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

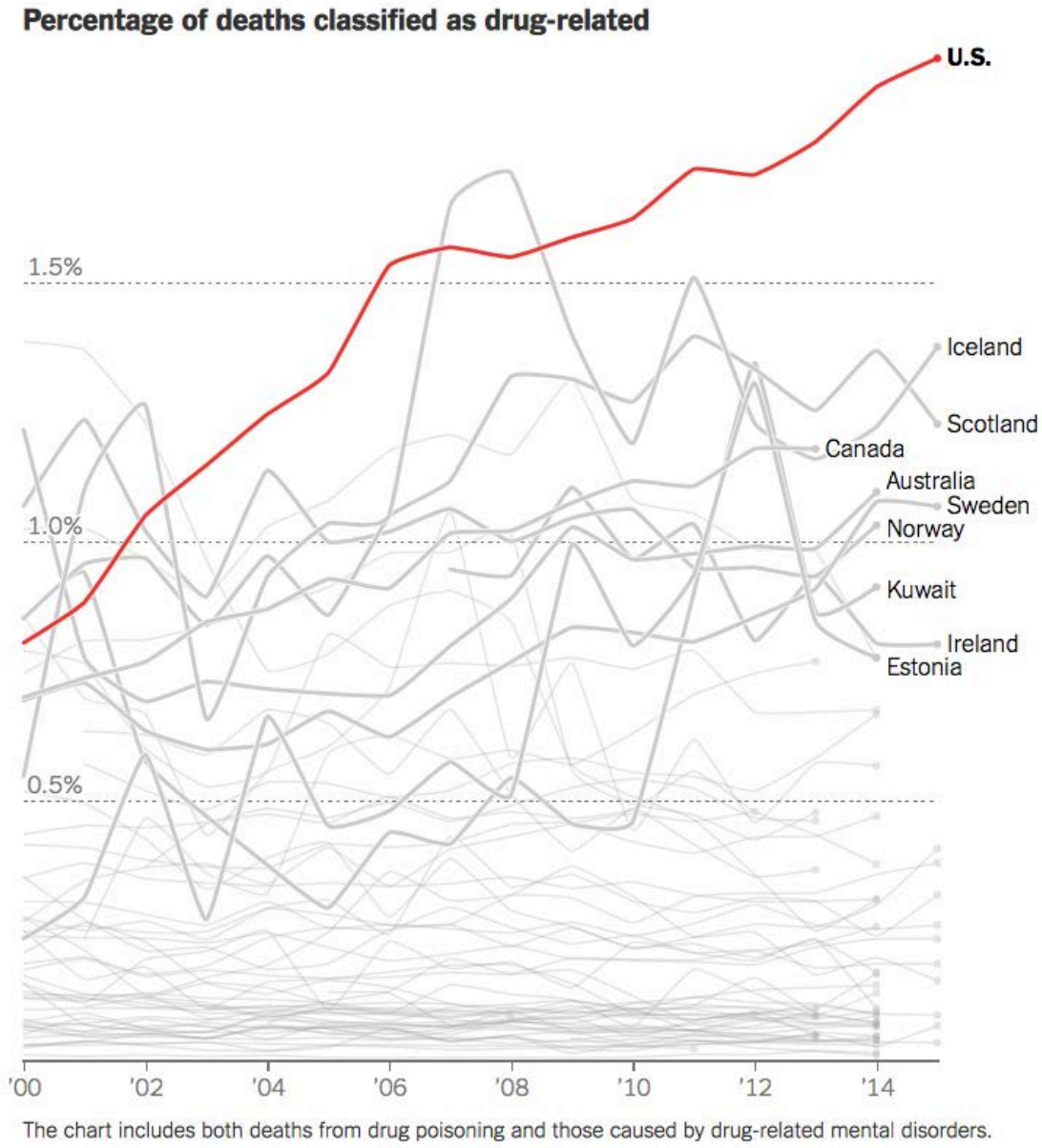
Fentanyl and other synthetics not from opium, but called ‘opioids’ often

Equivalency of Opioids

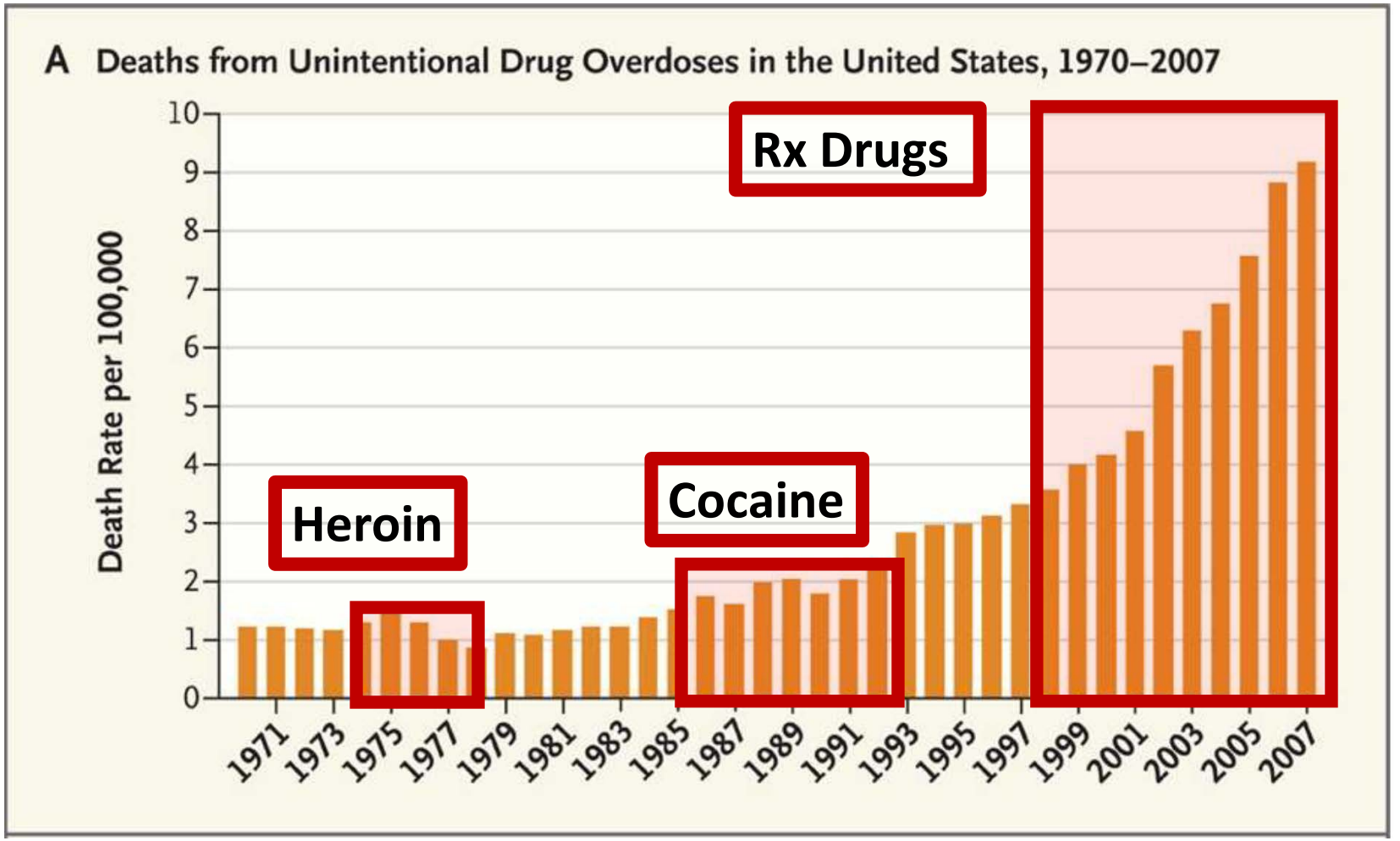
- Morphine (oral) – derived from poppy plant (1803)
- Hydrocodone – same strength as morphine, often mixed with other drugs (e.g., acetominophen)
- Oxycodone – 50% stronger than morphine (e.g., Oxycontin, Percocet)
- Heroin - 2X to 5X stronger than morphine
- Fentanyl – 50X to 100X stronger than morphine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

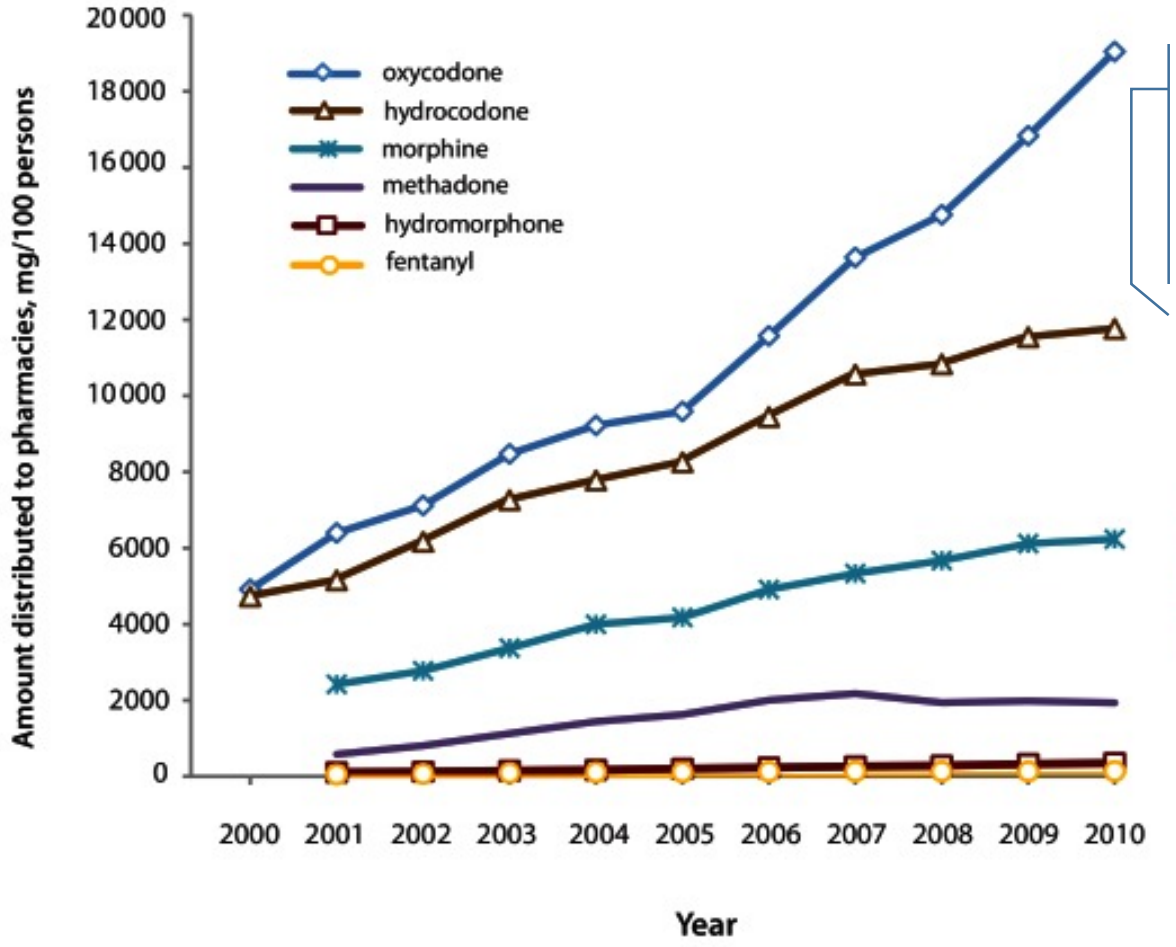


Historic Scope of the Drug Epidemic



Source: Okie, NEJM 2010

Increased prescribing of opioids

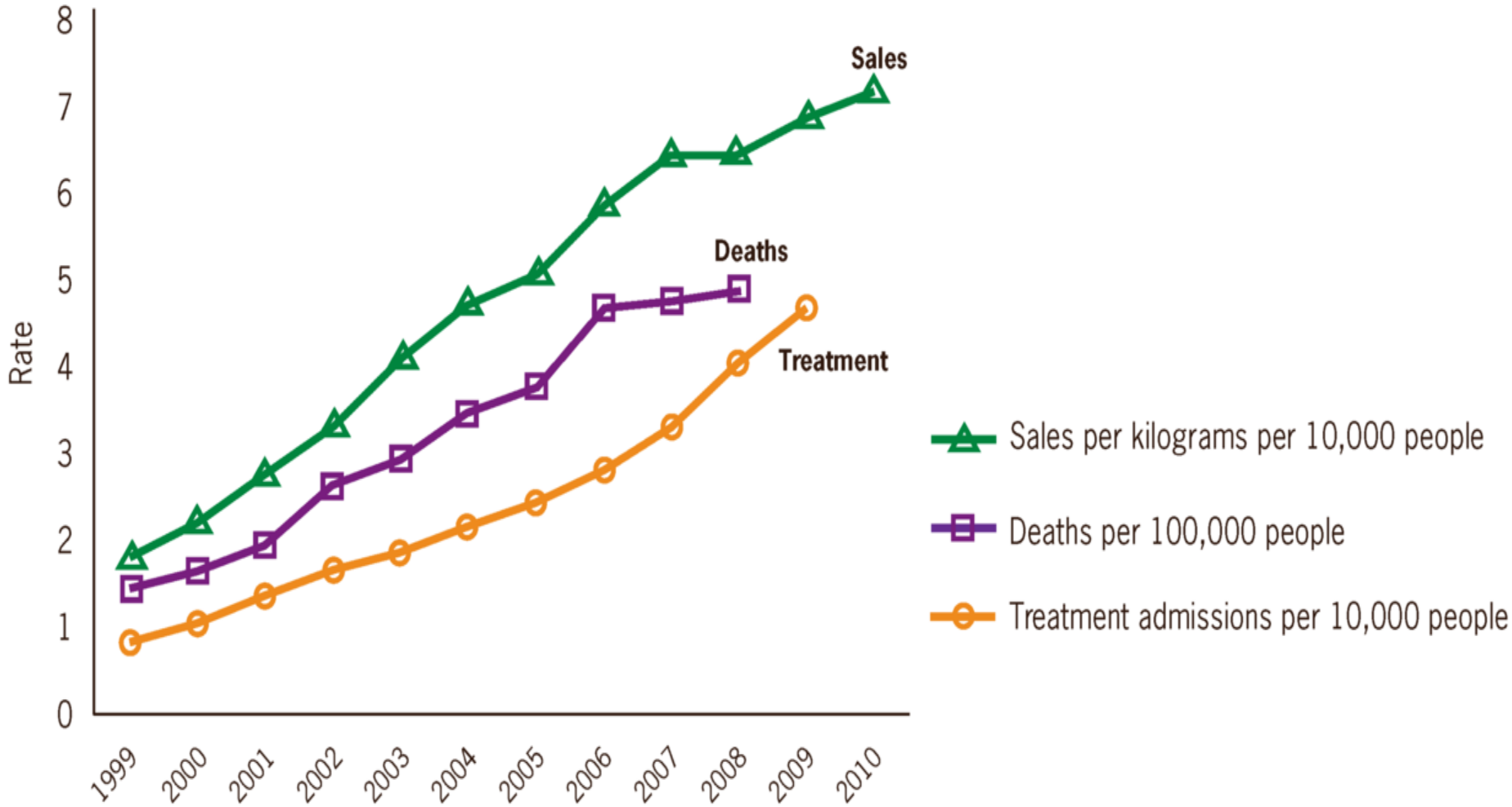


About 22 high doses of medication for every person in 2010

Figure 1
Distribution of selected opioids to US pharmacies (in milligrams per 100 persons). Based on data from the Automation of Reports and Consolidated Orders System, 2000–2010.

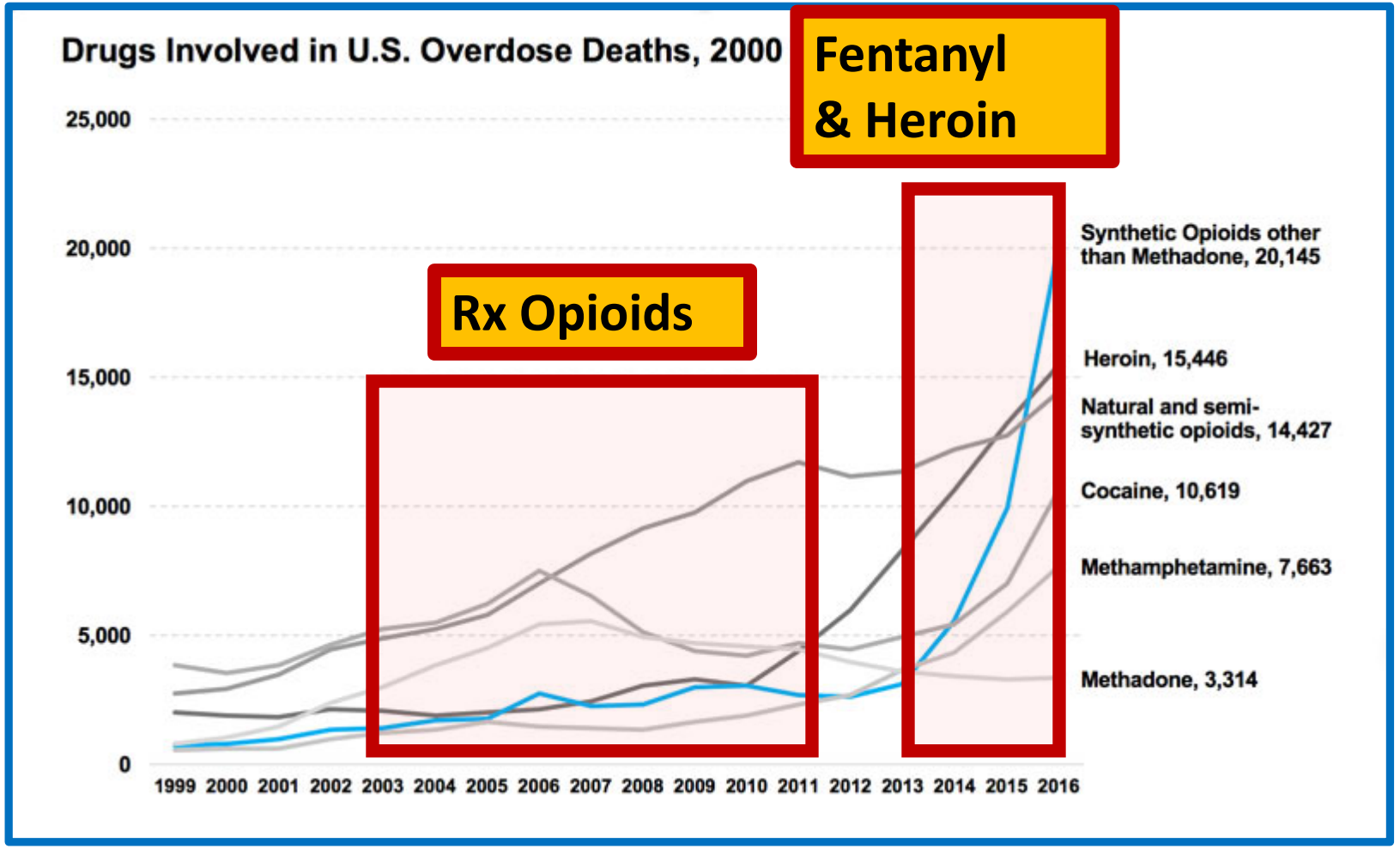
Open Med. 2012; 6(2): e41–e47. Published online 2012 Apr 10.
PMCID: PMC3659213, **Trends in prescriptions for oxycodone and other commonly used opioids in the United States, 2000–2010**
Kristen Kenan,* Karin Mack,* and Leonard Paulozzi*

Rates of prescription painkiller sales, deaths and substance abuse treatment admissions (1999-2010)



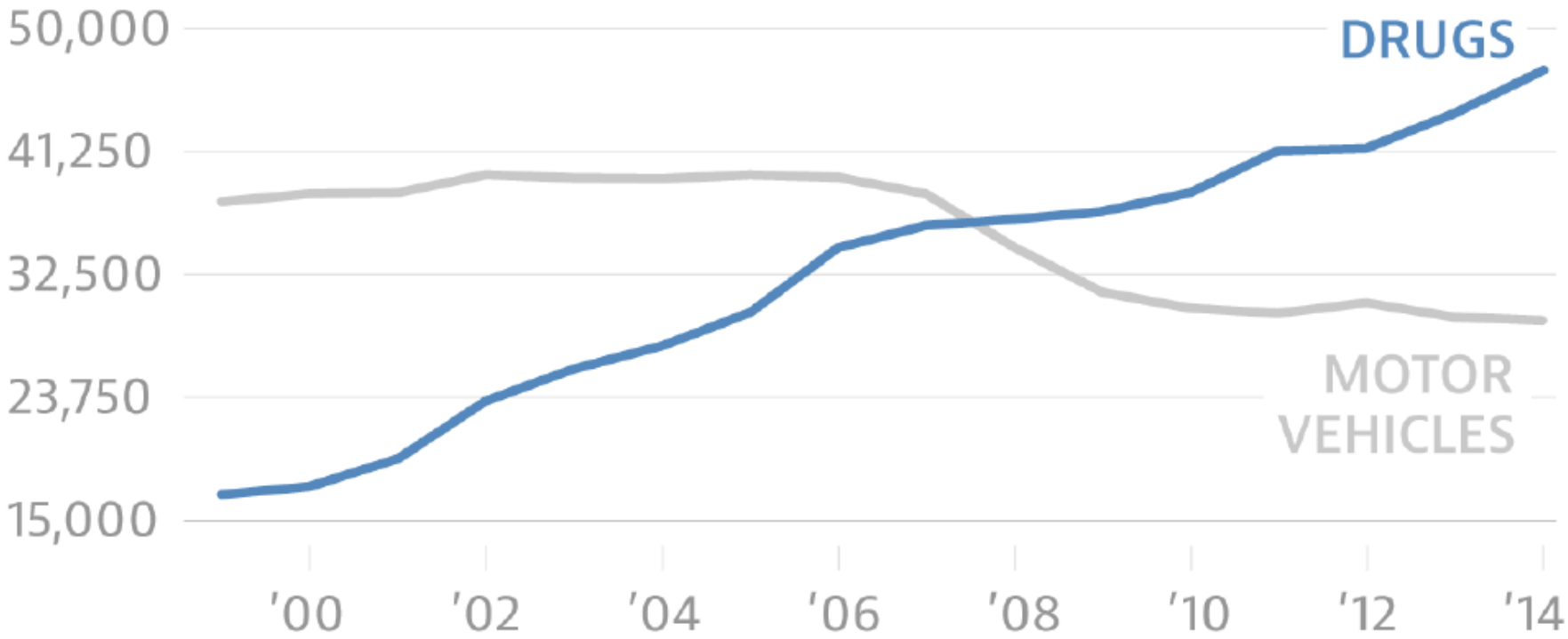
SOURCES: National Vital Statistics System, 1999-2008; Automation of Reports and Consolidated Orders System (ARCOS) of the Drug Enforcement Administration (DEA), 1999-2010; Treatment Episode Data Set, 1999-2009

Recent Trends in Drug-related Mortality



Source: NIDA, https://www.drugabuse.gov/related-topics/trends-statistics/overdose-death-rates

Drug Overdose & Motor Vehicle Accident Deaths



Data: CDC

SPEA

About Buprenorphine (Naloxone / Narcan)

- 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**

Ideas to consider - Data Integration / Analytics

Significant challenge:

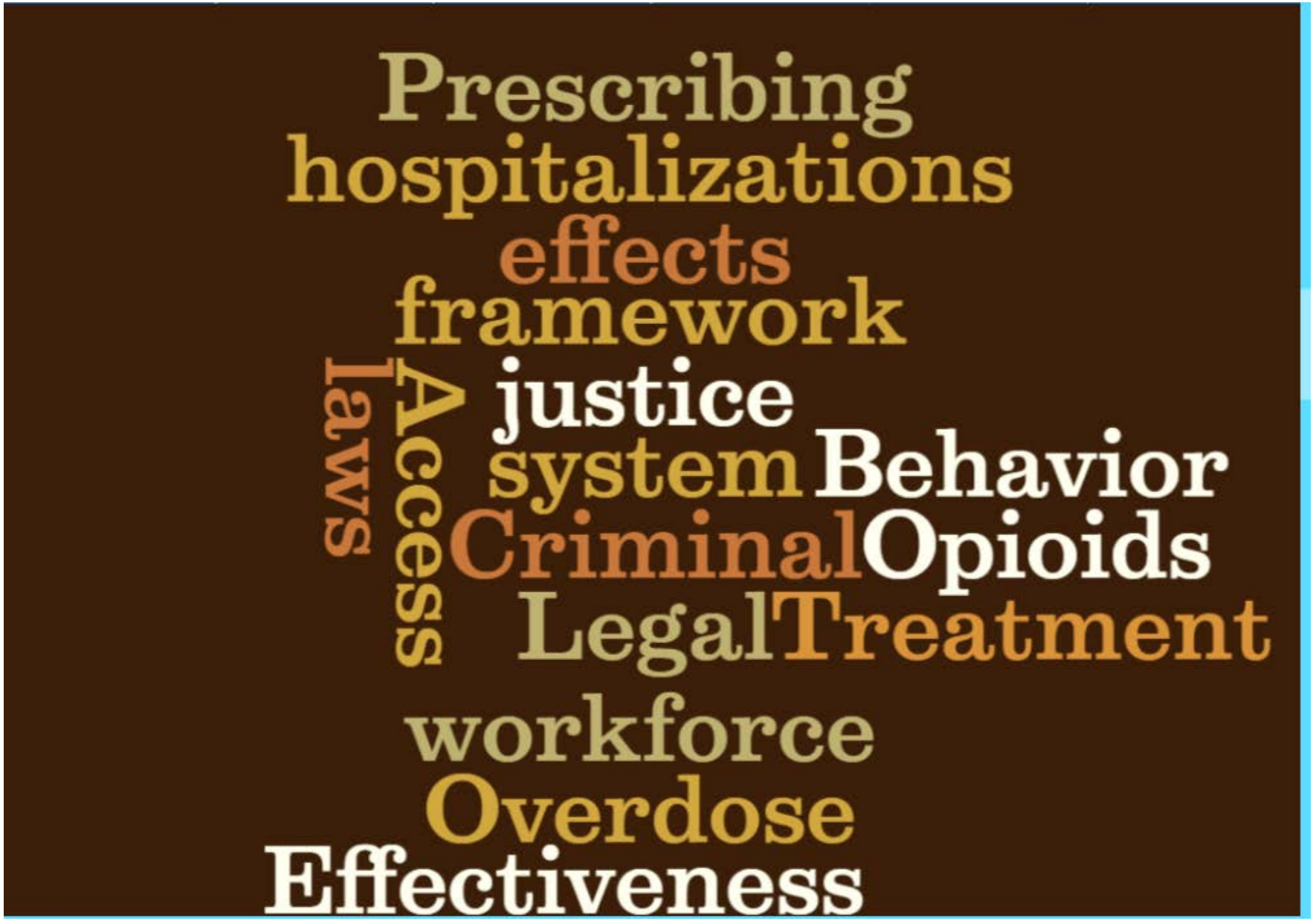
- Fragmented (healthcare system, social services, police, etc.);
- Silos (not easily connected);
- Difficult to interpret and navigate;
- Time-delayed

- 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

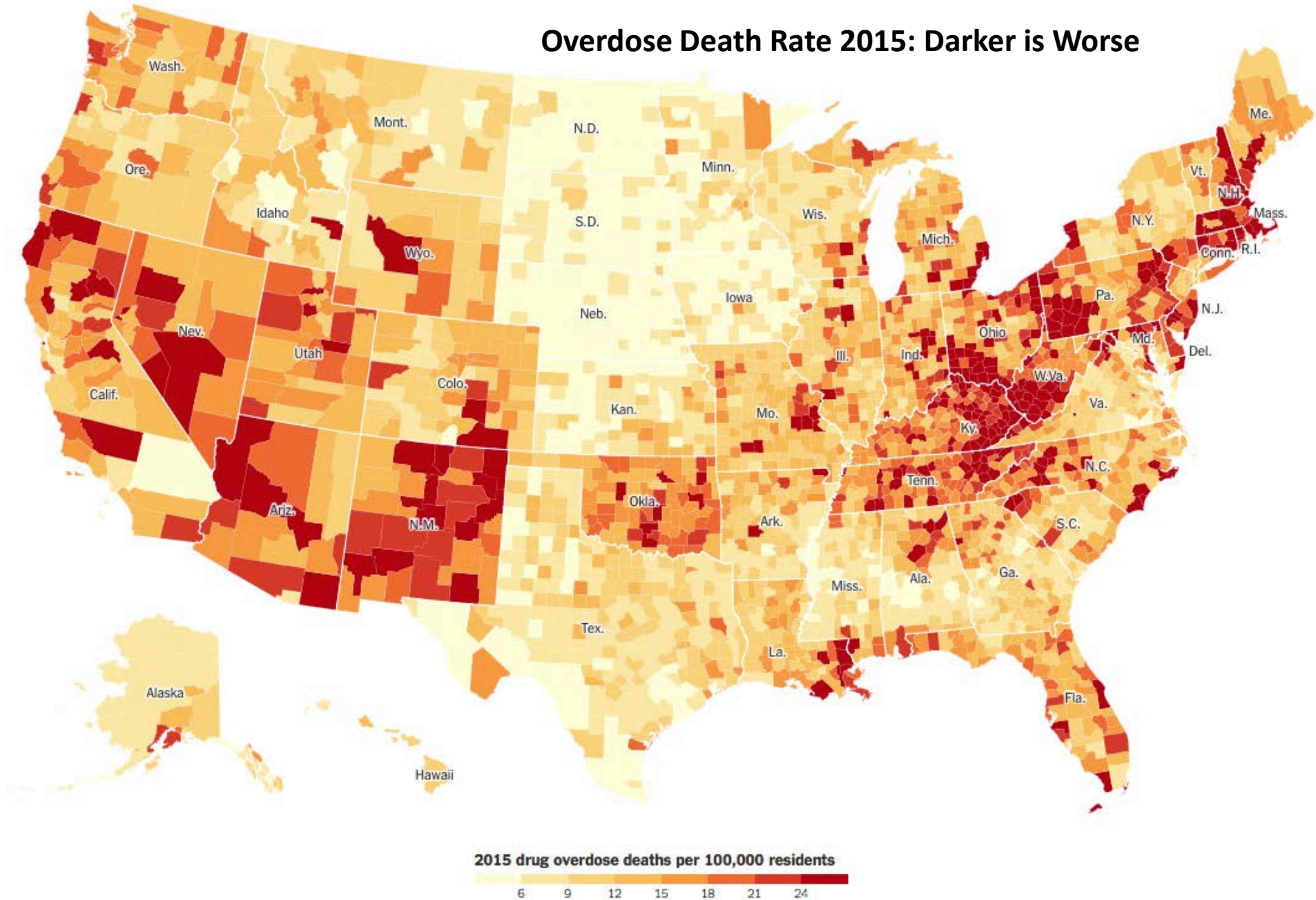
Topics


Prescribing
hospitalizations
effects
framework
laws
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?

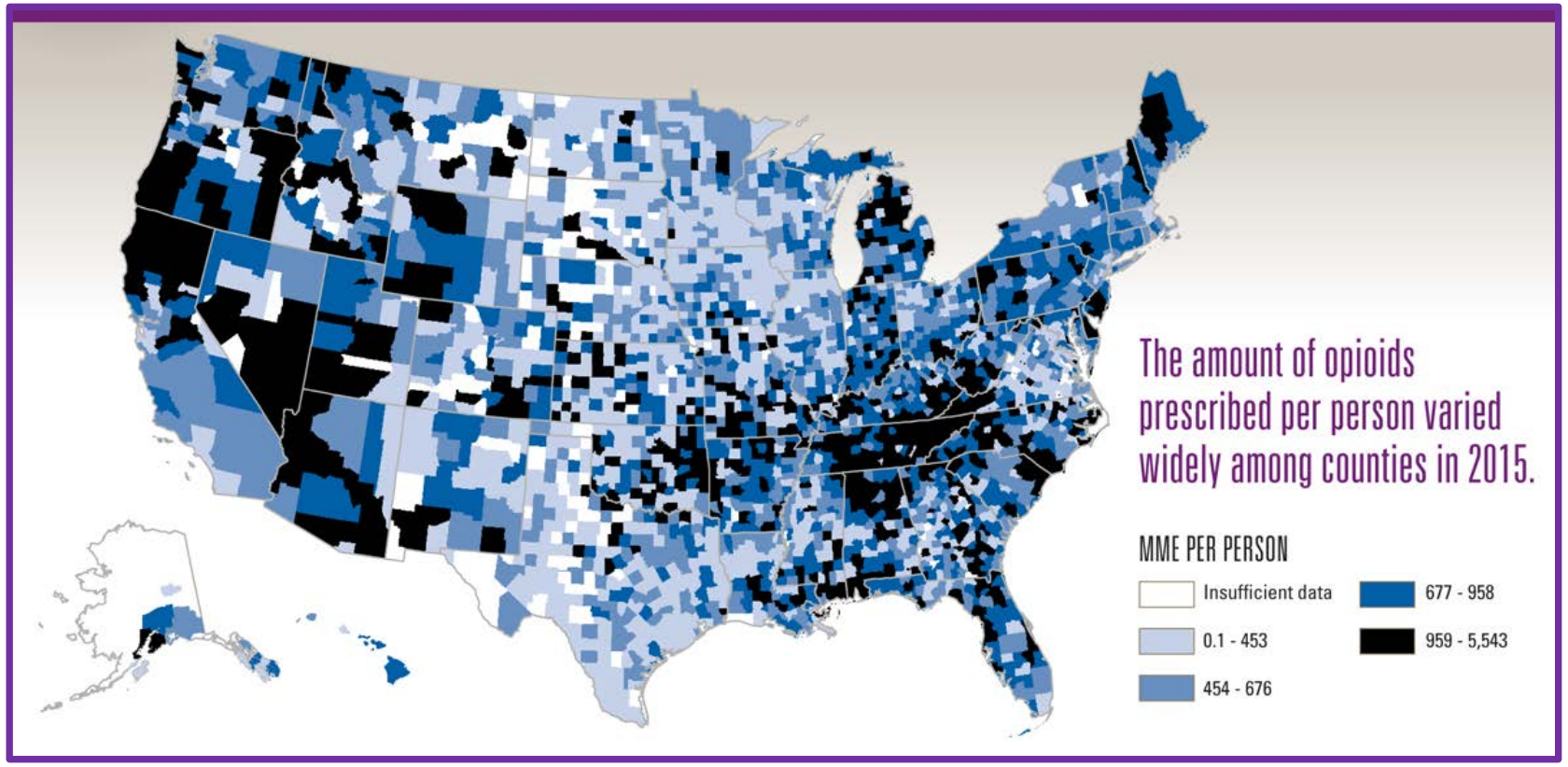
Overdose Death Rate 2015: Darker is Worse



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

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

Prescribing rates (Source: CDC.gov & New York Times)

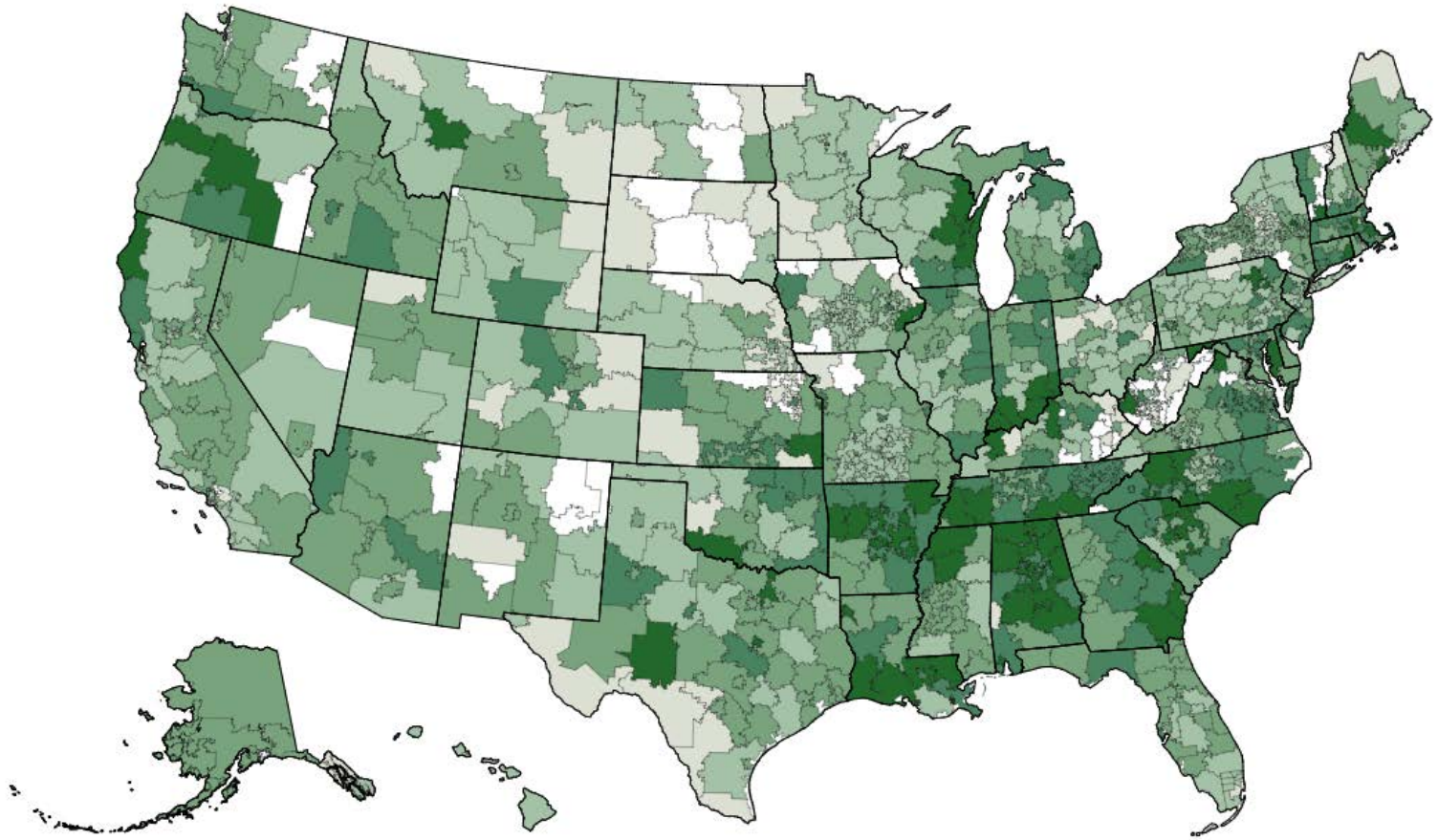


Variability in Drug Testing Rates

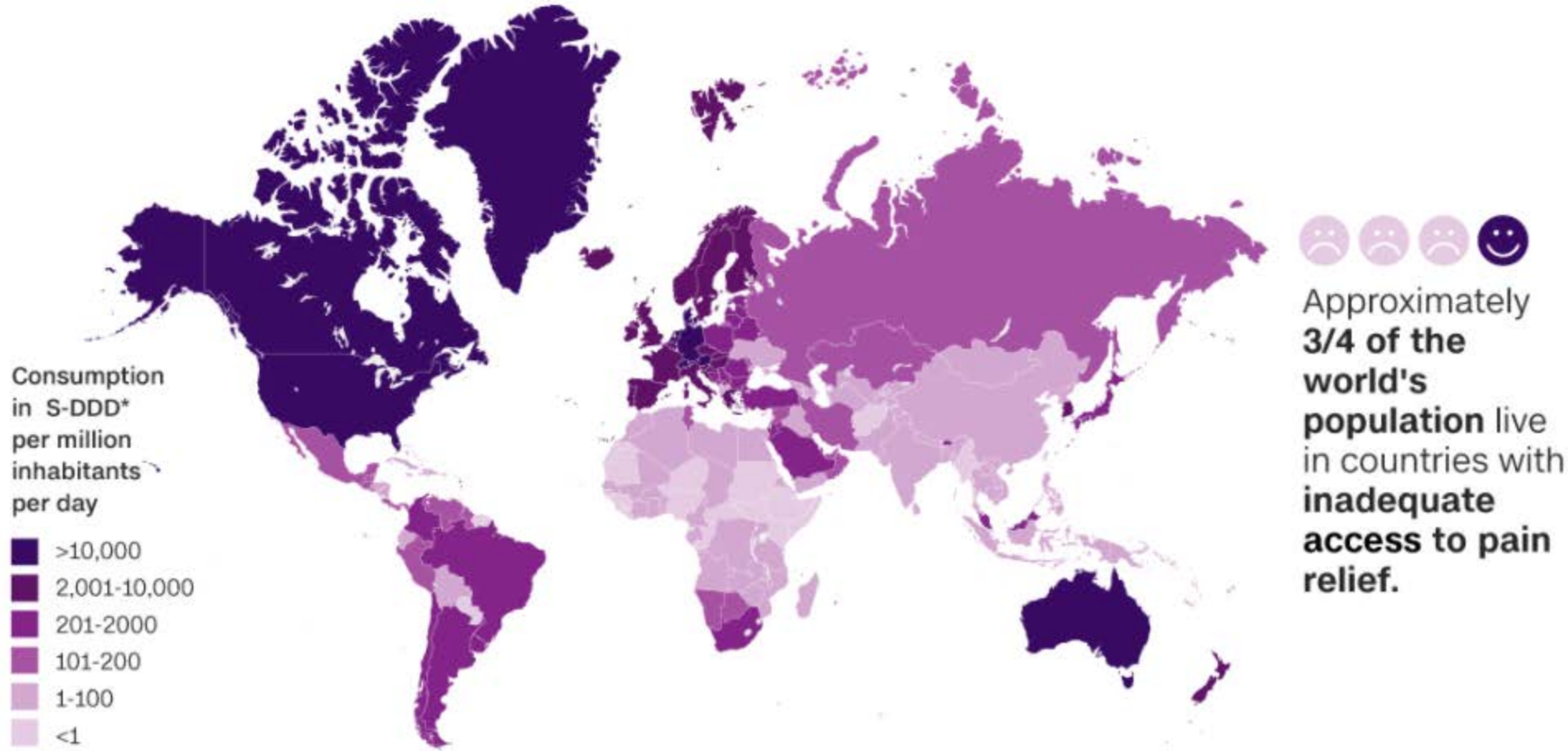
Overall positivity rate in 2016

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.

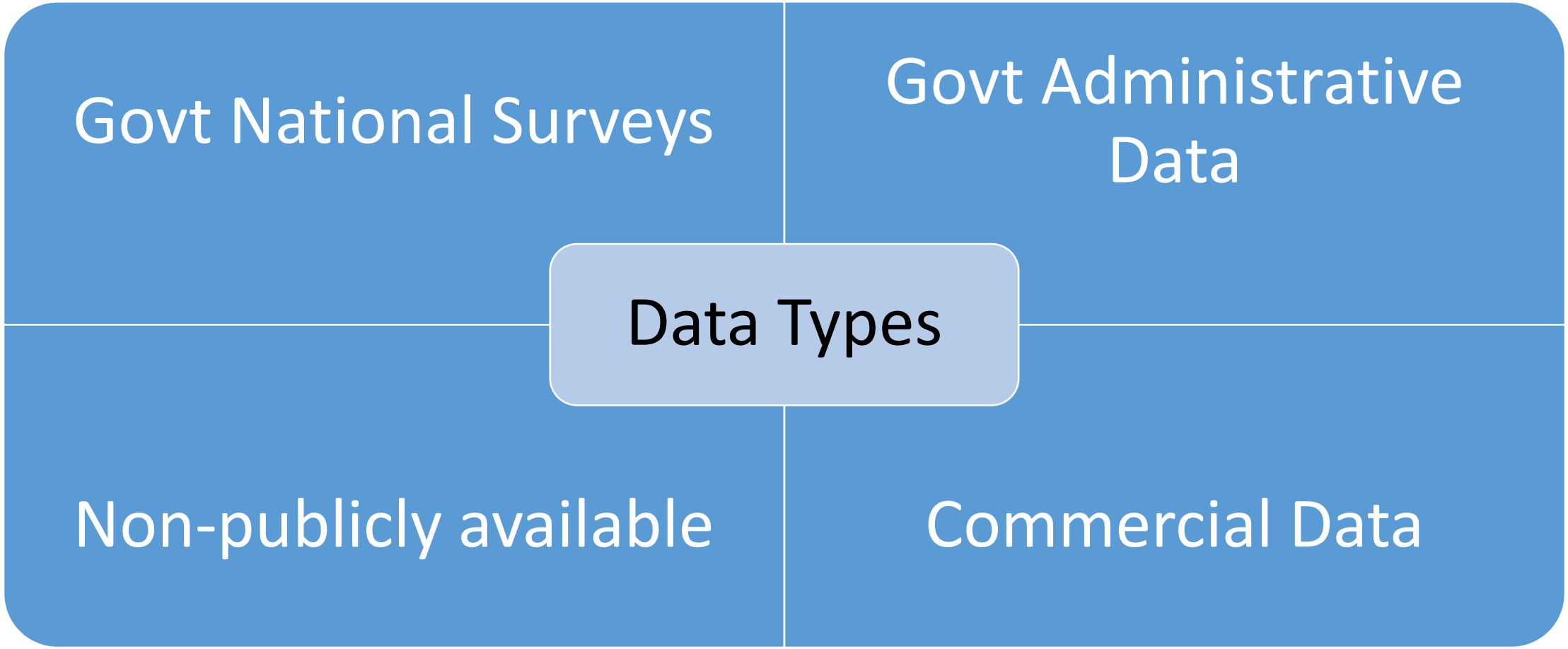


Global access to opioids for pain relief (2011—2013 average)



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

Sources: United Nations, International Narcotics Control Board
Note: Opioids defined as codeine, dextropropoxyphene, dihydrocodeine, fentanyl, hydrocodone, hydromorphone, ketobemidone, morphine, oxycodone, pethidine, tilidine and trimeperidine.
*Sold Defined Daily Doses


Govt National Surveys
Govt Administrative Data
Data Types
Non-publicly available
Commercial Data

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

Example Survey: Physician Visits (NAMCS)

Ambulatory Health Care Data

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

What's New

Data Products

- 2015 NHAMCS Emergency Department summary tables [PDF – 676 KB] (3/2018)
- 2015 NHAMCS Emergency Department public use data file (11/2017)
- NAMCS – Community Health Centers Summary Tables

Records many patient & doc details

NATIONAL AMBULATORY MEDICAL CARE SURVEY
2015 PATIENT RECORD

Form Approved: OMB No. 0920-0234; Expiration date 12/31/2017

NOTICE – Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing burden to: CDC/ATSDR Information Collection Review Office, 1600 Clifton Road, MS D-74, Atlanta, GA 30333, ATTN: PRA (0920-0234).

Assurance of confidentiality – All information which would permit identification of an individual, a practice, or an establishment will be held confidential; will be used for statistical purposes only by NCHS staff, contractors, and agents only when required and with necessary controls; and will not be disclosed or released to other persons without the consent of the individual or establishment in accordance with section 308(d) of the Public Health Service Act (42 USC 242m) and the Confidential Information Protection and Statistical Efficiency Act (PL-107-347).

PATIENT INFORMATION

Patient medical record No.

Date of visit

Month | Day | Year: 2 0 1

ZIP Code *Enter "1" if homeless.*

Date of birth

Month | Day | Year

Age ☐
1 ☐ Years
2 ☐ Months
3 ☐ Days

Sex
1 ☐ Female – Is patient pregnant?
  1 ☐ Yes - *Specify gestation week – Gestation week refers to the number of weeks plus 2 that the offspring has spent developing in the uterus* → ☐
  2 ☐ No
2 ☐ Male

Ethnicity
1 ☐ Hispanic or Latino
2 ☐ Not Hispanic or Latino

Race – *Mark (X) all that apply.*
1 ☐ White
2 ☐ Black or African American
3 ☐ Asian
4 ☐ Native Hawaiian or Other Pacific Islander
5 ☐ American Indian or Alaska Native

Expected source(s) of payment for THIS VISIT – *Mark (X) all that apply.*
1 ☐ Private insurance
2 ☐ Medicare
3 ☐ Medicaid or CHIP or other state-based program
4 ☐ Workers' compensation
5 ☐ Self-pay
6 ☐ No charge/Charity
7 ☐ Other
8 ☐ Unknown

Tobacco use
1 ☐ Not current
2 ☐ Current
3 ☐ Unknown

Prior tobacco use
1 ☐ Never
2 ☐ Former
3 ☐ Unknown

BIOMETRICS/VITAL SIGNS

Height ☐ ft ☐ in
OR

Weight ☐ lb ☐ oz
OR

Temperature ☐
1 ☐ °C
2 ☐ °F

Blood pressure – *If multiple measurements are taken, record the last measurement.*
Systolic ☐ Diastolic ☐

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.

		New	Continued
(1)		1 ☐	2 ☐
(2)		1 ☐	2 ☐
(3)		1 ☐	2 ☐
(4)		1 ☐	2 ☐
(5)		1 ☐	2 ☐
↓		1 ☐	2 ☐
		1 ☐	2 ☐
(30)		1 ☐	2 ☐

Codebook gives tons of details of the survey

Table of Contents

B. DRUG ENTRY CODES AND NAMES IN NUMERIC ORDER

00002 TAMIFLU
00004 LIDODERM PATCH
00008 VIACTIV
00009 BICILLIN L-A
00012 IPOL
00013 MYCOPHENOLATE MOFETIL
00019 HAWTHORN
00022 PREVNAR
00032 EXCEDRIN MIGRAINE
00036 MAALOX PLUS
00039 SONATA
00040 SOY
00042 PROTONIX
00047 DONNATAL ELIXIR
00048 MOBIC
00052 SILDENAFIL CITRATE
00169 KETOROLAC TROMETHAMINE
00175 PEDIA-POP
00176 PREDNISOLONE ACETATE
00177 SALT WATER
00184 KEPPRA
00187 OPHTHALMIC DROPS
00192 SPECTRAVITE
00195 TEMOZOLOMIDE
00198 ENOXAPARIN SODIUM
00206 ACTONEL
00208 CELECOXIB
00209 GLUCOVANCE
00213 PANTOPRAZOLE SODIUM
00216 REGAIN MEDICAL NUTRITION BAR
00217 TEMODAR
00218 CARBAMIDE PEROXIDE

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
- For GIS data
  - FIPS codes, zipcode to county crosswalks, lat & lon

Data provided as csv files with column names

ED2010 ×

```
1020431023009601900l1-9-902001000000309900640180940610990Z-9040702020119351-0009-0009011039179-9  -9  7823-7820-8252500000000000110000000000000000000000110000000001
1050860200001200600l2-9-9021100000002-009-09-09-09-09-09-9-904000201021640159300-0009011038796-9  -9  99676-9   -9   00-7-7000001000000000000000000000000000000000000
1050342030000514380l1-9-9-900000000-9101012002813809309202-9030002020114200-0009-0009010-7-9  -9  -9  49392-9   -9   00-7-7000001111111111000000000101110000000011
1050581141004104000l1-9-9010100000002097009801413808809301-9030802020010200190511430101O-7-9  -9  -9  311--781997803900000000000111111111110101000010011110000014
1070800040001802190l1-9-9021100000002099006801515205110O-9-9040802020010351106O1-0009011039064-9  -9  9134-6959-6829-000000000001111111100000000000000000000000006
1070841547002203180l2-9-9021100000002098006101410704209902-9031002020116051106021590001O-7-9  -9  -9  5694256400-9   0000-7000001000000000000000000000000000000000000
1040861034010701970l1-9-9021100000002098007401610205210001-9020002020010050101001440001103-9  -9  -9  0389-995915990-000000000001111111111001110000100111111000015
1030800015004500520l2-9-9011100000002098006501812506609602-9020002020110300-0009-0009010-7-9  -9  -9  43491-9   -9   01-7-7100000000000000000000000000000000000000000
1040932030001000200l2-9-9011100000002097013001811207609502-9030502020315900154510009010-7-9  -9  -9  5609--9   -9   00-7-7010000111111111001010000100111101000013
1060430315000100500l2-9-9020000100005097009501813208010002-9020002020014150411100009010-7-9  -9  -9  25002-9   -9   00-7-7000010100001000000000000000000000000001
1020362310000601850110203021000000001098008701912607310002-9040002020023700120001220101O-7-9  -9  -9  3061--9   -9   00-7-7000002111111111000010000101110000000012
1010960200000100330l2-9-9010100000002097007l-0908104809801-902-80202-81050125100-0009010-7-9  -9  -9  4111-4589--9   0000-7010000111111111000100000000110000000010
1030881551001601620l2-9-9011100000002098008501616107510002-9031002020119451121001940101103885984909-9  959018470-719410000000000011000000000000000000001111100000O
1010891715000101490l1-9-9021100000002098009101814007109Z-9-902-802020119151-0009-000901103885984909-9  8208--9   -9   00-7-7100000111111111001010000100111100000013
1060002250003501320l2-9-9020000100005098011Z-09-09-0910002-9030002020010801144000009010-7-9  -9  -9  46619-9   -9   00-7-7000002000000000000000000000000000000000000
1010791200004101430l1-9-9021100000002097006702016404709702-9020002010119151-0009-0009011-8-9  -9  -9  83500-9   -9   00-7-7010010111111111000010000101110000000012
1010721912000003180l1-9-9021100000002098007201618009609802-9020002010010501102O0-0009010-7-9  -9  -9  7865078652-9   0001-7100000111111111001110000100111110000014
```

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 −
  - Survey Instruments
  - Notices for NAMCS and NHAMCS Public Use Data File Users

Ambulatory Health Care Data

CDC > > NCHS > >Ambulatory Health Care Data > >Questionnaires, Datasets, and Related Documentation

Datasets and Documentation

Downloadable Data Files

Notice: Currently, NAMCS public-use files for 1993-2015 and NHAMCS public-use files for 1992-2015 contain sample design variables in masked form. The initial release of the 2000-2015 public-use files includes masked sample design variables. We re-released the 1993-99 NAMCS and 1992-99 NHAMCS files to include these variables. For re-released files, file names and layouts are essentially the same, but

Not secure | ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/NAMCS

Index of /pub/Health_Statistics/NCHS/Datasets/NAMCS

[parent directory]

Name	Size	Date Modified
NAMCS00.EXE	1.3 MB	4/4/02, 7:00:00 PM
NAMCS01.EXE	1.2 MB	8/28/03, 8:00:00 PM
NAMCS02.EXE	1.5 MB	9/29/04, 8:00:00 PM
NAMCS03.exe	1.6 MB	7/18/05, 8:00:00 PM
NAMCS04.exe	1.6 MB	3/19/06, 7:00:00 PM
NAMCS05.exe	1.8 MB	5/16/07, 8:00:00 PM
NAMCS06.exe	2.1 MB	3/14/11, 8:00:00 PM
NAMCS07.exe	2.5 MB	3/14/11, 8:00:00 PM
NAMCS08.exe	2.2 MB	3/13/12, 8:00:00 PM
NAMCS09.exe	2.5 MB	3/13/12, 8:00:00 PM
NAMCS2010.exe	2.5 MB	6/28/12, 8:00:00 PM

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

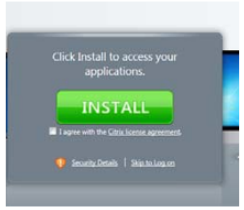
Instructions for opening the data file in Stata & completing answers to HW

(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 IUanware. If you would like to use IUAnyware follow the instructions below. If not, skip to the Stata commands.

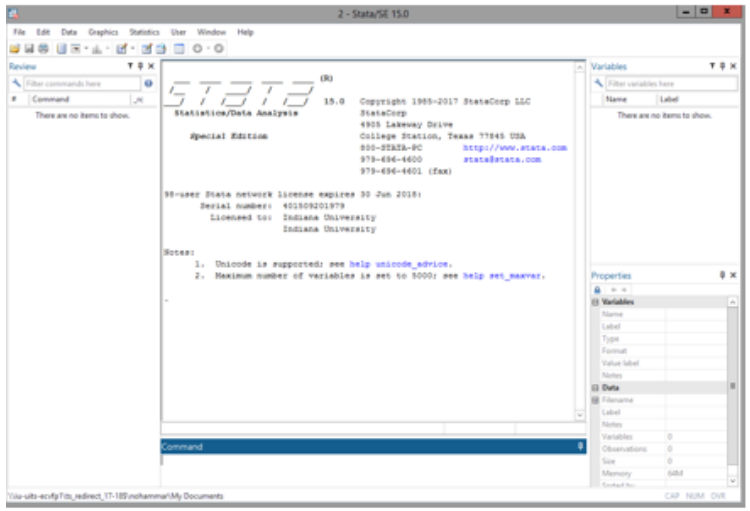
Once you have downloaded the ".dta" file, you will go to IUanyware and open up the Stata program

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 IUanywware, 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.



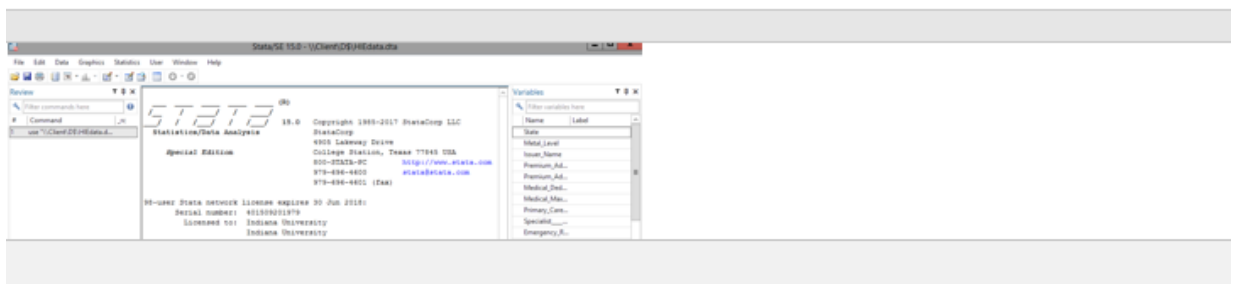
After you have logged into IUanyware, go to Stata under Apps

screen like this



To open the file, go to “File”, ”Open” and open the saved “.dta” data file.
For opening files in IUanyware: please see https://kb.iu.edu/d/bbcl

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"sum" (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

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

SEARCH

CDC A-

CDC WONDER FAQ Help Contact Us WONDER Search

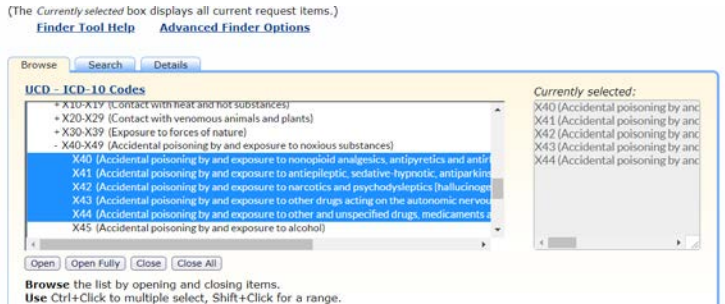
About Multiple Cause of Death, 1999-2016

Request Form | Results | Map | Chart | About

Multiple Cause of Death Data | Dataset Documentation | Other Data Access | Data Use Restrictions | How to Use WONDER

Note: *Any use of these data implies consent to abide by the terms of the data use restrictions.*

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. resident
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, 113
selected causes of death, 130 selected causes of infant death, drug and alcohol related causes of death, injury intent and injury mechanism categories), p
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
urbanization categories for county of residence, place of death, month and week day of death, and whether an autopsy was performed.



Multiple Cause of Death, 1999-2016 Results

HWmarch27

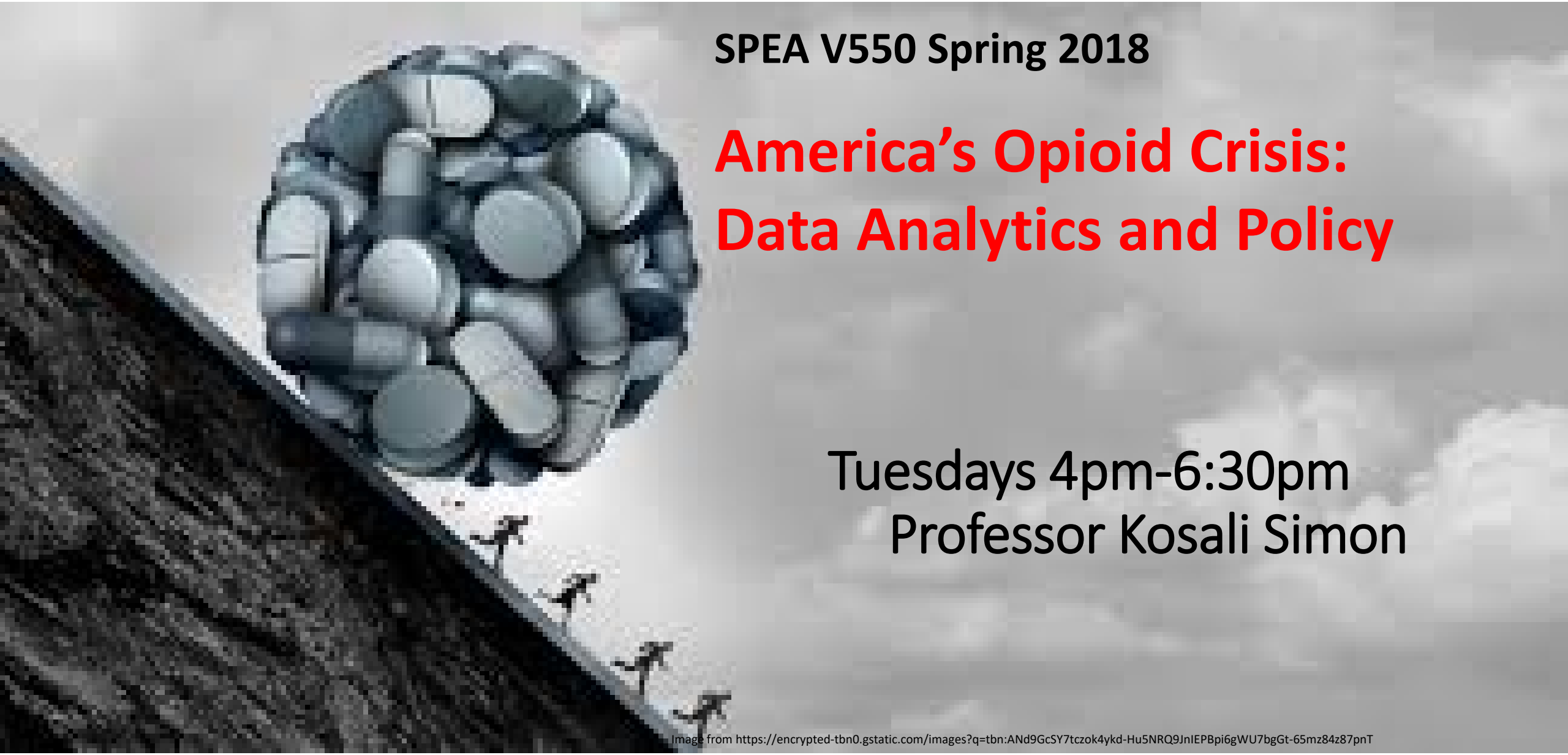
Request Form | Results | Map | Chart | About

Multiple Cause of Death Data | Dataset Documentation | Other Data Access | Help for Results | Printing Tips | Help with Exports | Save | Export | Reset

Quick Options | More Options | Top | Notes | Citation | Query Criteria

State	Year	Deaths	Population	Crude Rate Per 100,000
Indiana (18)	1999	65	6,044,969	1.1
Indiana (18)	2000	53	6,080,485	0.9
Indiana (18)	2001	71	6,127,760	1.2
Indiana (18)	2002	64	6,155,967	1.0
Indiana (18)	2003	128	6,196,638	2.1

Next week's homework from



SPEA V550 Spring 2018

America's Opioid Crisis: Data Analytics and Policy

Tuesdays 4pm-6:30pm
Professor Kosali Simon

Image from https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSY7tczok4ykd-Hu5NRQ9JnIEPBpi6gWU7bgGt-65mz84z87pnT

Example: Dashboard with Download Option

HCUP Fast Stats - Opioid-Related Hospital Use

HCUP Fast Stats provides easy access to the latest HCUP-based statistics for health information topics. This section provides trends in opioid
national and State levels.

HCUP Home | Databases | Tools & Software | Reports | Fast Stats | News & Events | Purchase HCUP Data | Technical Assistance | Inno

Opioid-Related Hospital Use

itial Selection:

ational Level or State: National * * ED data available

haracteristic: All stays or visits - rate

spital Setting: Inpatient Stays ED Visits

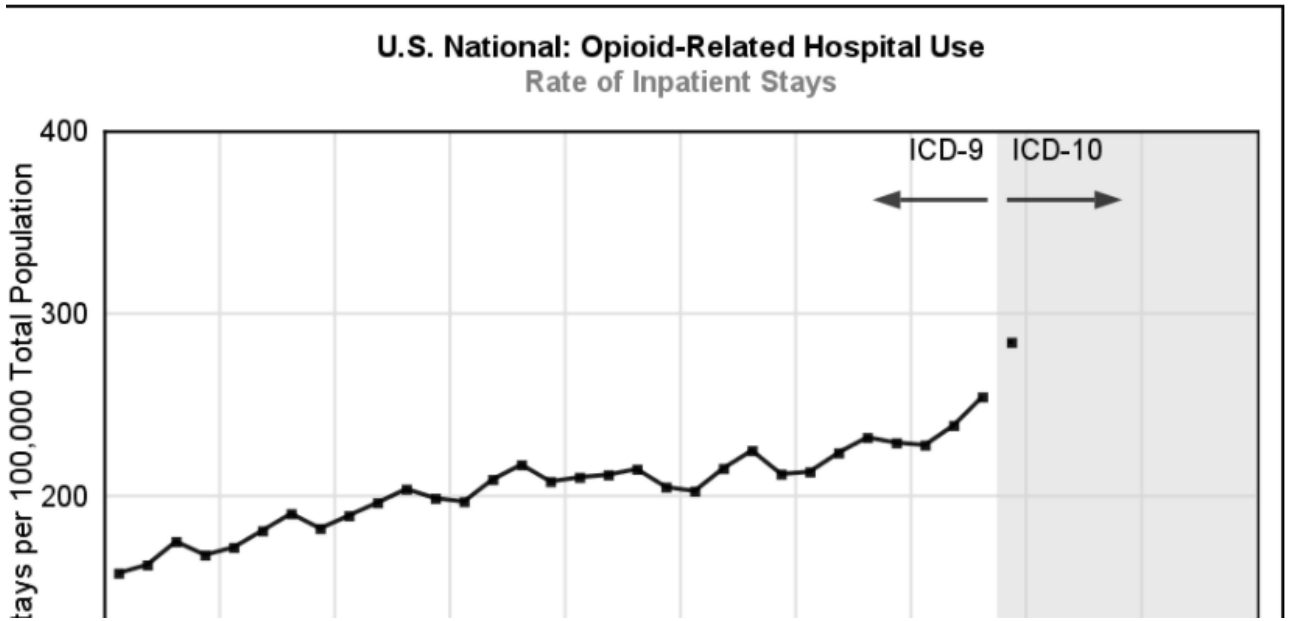
Compare to:

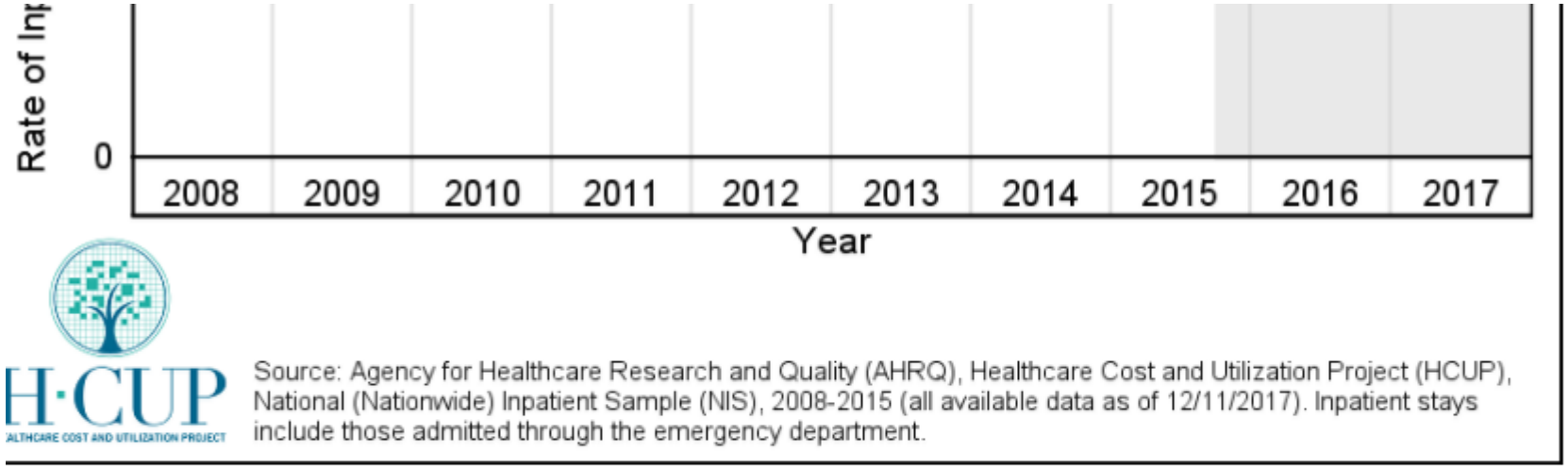
National Level or S

Characteristic:

Hospital Setting:

Refresh





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.

- Show Underlying Data Tables
- Show Data Notes & Methods
- Show Data Export Options
- HCUP Fast Stats FAQs

1. Click this Excel Export link to request the download.
2. Follow the prompts to save a copy of the Excel file to yo

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…

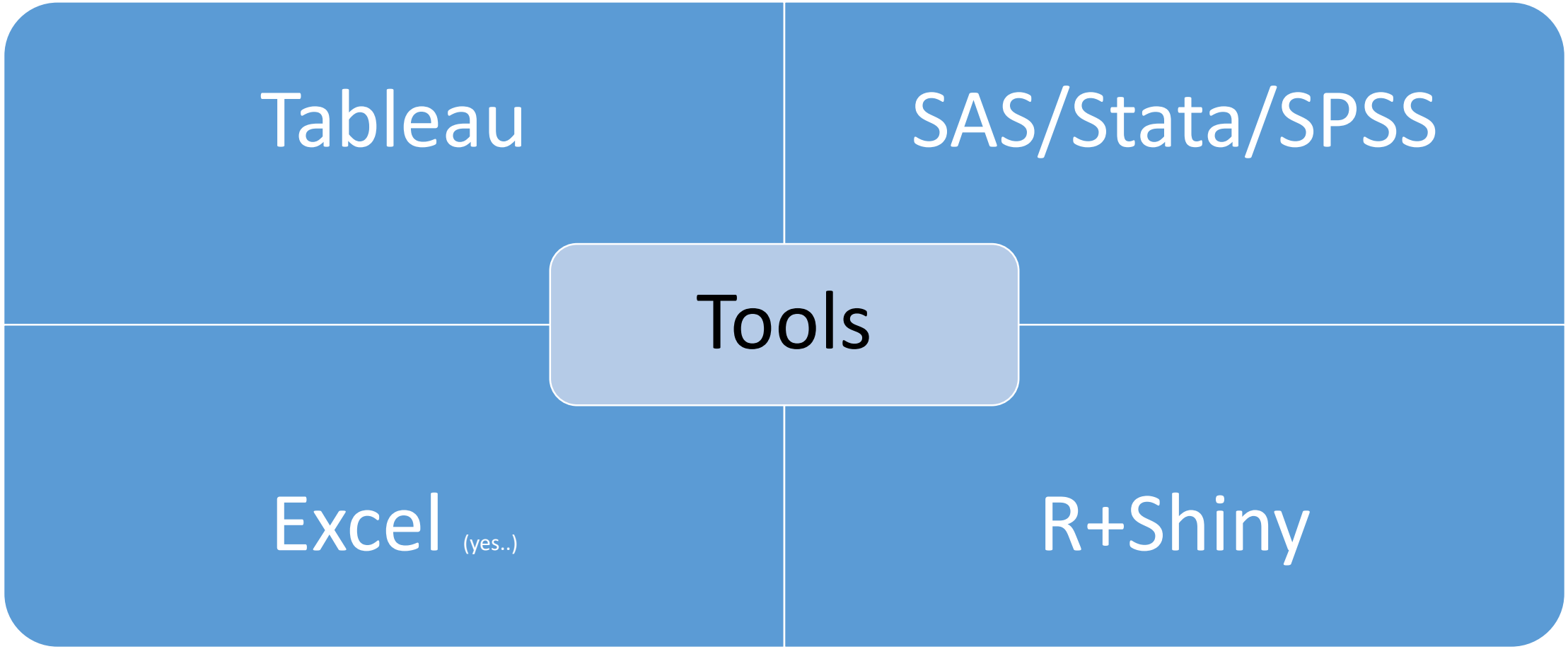
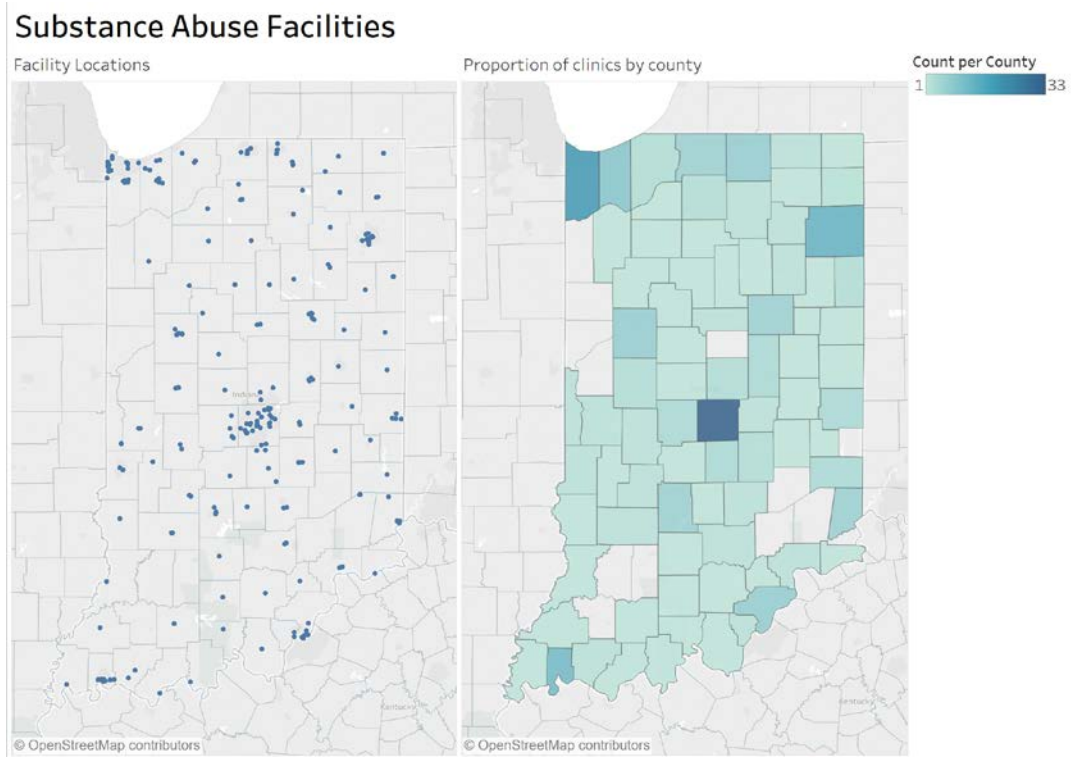


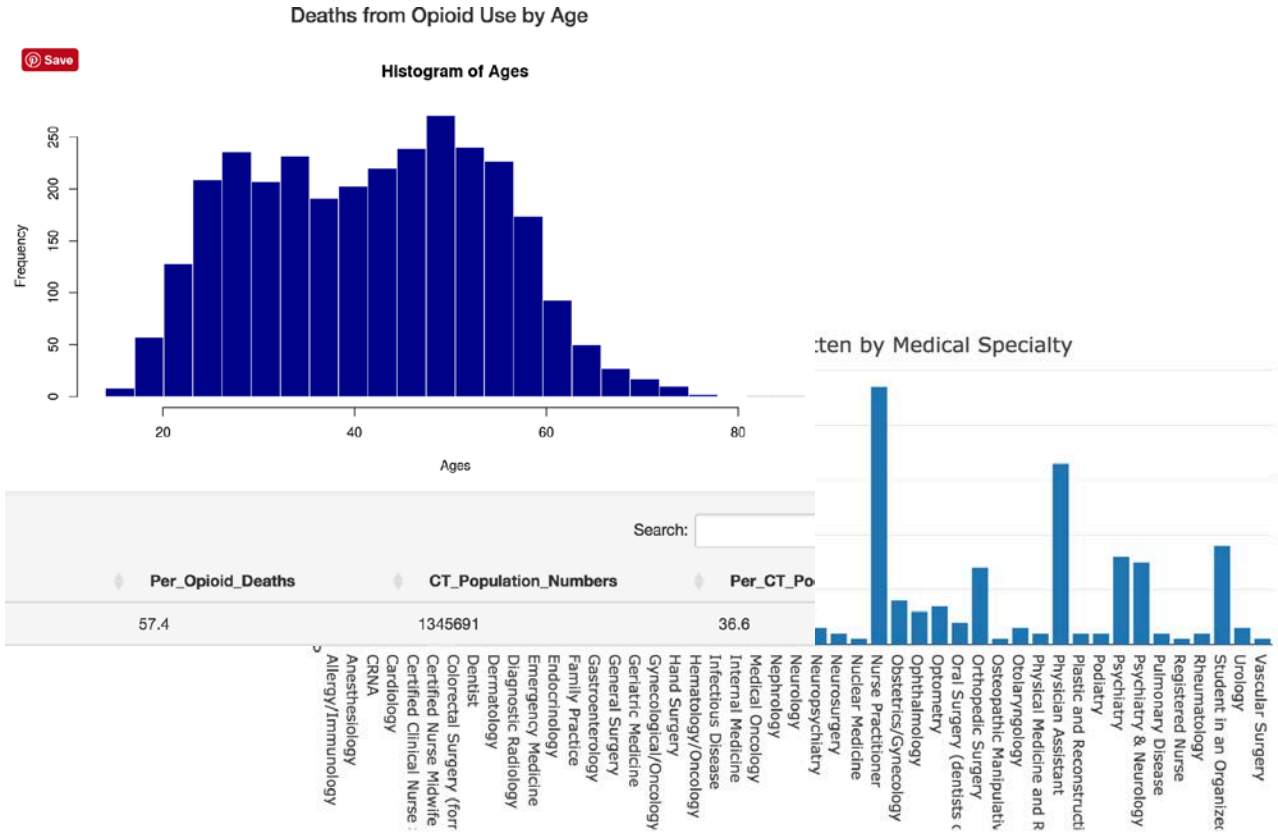
Tableau
SAS/Stata/SPSS
Tools
Excel (yes..)
R+Shiny

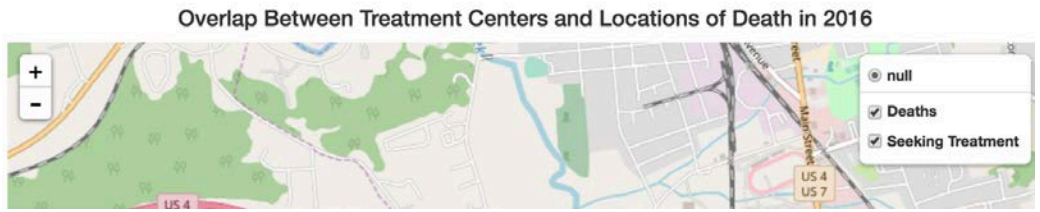
TABLEAU



https://public.tableau.com/profile/jivitesh.poojary1464#!/vizhome/Opioidaddictionmedicationcentermap/Dashboard1?publish=yes

SHINY + R





https://kcritelli.shinyapps.io/Shiny_Project/

Example of integration into research

Journal of Health Economics 56 (2017) 222–233

Contents lists available at ScienceDirect

Journal of Health Economics

journal homepage: www.elsevier.com/locate/econbase

Macroeconomic conditions and opioid abuse

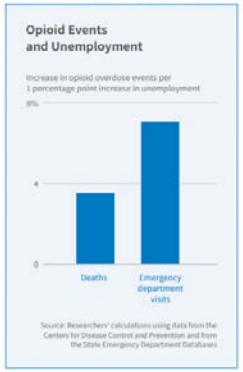
Alex Hollingsworth [a], Christopher J. Ruhm [b,c], Kosali Simon [a,c,*]

[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

NBER
Bulletin on Aging and Health
NATIONAL BUREAU OF ECONOMIC RESEARCH
2017, No. 3

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 recently garnered significant attention posits that a decline in economic opportunities for some segments of the population has led to a rise in "deaths 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 its aftermath highlights the importance of understanding the connection between economic conditions and drug deaths.



Researchers Alex Hollingsworth, Christopher Ruhm, and Kosali Simon take up this question in their working paper **Macroeconomic Conditions and Opioid Abuse** (NBER Working Paper No. 23192). The researchers examine how deaths and emergency department (ED) visits due to opioids and other drugs are related to shocks to the local unemployment rate.

The researchers use data on drug poisoning deaths derived from the CDC's Multiple Cause of Death files for the period 1999 to 2014. These data cover all deaths in the U.S. and include state and county of residence. They also use information from the Healthcare Cost and Utilization Project of the Agency for Healthcare Research and Quality to compile data on drug-related ED visits at the county and state level. While comprehensive national ED visit data

(continued on page 2)

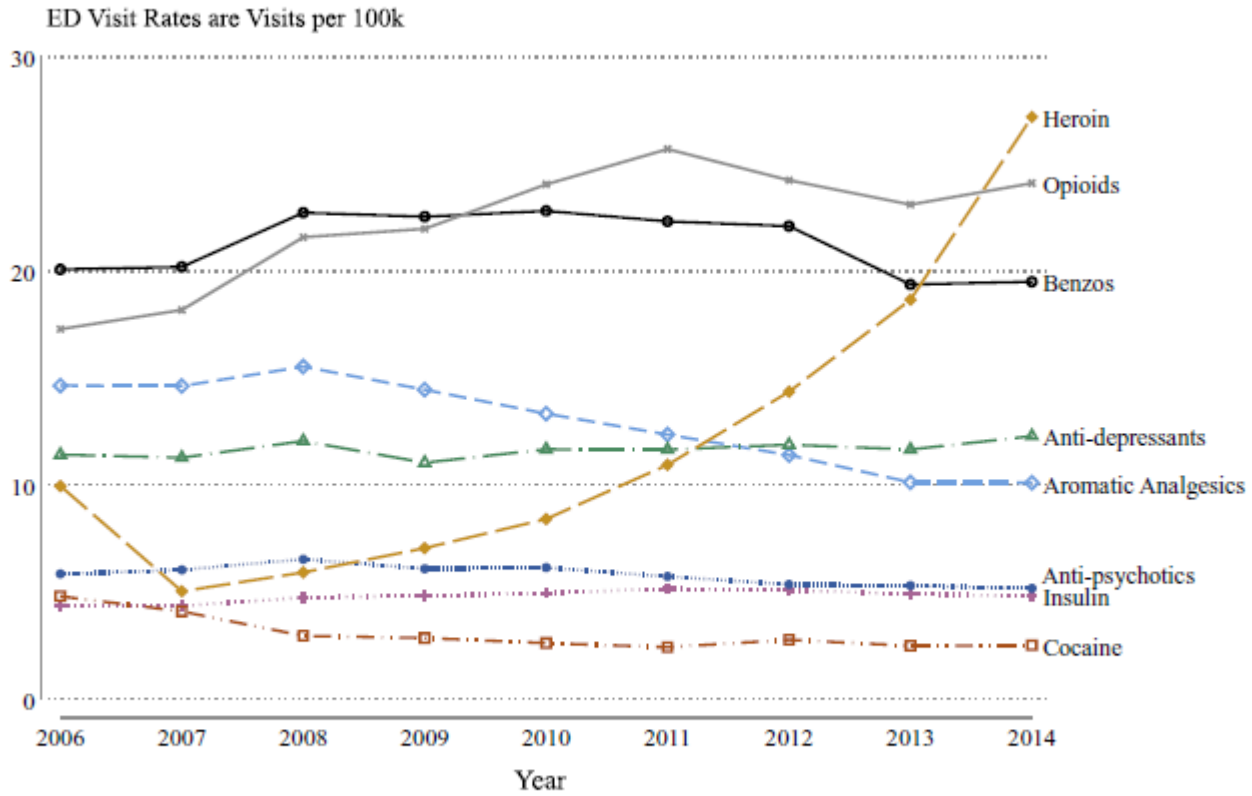


Fig. 4. Drug overdose ED visit rate by major drug type, 2006–2014.

tions 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.

	(1)	(2)	(3)
Opioid death rate per 100k			
Unemployment rate [0–100]	0.22***	0.19***	0.19***
	(0.05)	(0.04)	(0.05)
Mean of dependent variable	5.35	5.35	5.35
Observations	50,148	50,148	50,148
Drug death rate per 100k			
Unemployment rate [0–100]	0.29***	0.18***	0.36***
	(0.08)	(0.05)	(0.07)
Mean of dependent variable	10.77	10.77	10.77
Observations	50,148	50,148	50,148
Opioid overdose ED visit rate per 100k			
Unemployment rate [0–100]	0.57**	1.10***	0.95***
	(0.26)	(0.30)	(0.28)
Mean of dependent variable	13.54	13.54	13.54
Observations	1873	1873	1873
Drug overdose ED visit rate per 100k			
Unemployment rate [0–100]	0.71	1.54	1.19
	(0.88)	(1.04)	(1.20)
Mean of dependent variable	97.52	97.52	97.52
Observations	1873	1873	1873
County fixed-effects	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes
County specific time trends	No	Yes	No
State-by-year fixed-effects	No	No	Yes

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..

INDIANA UNIVERSITY

Social Science Research Commons

ABOUT US | NEWS & EVENTS | SERVICES | SEMINARS & WORKSHOPS | FUNDING | RESOURCES | SOCI

General Topics

- About the IU Grand Challenge +
- Community Resources +
- Data, Trends, and Statistics +
- History: How Did We Get Here? +
- Assessing the Economic Impact +
- Physicians, Patients, and Prescribing +
- The Biology of Addiction and Treatment +
- Treatments and Harm Reduction +
- Faces of the opioid crisis +

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)

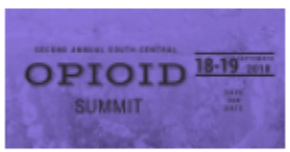
Data USA

Policy and the Opioid Epidemic

- Policy Approaches (General) +
- Harm Reduction and Treatment Policies (Needle Exchanges, Naloxone, and MAT) +
- Policy Through Lawsuits +
- Governmental Regulation +

ADDICTIONS POLICY NEWS AND EVENTS

Browse recent news and announcements about upcoming events of interest.



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