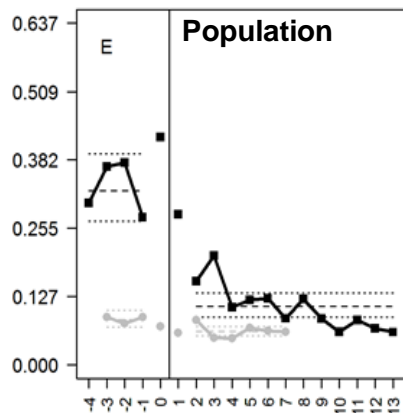
**Poison Center Program**



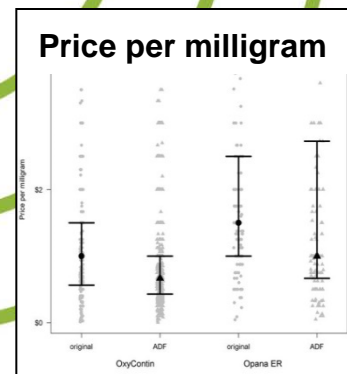
**Drug Diversion Program**



**Treatment Programs COMBINED**



**StreetRx**



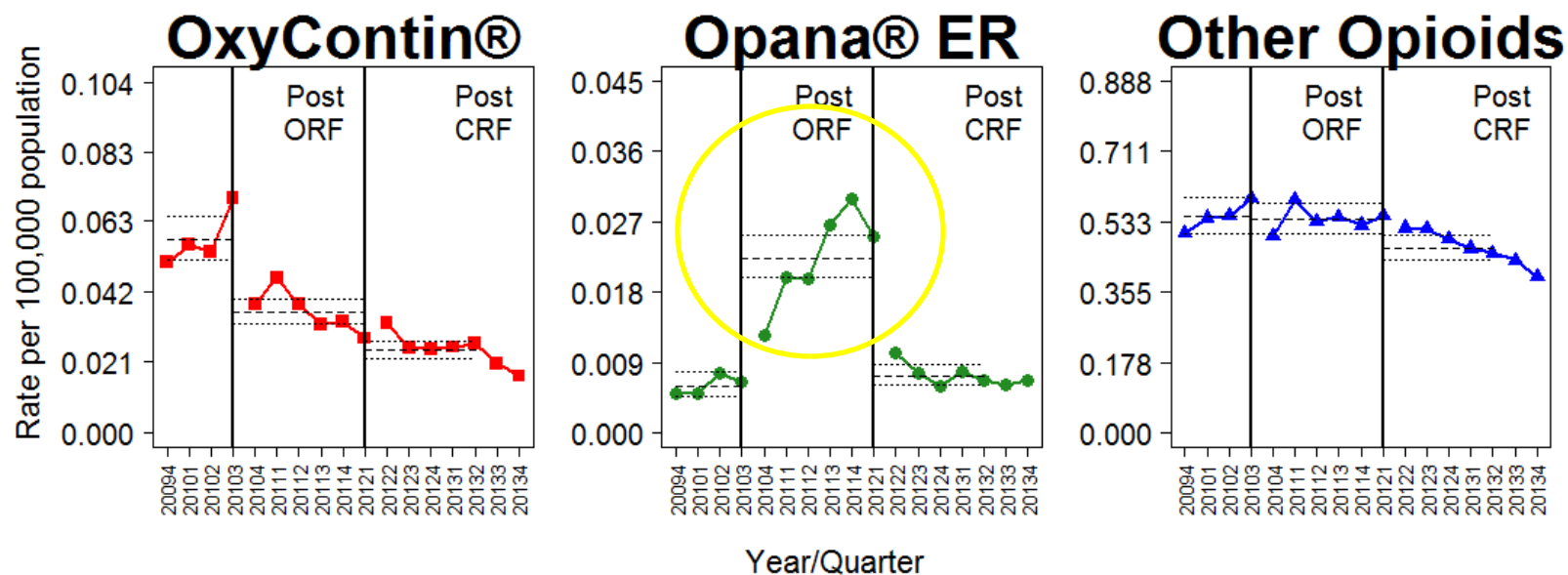
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URDD – Unique Recipients of Dispensed Drug

# Drug Diversion Program

## ER oxymorphone diversion cases by state and time period

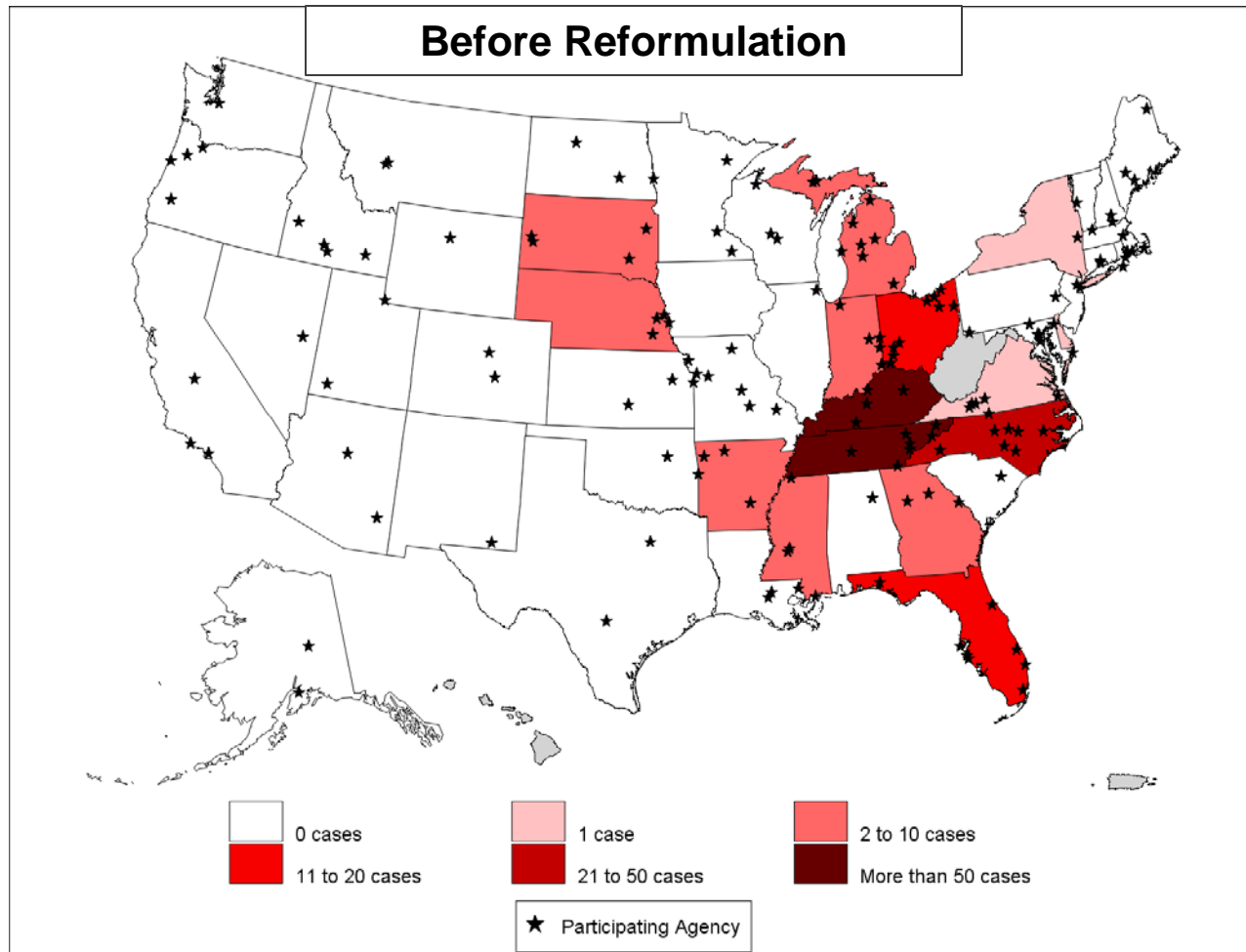
### January 2011 through June 2013



# Drug Diversion Program

## ER oxymorphone diversion cases by state and time period

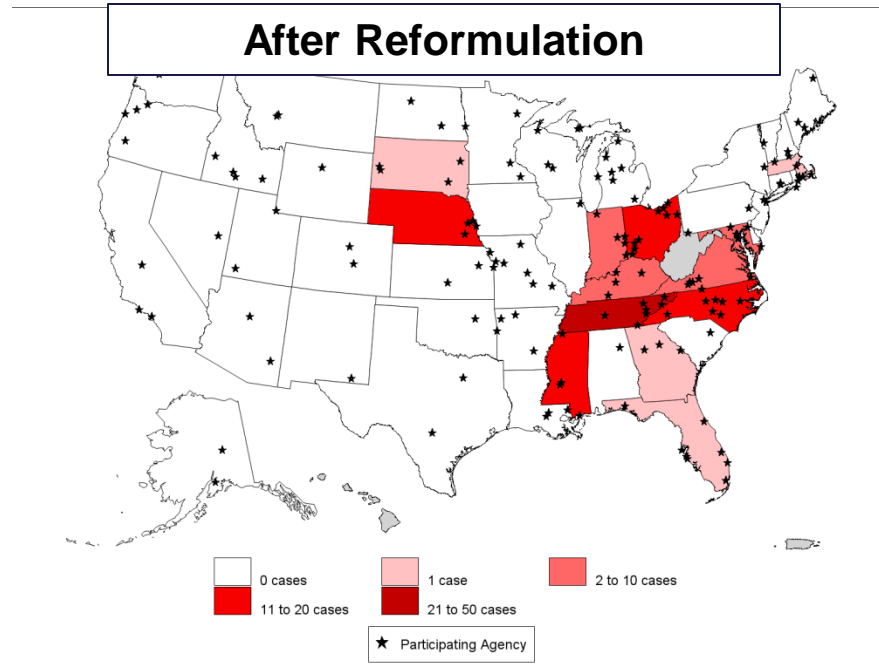
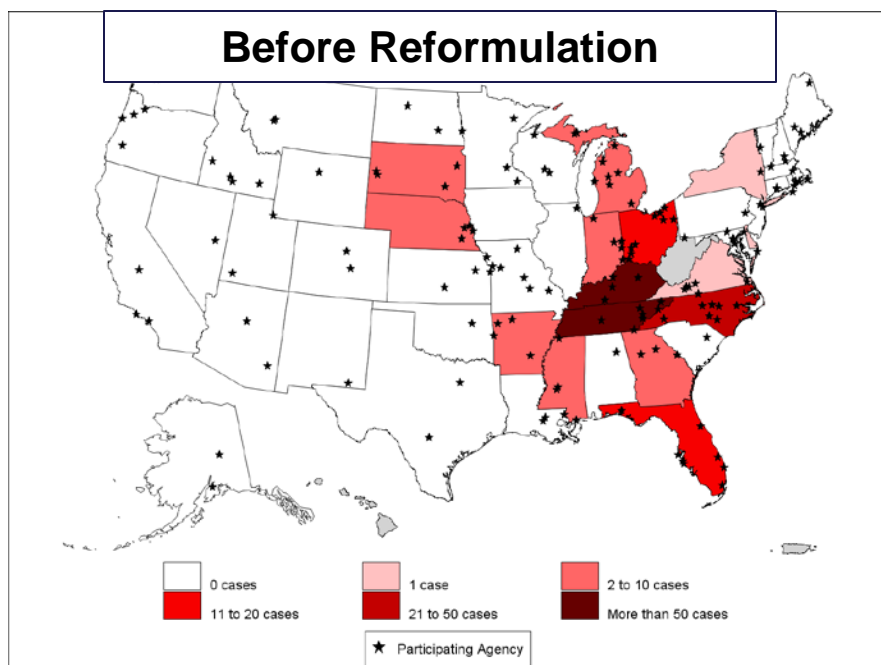
### January 2011 through June 2013



# Drug Diversion Program

## ER oxymorphone diversion cases by state and time period

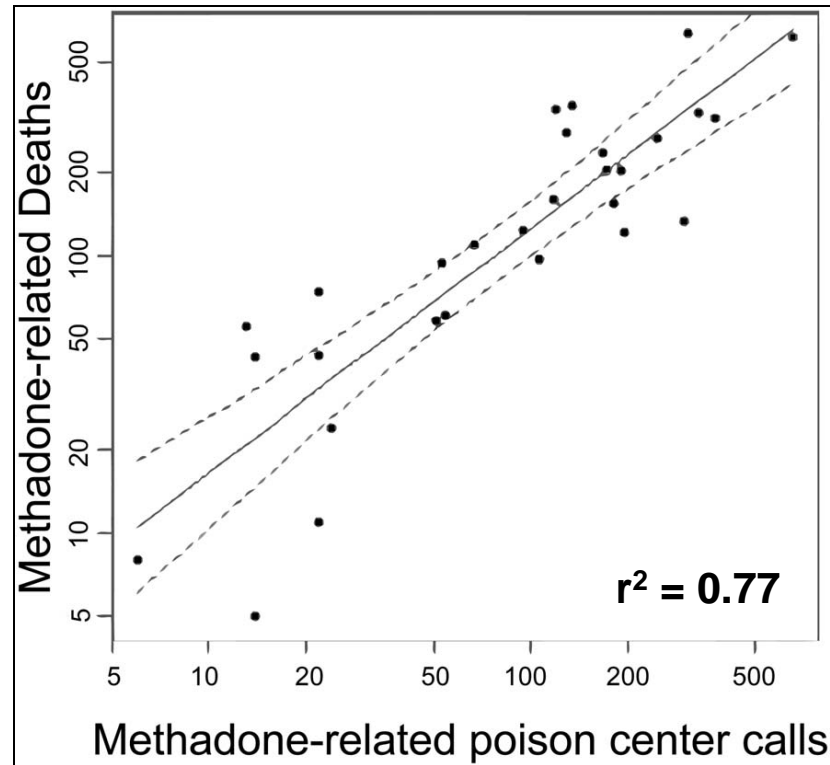
### January 2011 through June 2013





# Validation

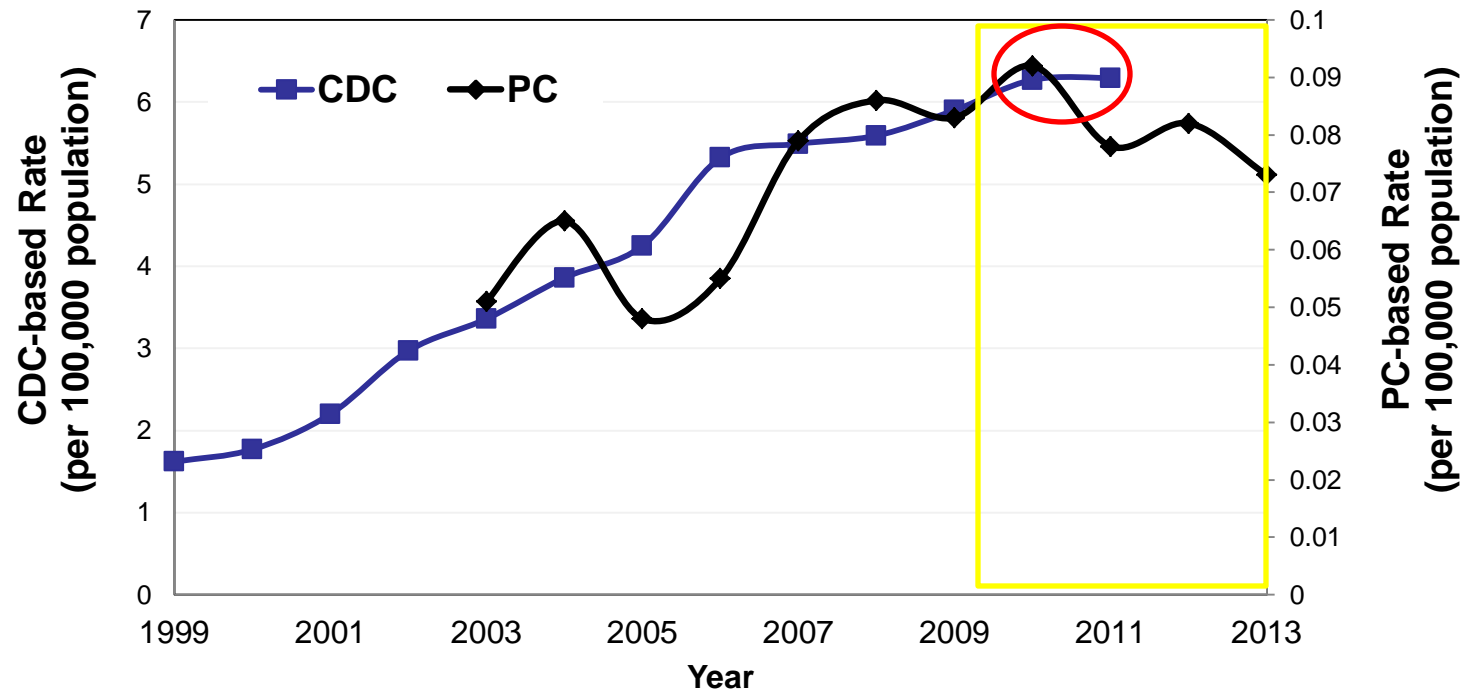
# Poison Center Cases Predict Variation in Death Counts from Vital Statistics Data, 29 states, 2006–7.



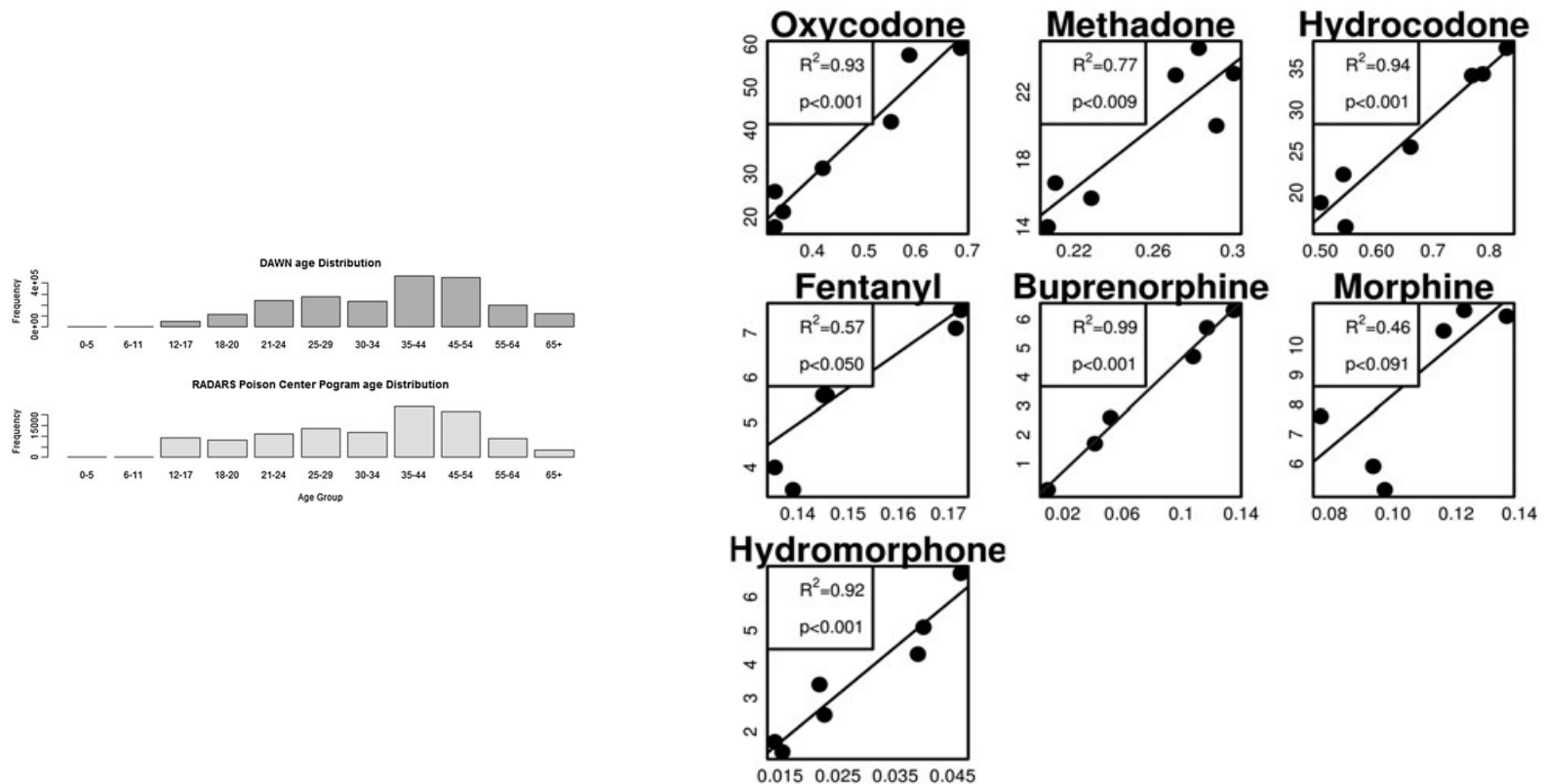
Dasgupta N, Davis J, Funk MJ, Dart R. Using poison center exposure calls to predict methadone poisoning deaths. PLoS One. 012;7(7):e41181.doi:10.1371/journal.pone.0041181

# Prescription Opioid Mortality Rates are Similar for CDC, RADARS Poison Centers

Add methods from tech report

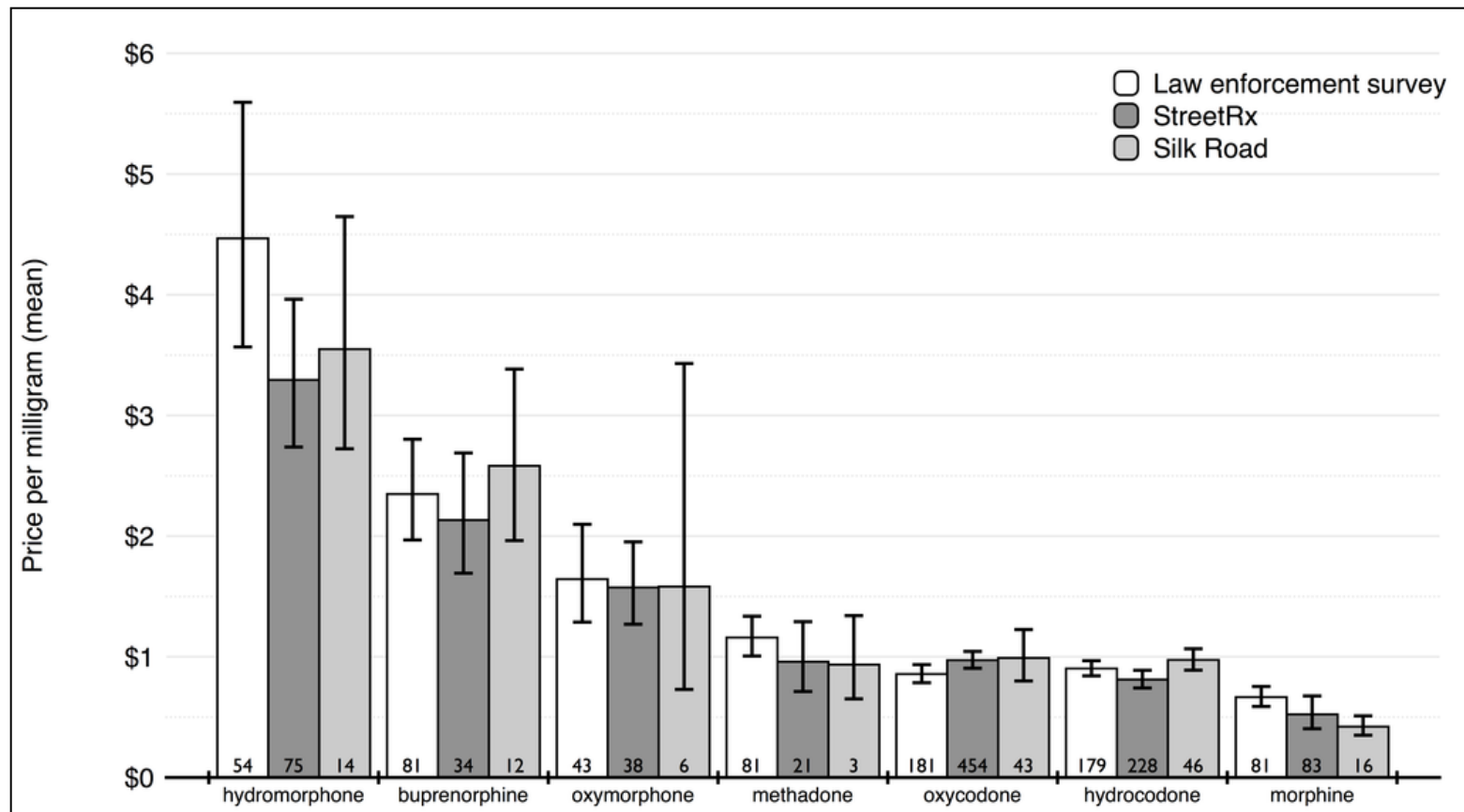


# Poison Center Calls Predict ED Visits in DAWN ED Data



Davis JM, Severtson SG, Bucher Bartelson B, Dart RC. Using poison center exposure calls to product prescription opioid abuse and misuse-related emergency department visits. *Pharmacoepidemiol Drug Safety* 2013; DOI 10.1002/pds.3533

# StreetRx, RADARS Drug Diversion and Silk Road Provide Similar Estimates of Street Price for Prescription Opioids



# International Mosaic Surveillance of Prescription Drug Abuse

**Acute Health  
Events**

**Poison Centers**  
Canada (CPCN)  
Europe (GTNet)

**Drug  
Transactions/  
Criminal Justice**

**Drug Diversion**  
Canada

**Entering  
Treatment**

**EUROPAD**  
Europe

**Entering  
Treatment**

**SKIP**  
Canada

**General  
Population**

**National Survey**  
Canada  
Europe

**Illicit Market  
Price**

**StreetRx.com**  
Users/Buyers  
Canada, Europe

**Social Media  
Chatter/Activity**

**Web Monitoring**  
Canada, UK



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# Endorsement of Canadian Oxycodone Products in United States



# Cost of Oxycodone ER in US and Canada – StreetRx

Formulation	United States	Canada
	Reported Median Price per mg, US Dollar (range)	Reported Median Price per mg, Canadian Dollar (range)
<b>Crushable “Old OxyContin”</b>		
<b>Apo-Oxycodone CR</b>	1.00 (0.15 – 16.80)	1.00 (NR)
<b>OxyContin®</b>	1.00 (0.06 – 10.00)	1.00 (0.54 – 6.00)
<b>Co-Oxycodone CR</b>	1.00 (0.30 – 4.00)	NR
<b>Teva-Oxycodone CR</b>	0.88 (0.10 – 3.75)	NR
<b>Average</b>	1.00	1.00
<b>Abuse Deterrent “New OxyContin”</b>		
<b>Oxycodone ER (OxyContin in US, OxyNEO in Canada)</b>	0.63 (0.03 – 10.00)	0.75 (0.38 – 1.40)
<b>Average</b>	0.63	0.75



# Future Work

- Surveillance of prescription drug abuse requires multiple perspectives and timely, product-specific data.
- Tantalizing to think that the US may be making progress on prescription opioid abuse.
- Further validation to understand relation of different perspectives to drug abuse is needed.
  - What types? What programs?

# THE END

