Data Analysis in Opioid Addictions Topics

Examine available data, incorporate analysis into quant-based teaching and research

Kosali Simon
Herman Wells Professor
Indiana University-SPEA

Olga Scrivner
Research Scientist
Indiana University-SICE-CNS
Plan for today

• Opioids addictions primer & possible topics

• Types of data

• Where to find them

• Typical steps for data processing

• Software easily accessible for students
By 4:50pm, you should be able to..

1) If new to this area:
   ...incorporate opioid addictions topics data and analysis into teaching/research

2) If not a newbie:
   ...learn a broader range of data sources, tools & tips
How familiar are we with Data Analysis?

https://pollev.com/scrivnerpoll
First, what are the salient facts and the context?
What is an Opioid?

- Drug derived from the opium poppy
- Reacts with receptors in the body/brain
- Alleviates pain, slows breathing (overdose deaths from this), euphoria
- Very addictive, withdrawal symptoms difficult

Fentanyl and other synthetics not from opium, but called ‘opioids’ often
Equivalency of Opioids

- Morphine (oral) – derived from poppy plant (1803)
- Hydrocodone – same strength as morphine, often mixed with other drugs (e.g., acetaminophen)
- Oxycodone – 50% stronger than morphine (e.g., Oxycontin, Percocet)
- Heroin - 2X to 5X stronger than morphine
- Fentanyl – 50X to 100X stronger than morphine
- Carfentanil – 10,000 to 100,000X stronger than morphine

Source: Lorraine Collins. Research to address the Opioid crisis: A call to action
How Bad Are Drug Addictions related Mortality rates in the US?
Historic Scope of the Drug Epidemic

Source: Okie, NEJM 2010
Increased prescribing of opioids

About 22 high doses of medication for every person in 2010

Figure 1

Open Med. 2012; 6(2): e41–e47. Published online 2012 Apr 10.
PMCID: PMC3659213, Trends in prescriptions for oxycodone and other commonly used opioids in the United States, 2000–2010
Kristen Kenan,* Karin Mack, and Leonard Paulozzi*
Rates of prescription painkiller sales, deaths and substance abuse treatment admissions (1999-2010)

Recent Trends in Drug-related Mortality

Drug Overdose & Motor Vehicle Accident Deaths

Data: CDC

The Macroeconomy and Opioid Abuse
Hollingsworth, Ruhm, and Simon
Narcan is to be administered to a patient when they are undergoing an overdose. It knocks out the opioid from the µ receptors in the brain with a process called "competitive inhibition". However it does not remove the opioid from the brain, and if the opioid goes again into a µ receptors then there is a chance of overdosing again. Hence a quick medical treatment is a necessity. As a result fentanyl due to its high potency though taken in small quantities require multiple shots of Narcan. There will be some side effects of naloxone similar to the individual going into withdrawal instantly.
How Can Data Help?

• Analyze to **UNDERSTAND** trends & know which govt. policies are **EFFECTIVE**

• Integrate to make health/social services more **EFFICIENT**

• Harness to make individuals & societies more **RESILIENT**, and treatments more **SUCCESSFUL**
Idea to consider - **Data Integration / Analytics**

Significant challenge:

- Fragmented (healthcare system, social services, police, etc.);
- Silos (not easily connected);
- Difficult to interpret and navigate;
- Time-delayed

- E.g. Oct. 2, 2017 - University of Pittsburgh’s CTSI held national workshop on computational modeling and the opioid epidemic
  - Focus on constructing dynamic models, map trajectories
Ideas to consider - Technology for Prevention

• Smartphone apps to provide training in overdose prevention,

• Apps to identify treatments and harm-reduction programs in close proximity
  • (e.g. Indiana “Open Beds”)

• Social media, gaming, GPS and other real-time technologies

• Virtual Reality for Pain Management
Topics

Prescribing
Hospitalizations
effects
Framework
Access
Justice
System
Behavior
Criminal
Opioids
Legal
Treatment
Workforce
Overdose
Effectiveness
Types of Data
Many fancy graphics available online, but where we get the microdata?
Overdose Death Rate 2015: Darker is Worse

2015 drug overdose deaths per 100,000 residents

In counties with fewer than 20 drug overdose deaths, this map combines observed totals with modeled estimates.

Source: National Center for Health Statistics, Centers for Disease Control and Prevention

The amount of opioids prescribed per person varied widely among counties in 2015.
Variability in Drug Testing Rates

Overall positivity rate in 2016

This interactive map shows urine drug test positivity by 3-digit zip code in the United States.

The Quest Diagnostics Drug Testing Index™ is a comprehensive analysis of workforce drug use trends.
Global access to opioids for pain relief (2011–2013 average)

Approximately 3/4 of the world's population live in countries with inadequate access to pain relief.

Consumption in S-DDD* per million inhabitants per day
- >10,000
- 2,001-10,000
- 201-2000
- 101-200
- 1-100
- <1

Sources: United Nations, International Narcotics Control Board
Note: Opioids defined as codeine, cimetropoxyphene, dihydrocodeine, fentanyl, hydrocodone, hydromorphone, ketobemidone, morphine, oxycodone, pethidine, tilidine and trimetiperidene.
*Sold Defined Daily Doses
Govt National Surveys | Govt Administrative Data
---|---
Non-publicly available | Commercial Data

Data Types
Versions of data

• Public-use vs DUA (data use agreement)-bound
  • State or substate geography
  • Small cells suppressed (eg less than 10 deaths per county)

• Aggregated (eg at state level) vs micro data (at person level)

• Online dashboards vs downloadable csv files

• Scrape vs download
Individual level national surveys

• Ongoing, publicly available, usually 2 yr lag
  • Sample sizes from ~20k to 2 mil respondents/yr

• Well organized, with codebooks and data dictionaries

• Can learn from previously published research
National Center for Health Statistics

Ambulatory Health Care Data

Meaningful Use and The Merit-based Incentive Payment System

About NAMCS/NHAMCS

What's New

Questionnaires, Datasets, and Related Documentation

Research Tools

Survey Results and Products

Ambulatory Care Listserv

NAMCS Survey Participants

Ambulatory Health Care Data

The National Ambulatory Medical Care Survey (NAMCS) is designed to meet the need for objective, reliable information about the provision and use of ambulatory medical care services in the United States. Findings are based on a sample of visits to nonfederally employed office-based physicians who are primarily engaged in direct patient care and, starting in 2006, a separate sample of visits to community health centers.

The National Hospital Ambulatory Medical Care Survey (NHAMCS) is designed to collect data on the utilization and provision of ambulatory care services in hospital emergency departments and hospital outpatient departments.

What's New

Data Products

- 2015 NHAMCS Emergency Department summary tables
- 2015 NHAMCS Emergency Department public use data file
- NAMCS – Community Health Centers Summary Tables
Lists all drugs prescribed

### MEDICATIONS & IMMUNIZATIONS

 Were any prescription or non-prescription drugs ORDERED or PROVIDED (by any route of administration) at this visit? Include Rx and OTC drugs, immunizations, allergy shots, oxygen, anesthetics, chemotherapy, and dietary supplements that were ordered, supplied, administered, or continued during this visit. Include drugs prescribed at a previous visit if the patient was instructed at THIS VISIT to continue with the medication.

1  □ Yes  
2  □ No

List up to 30 medications.

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Note: Formal Data Definitions

• How are opioids defined?
  • NDC codes, drug classes, molecule names, brand names, mme
    • E.g. CDC, CMS, has list of opioids

• What are death codes to identify overdose in Mortality data?
  • CDC and data appendices of previous papers show ICD10 codes
    • [http://www.icd10data.com/ICD10CM/Codes/S00-T88](http://www.icd10data.com/ICD10CM/Codes/S00-T88)

• For GIS data
  • FIPS codes, zipcode to county crosswalks, lat & lon
Data provided as csv files with column names.
### Index of /pub/Health_Statistics/NCHS/Datasets/NAMCS

[parent directory]

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#### Stata Documentation and Datasets

- NAMCS

  - namcs2014.do
  - namcs2015-stata.zip
Undergrad class data integration

• Iuanyware-Stata
  • Demo in class, provide quickstart guide
• Provide students with dataset on Box
• Handout to get started

Example from undergrad health econ

Instructions for opening the data file in Stata & completing answers to HW
(these are the same steps I will show in class)

Please download the data set directly using the link on Canvas. You can then open Stata from an IU computer OR use Iuanyware. If you would like to use Iuanyware follow the instructions below. If not, skip to the Stata commands.

Once you have downloaded the "data" file, you will go to Iuanyware and open up the Stata program.

To do that, go to https://iuanyware.iu.edu. There are descriptions of what this is on the left hand side of that screen if you have never used Iuanyware, as well as buttons on the right side if you need any questions answered by IU’s IT (UITS). A message will pop up asking to install a citrix client server, the typical types of things that happen when you log into a cloud application.

After you have logged into Iuanyware, go to Stata under Apps
To open the file, go to "File", "Open" and open the saved "dta" data file.

For opening files in Stata: please see https://kb.iu.edu/d/bbc1

Once you have opened the .dta file, it will show up with variable names on the right hand size.
Stata Commands

Now, you are ready to do type in the commands needed to answer the questions # a-e.

1) To see how many plans are in Indiana, you can type "state" (hit enter afterwards, and do not put the quotes into see the number of observations in the data set. One row in the data set represents one plan.

2) To see how many plans in each metal level, type "tab" and then click on the variable name "Metal_Level" (or just type the variable name) and hit enter. Do not enter the quotes into Stata. i.e. copy and paste the words in green and then hit enter:

```
.tab Metal_Level
then describe what you see
```

3) To see how many insurers are offering coverage, type "tab" and then click on the variable name "Issuer_Name" (or just type the variable name) and hit enter.

```
.tab Issuer_Name
describe what you see
```
Administrative data

• Harder to find
• More limited sample, need to know context more
• Has improved a lot in recent years
• Usually free
• Usually at county level (good for mapping)

• (sometimes there is free version and restricted or costly version)
Example Administrative data: Death Records

The Multiple Cause of Death database contains mortality and population counts for all U.S. counties. Data are based on death certificates for U.S. residents. Each death certificate contains a single underlying cause of death, up to twenty additional multiple causes, and demographic data. The number of deaths, crude death rates, age-adjusted death rates and 95% confidence intervals for death rates can be obtained by cause of death (4 digit ICD-10 codes), 133 selected causes of death, 130 selected causes of infant death, drug and alcohol related causes of death, injury intent and injury mechanism categories, place of residence (national, region, division, state, and county), age (single-year of age, 5-year age groups, 10-year age groups and infant age groups), race (American Indian or Alaskan Native, Asian/Pacific Islander, Black or African American, White), Hispanic ethnicity, gender and year. Data are also available for urbanization categories for county of residence, place of death, month and week day of death, and whether an autopsy was performed.
Next week’s homework from

SPEA V550 Spring 2018

America’s Opioid Crisis: Data Analytics and Policy

Tuesdays 4pm-6:30pm
Professor Kosali Simon
Example: Dashboard with Download Option

HCUP Fast Stats
HCUP Fast Stats provides easy access to the latest HCUP-based statistics for health information topics. HCUP Fast Stats convey complex information at a glance. Fast Stats will be updated regularly (quarterly or annually, as newer data becomes available).

State Trends in Hospital Use by Payer

- Inpatient Stay Trends by Payer (Updated Nov. 2017)
- Emergency Department Visit Trends by Payer (Updated Nov. 2017)

Opioid-Related Hospital Use

- Trends in Opioid-Related Inpatient Stays and Emergency Department Visits, National and State (Updated Dec. 2017)
Rate of In:

Year


Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National (Nationwide) Inpatient Sample (NIS), 2008-2015 (all available data as of 12/11/2017). Inpatient stays include those admitted through the emergency department.
Commercial data

• Usually expensive, but maybe very detailed, very current

• Lots more to say on data types but..

Will skip to software because of limited time
Implement good workflow concepts to get from source to working version of data, then...
Substance Abuse Facilities

Counts per County

Proportion of Clinics by County

Deaths from Opioid Use by Age

Histogram of Ages

Overlap Between Treatment Centers and Locations of Death in 2016


https://kcritelli.shinyapps.io/Shiny_Project/
Macroeconomic conditions and opioid abuse

Alex Hollingsworth a, Christopher J. Ruhm b,c, Kosali Simon a,c,*

a School of Public and Environmental Affairs, Indiana University, United States
b Public Policy and Economics, Frank Batten School of Leadership and Public Policy, University of Virginia, United States
c NBER, United States

Are Opioid Deaths Affected by Macroeconomic Conditions?

The rate of drug overdose deaths involving opioids tripled between 2000 and 2014, according to the U.S. Centers for Disease Control and Prevention (CDC). One theory that has received significant attention is that a decline in economic opportunities for some segments of the population has led to a rise in “shades of despair,” including deaths related to drug use. The fact that some of the recent rise in drug deaths coincides with the Great Recession and in some states high

NBER Bulletin on Aging and Health

2017, No. 3

National Bureau of Economic Research
Fig. 4. Drug overdose ED visit rate by major drug type, 2006–2014, using the Healthcare Cost and Utilization Project’s Nationwide Emergency Department Sample for 2006–2014.

Table 3
The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department visits across multiple specifications.

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Note: Robust standard errors clustered at the county level in parentheses. Each regression is weighted by total county population.

* p < 0.1
** p < 0.05
*** p < 0.01
Arriving soon..
Data, Trends, and Statistics

Tipsheet: "Covering opioids with data" (Charles Ornstein, ProPublica)

Indiana
Indiana Data Hub

National
"Drug Overdose Deaths in the United States, 1999-2016" (NCHS Data Brief, December 2017)

"Opioid Data Analysis" (CDC)

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

"Overall positivity rate in 2016" (Quest Diagnostics)

"Quest Diagnostics Drug Testing Index: Full year 2016 tables" (Quest Diagnostics)

Policy and the Opioid Epidemic

Policy Approaches (General)  +
Harm Reduction and Treatment Policies (Needle Exchanges, Naloxone, and MAT)  +
Policy Through Lawsuits  +
Governmental Regulation  +
Upcoming Event and Call for Proposals: 2nd Annual South Central Opioid Summit
(September 18-19, 2018)

THURSDAY, MARCH 22, 2018

The 2nd Annual South Central Opioid Summit will be held on
Summary & Take-away

• Pressing social problems need data analysis for understanding and moving towards solutions

• Much publicly available data to easily integrate into teaching and research