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® 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® System Mosaic Surveillance

- Poison Center
- Treatment Center
- Entering Treatment
- Internet Chatter
- Survey of Non-Medical Use of Prescription Drugs
- StreetRx Illicit Market Price
- Drug Transactions
- Drug Diversion
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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

2018 Respondents

Respondents

[Map of the United States with respondents marked]
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

2018 Coverage
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

2018 Coverage

[Map showing coverage across the United States]
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

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

| TABLE 4 Examples of ‘continue to abuse’ posts and specific tamper strategies provided |
|**Date of post** |
| Examples of posts |
| August 2010 |
| Everyone here is a fool. If you cannot figure out how to either inject or snort OxyContin, then just switch to Roxicodone. However, there will always be a way to crush, snort, and inject OxyContin. I have already figured out how to inject those 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 it... |
| November 2010 |
| 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. |
| September 2010 |
| Freezing |
| 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. |
| September 2010 |
| Microwaving |
| As others have already stated, either the microwaving or the crispy method work okay... |
| November 2010 |
| 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. |
| September 2010 |
| Multiple steps/chemistry |
| 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 3 molar or hydrochloric acid, and all of the oxycodone will bind to the acid... |
| December 2010 |
| 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... |
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)
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® 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

Prevalence (%)

Cocaine Use, Heroin Use, Methamphetamine Use, Cannabis Use, Poor/Fair Health, Private Insurance

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