

Data Access in the American Opioid Epidemic

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July 2nd, 2020

Main point of this talk:

1. The US opioid epidemic is an illustrative example of how data access determines our knowledge of a problem, and biases our research.
2. Better data access during the epidemic would have saved lives.
3. Therefore, you should care about this kind of data access, especially as people who work with data.

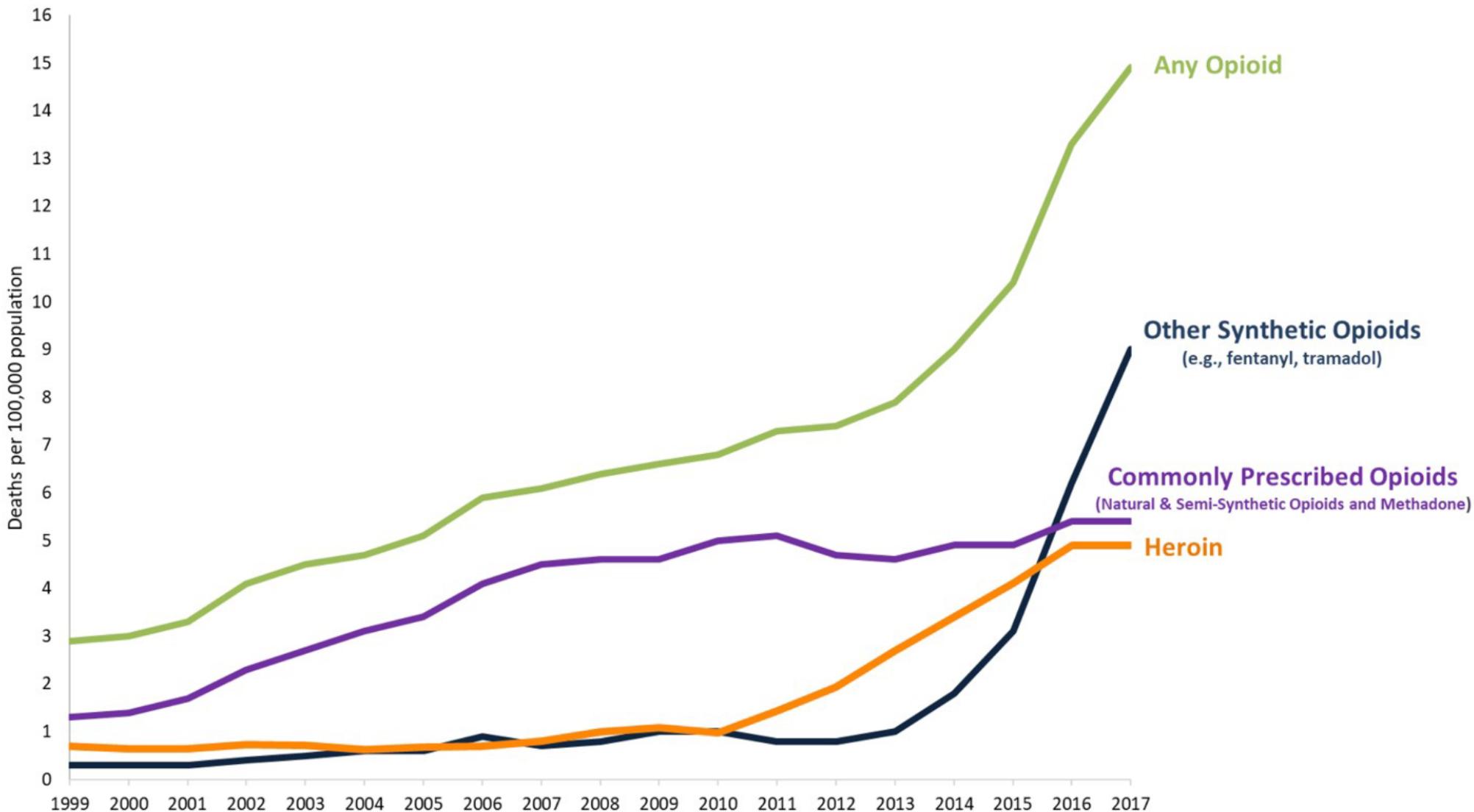
Plan:

1. Brief summary of 20 years of epidemic
2. Examination of the evidence of events 2000-2010, then exploration of data access issues 2000-2010.
3. Repeat for 2012-2015.
4. Repeat for 2015-present.
5. Conclusions.

1st wave:

1. Number of prescriptions increased
 - Esp. for long-acting opioid pain relievers for chronic pain
2. Opioids are incredibly dangerous
 - Lead to addiction and overdose
 - The higher the dose, the higher the risk
 - The longer the prescription, the higher the risk
3. Long, potent prescriptions were dispensed 2000-2012

Overdose Death Rates Involving Opioids, by Type, United States, 2000-2017



SOURCE: CDC/NCHS, National Vital Statistics System, Mortality. CDC WONDER, Atlanta, GA: US Department of Health and Human Services, CDC; 2018.
<https://wonder.cdc.gov/>.

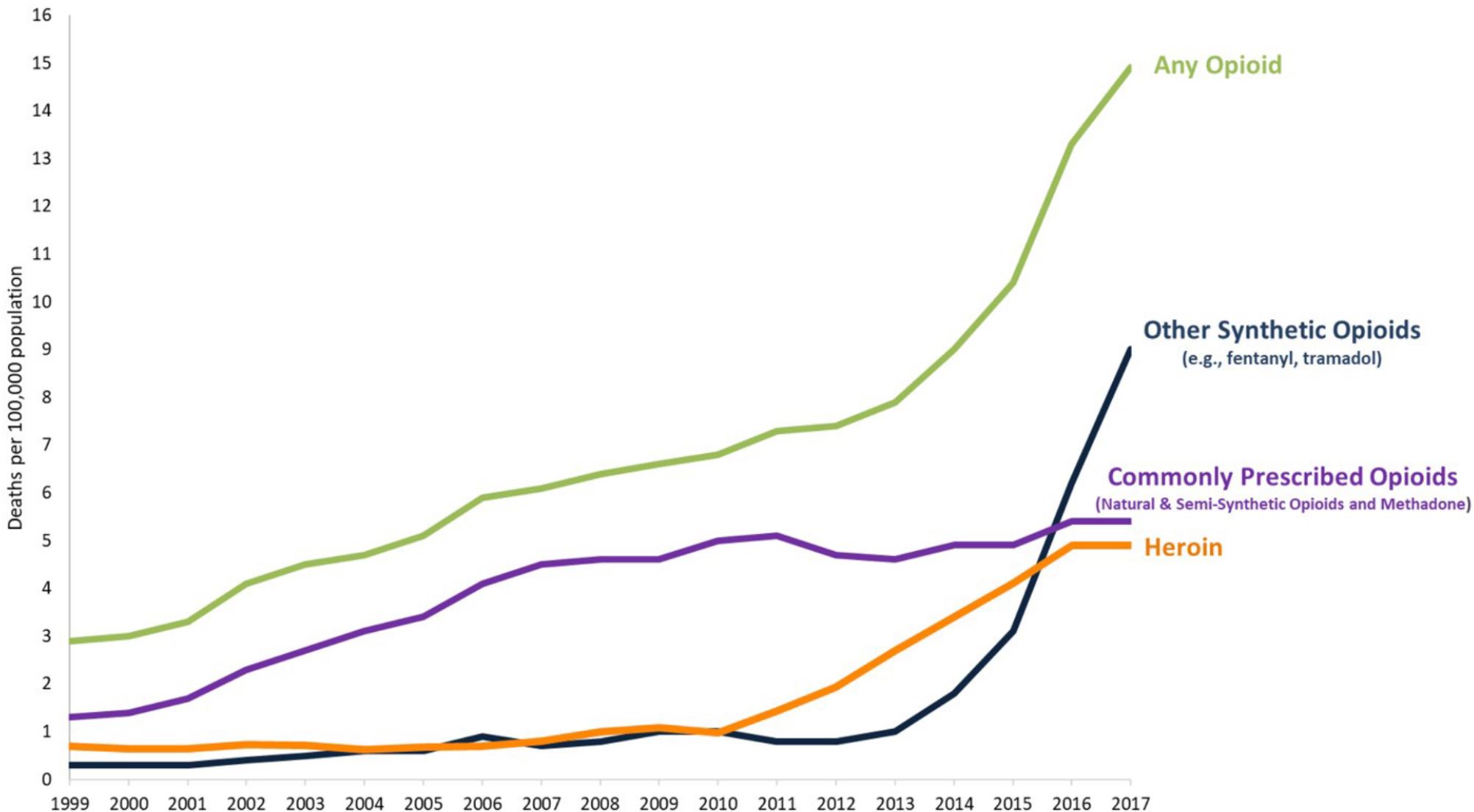
2nd wave:

1. Access to prescriptions became limited
2. Heroin became much more easy to obtain
3. Some people who used prescription opioids switched to heroin,
and there was a plain increase in heroin use
4. This caused the increase in heroin deaths

3rd wave:

1. Fentanyl introduced into US drug supply
2. Not easy to dilute => variability in opioid potency
3. Drugs that are too potent cause overdose

Overdose Death Rates Involving Opioids, by Type, United States, 2000-2017

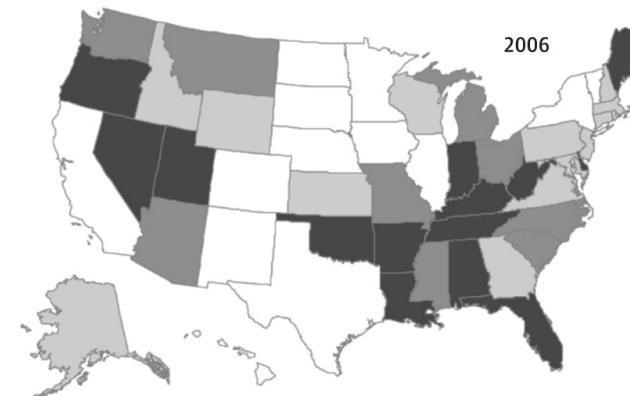


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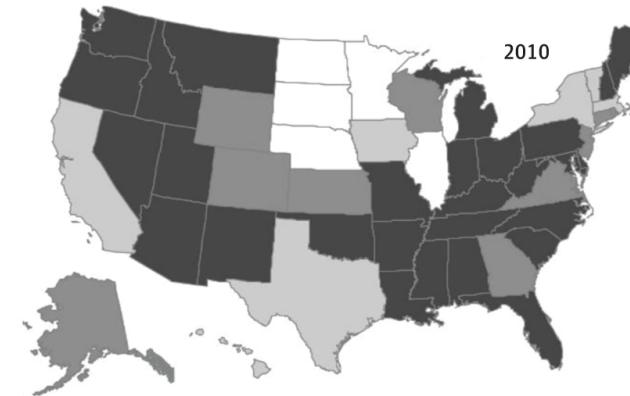
1st Wave Data

A Annual amount of opioids prescribed

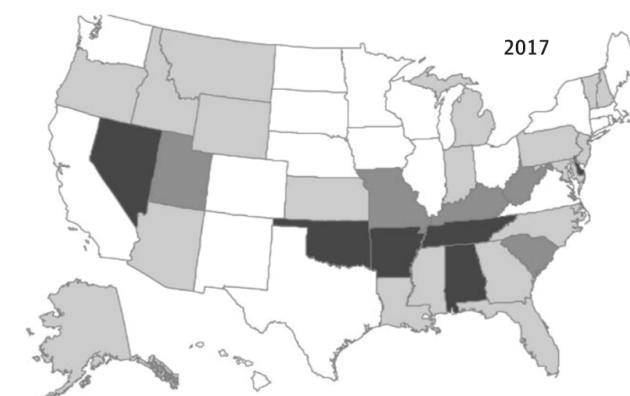
MME per person
□ <500 □ 500 to <650 □ 650 to <750 □ ≥750



2006

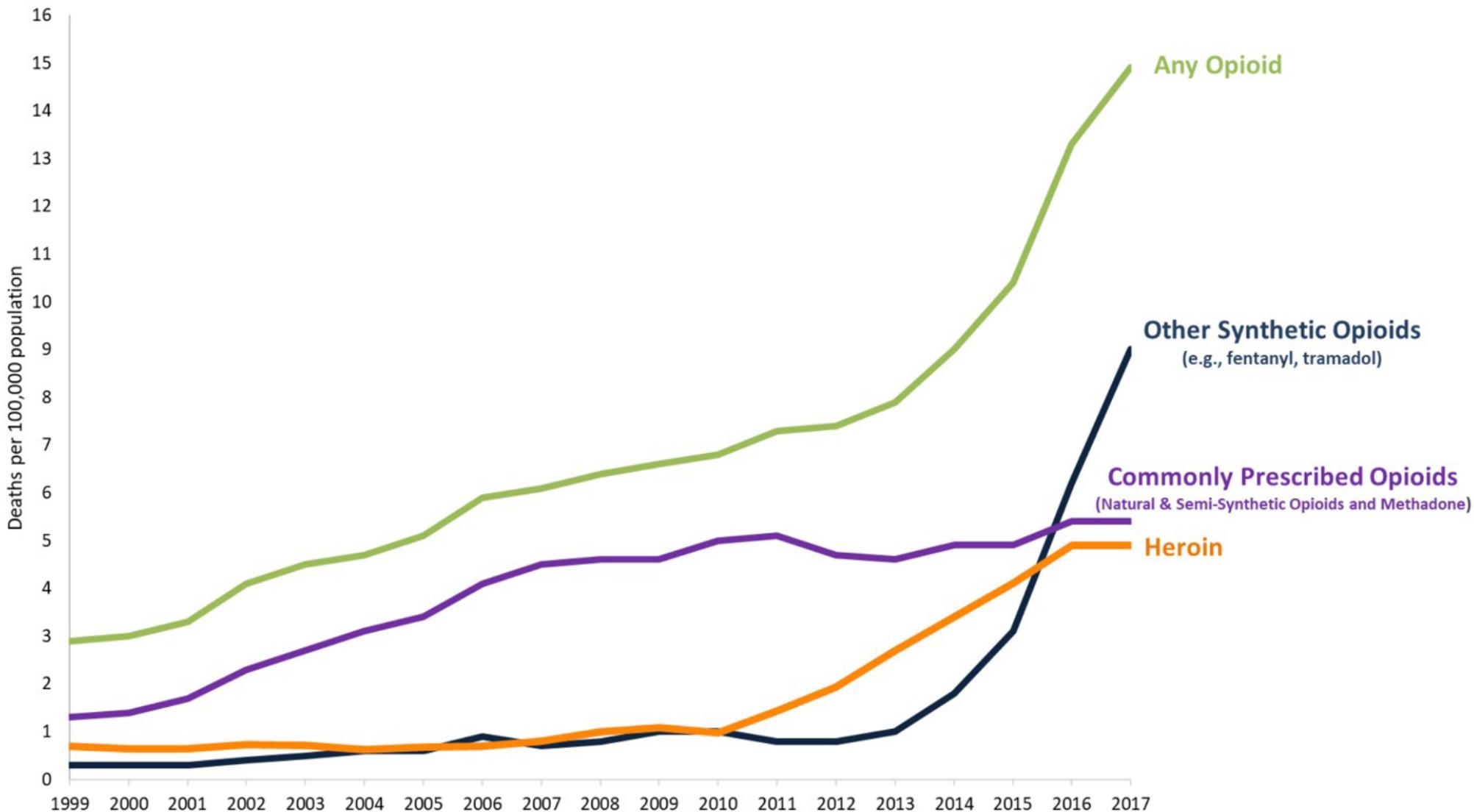


2010



2017

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Data Source:	Evidence:
1. National Center for Health Statistics All-Cause Mortality Data	Deaths from prescription increase
2. US Drug Enforcement Administration Data containing records of all prescriptions	Prescriptions increasing, correlated w deaths
3. DAWN: Drug Abuse Warning Network Surveillance Program	Emergency room visits for overdose correlated w prescriptions
4. Medicaid administrative data	<ul style="list-style-type: none"> a) Addiction treatment and neonatal abstinence usage increased w prescriptions b) Prescriptions leading to harm
5. Purdue trial on addictive potential of OxyContin (followed people with headaches)	Direct evidence of risk of death and addiction
6. Independent randomized controlled trials of OxyContin and other opioids for chronic pain	Direct evidence of risk of death and addiction
7. Qualitative research of opioid use	Small-scale evidence of risks of death and addiction
8. News reports	Evidence of illegal use of opioids and diversion
9. Original randomized controlled trial data produced by Purdue, used in the FDA approval	Showed OxyContin was not effective in relieving pain (a preliminary clue towards its risk of addiction)
10. Purdue database of prescribing	Evidence of increasing prescriptions, and evil
11. Purdue safety study	Evidence of potential for OxyContin to be abused

Data Source:	Evidence:	Available:
National Center for Health Statistics All-Cause Mortality Data	Deaths from prescription increase	Immediate
US Drug Enforcement Administration Data containing records of all prescriptions	Prescriptions increasing, correlated w deaths	Summer 2019
DAWN: Drug Abuse Warning Network Surveillance Program	Emergency room visits for overdose correlated w prescriptions	Immediate
Medicaid administrative data	<ul style="list-style-type: none"> a) Addiction treatment and neonatal abstinence usage increased w prescriptions b) Prescriptions leading to harm 	Immediate
Purdue trial on addictive potential of OxyContin (followed people with headaches)	Direct evidence of risk of death and addiction	2019
Independent randomized controlled trials of OxyContin and other opioids for chronic pain	Direct evidence of risk of death and addiction	2000-2005; ongoing
Qualitative research of opioid use	Small-scale evidence of risks of death and addiction	Immediate
News reports	Evidence of illegal use of opioids and diversion	Immediate
Original randomized controlled trial data produced by Purdue, used in the FDA approval	Showed OxyContin was not effective in relieving pain (a preliminary clue towards its risk of addiction)	2019

Summary:

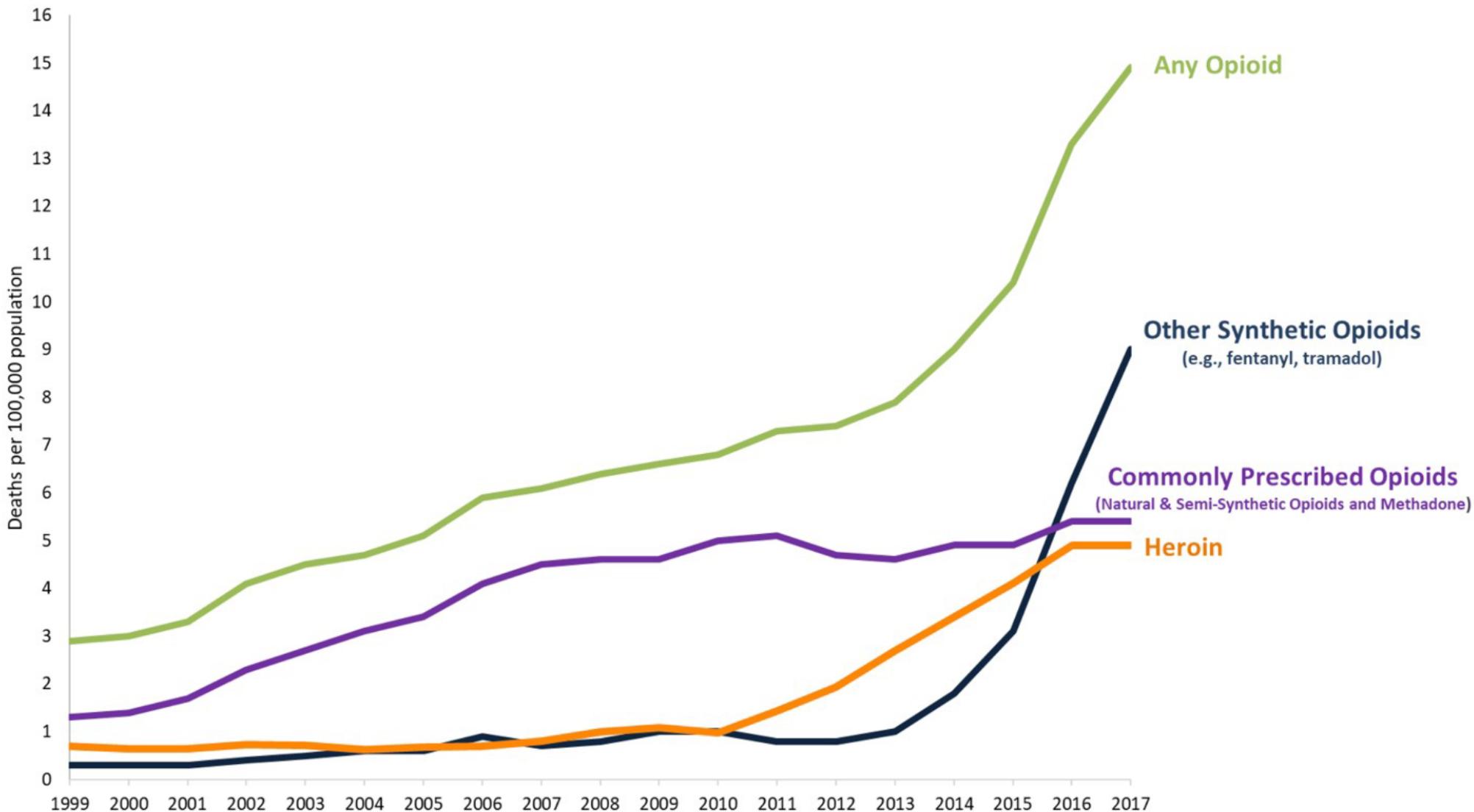
1. Long delays in release of data
 - No data on national prescription rates
 - Missing preliminary data on danger of long-acting prescription opioids
2. "Addicts" and diversion were blamed for epidemic
3. Earlier data access would have clarified truth sooner

2nd Wave: Heroin

Interventions that Reduced Prescription Opioid Use:

1. Education programs for medical professionals
2. Prescription drug monitoring programs
3. Law enforcement programs
4. Development of abuse-deterrent opioids

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<https://wonder.cdc.gov/>.

Data Source:**Evidence:**

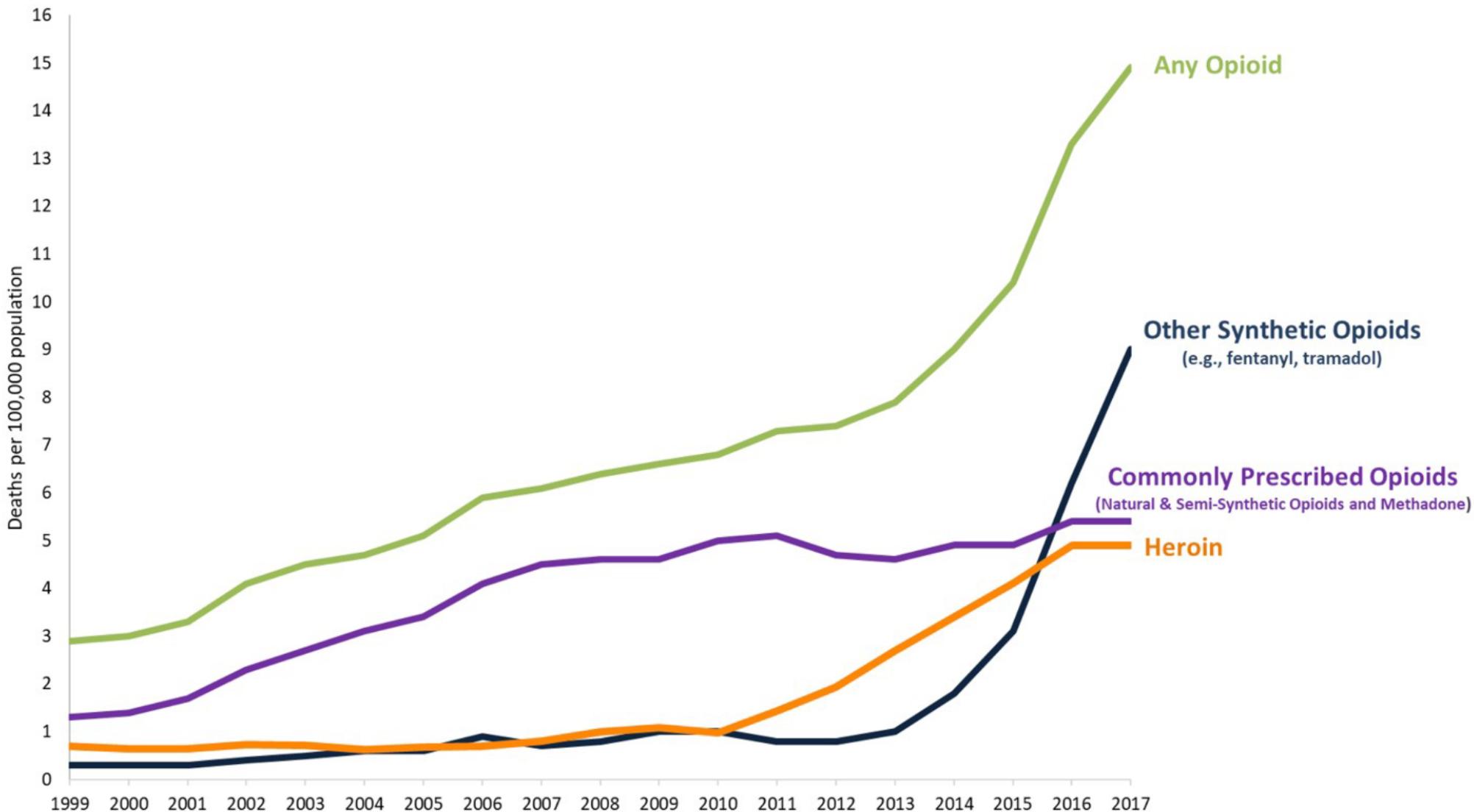
1. National Center for Health Statistics All-Cause Mortality Data	Deaths from heroin increase
2. Drug Enforcement Administration Prescription Data	Prescription rates levelled off
3. Researched Abuse, Diversion, and Addiction-Related Surveillance (RADARS) System	Illegal prescription drug use levelled off
4. Drug Enforcement Administration Reports and Summary Statistics	<ul style="list-style-type: none">a. Heroin supply increasedb. price droppedc. potency increasedd. supply sources changed
5. Medicaid data	<ul style="list-style-type: none">a) emergency room visits for heroin overdose increaseb) emergency room visits for related illnesses (HIV, Hepatitis, abscesses) increase
6. Substance Abuse and Mental Health Services Administration National Survey on Drug Use and Health	150% increase in heroin use 2007-2013
7. Qualitative interview data of heroin users	Reports of becoming addicted to prescription opioids before using heroin

Summary:

1. Access to prescription opioids was restricted
2. Heroin supply increased, so did heroin potency
3. Drug Enforcement Administration data determines our knowledge

3rd Wave: Fentanyl

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<https://wonder.cdc.gov/>.

Data Source:**Evidence:**

1. CDC Wonder All-Cause Mortality Data Deaths from fentanyl increase

2. Medicaid Data

Fentanyl prescriptions not present in fentanyl deaths

3. Drug Enforcement Administration Summary Reports

Fentanyl supply information

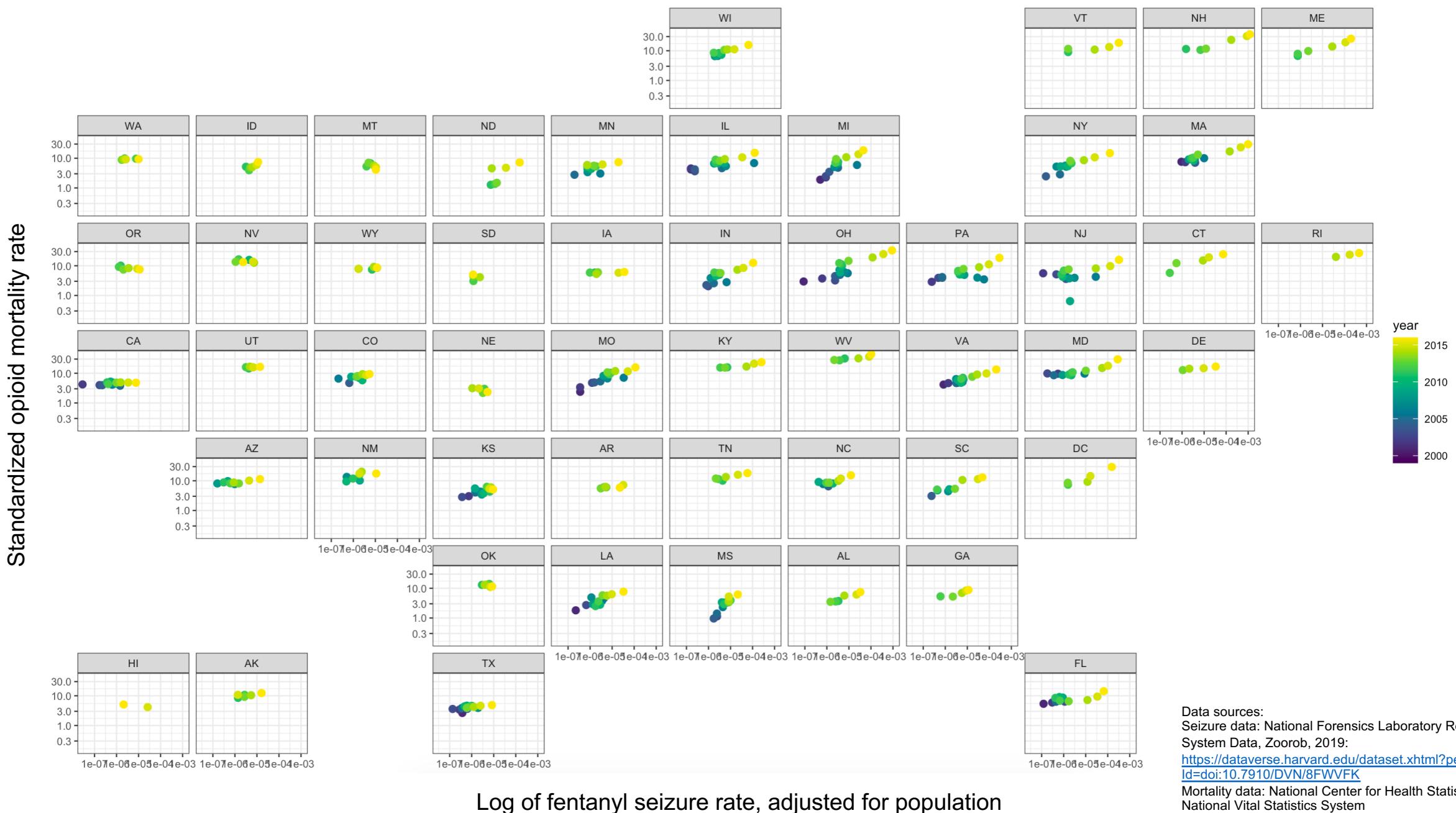
4. Qualitative research

Accounts of fentanyl in the drug supply

5. DEA National Forensic Laboratory Reporting System

Detailed fentanyl supply information: fentanyl seizures correlated with death

Overall Opioid Mortality Rate vs. Adjusted Fentanyl Seizure Rate by State and Year, 2000-2015



Data sources:
Seizure data: National Forensics Laboratory Reporting System Data, Zoorob, 2019:
<https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/8FWVFK>
Mortality data: National Center for Health Statistics, National Vital Statistics System

Conclusion:

Better data access might have kept people from dying at every stage of the opioid epidemic.

R Packages for Government Data Access:

wonderapi: "User Friendly Access to CDC Wonder API"

arcos: "Load ARCos Prescription Data Prepared by the Washington Post (DEA opioid prescription data)"

tidycensus: "Load US Census Boundary and Attribute Data as 'tidyverse' and 'sf'-Ready Data Frames"

cancensus: "Access Canadian Census in a programmatic way following good tidy data practices"

The end.

Package used to create mortality vs. seizures plot:
(thanks to Dr. Monica Alexander for introducing me to this)

geofacet

This R package provides geofaceting functionality for ggplot2. Geofaceting arranges a sequence of plots of data for different geographical entities into a grid that strives to preserve some of the original geographical orientation of the entities. It's easiest to describe with examples. See below.

<https://hafen.github.io/geofacet/>

