The social, structural, and environmental drivers of the opioid overdose crisis

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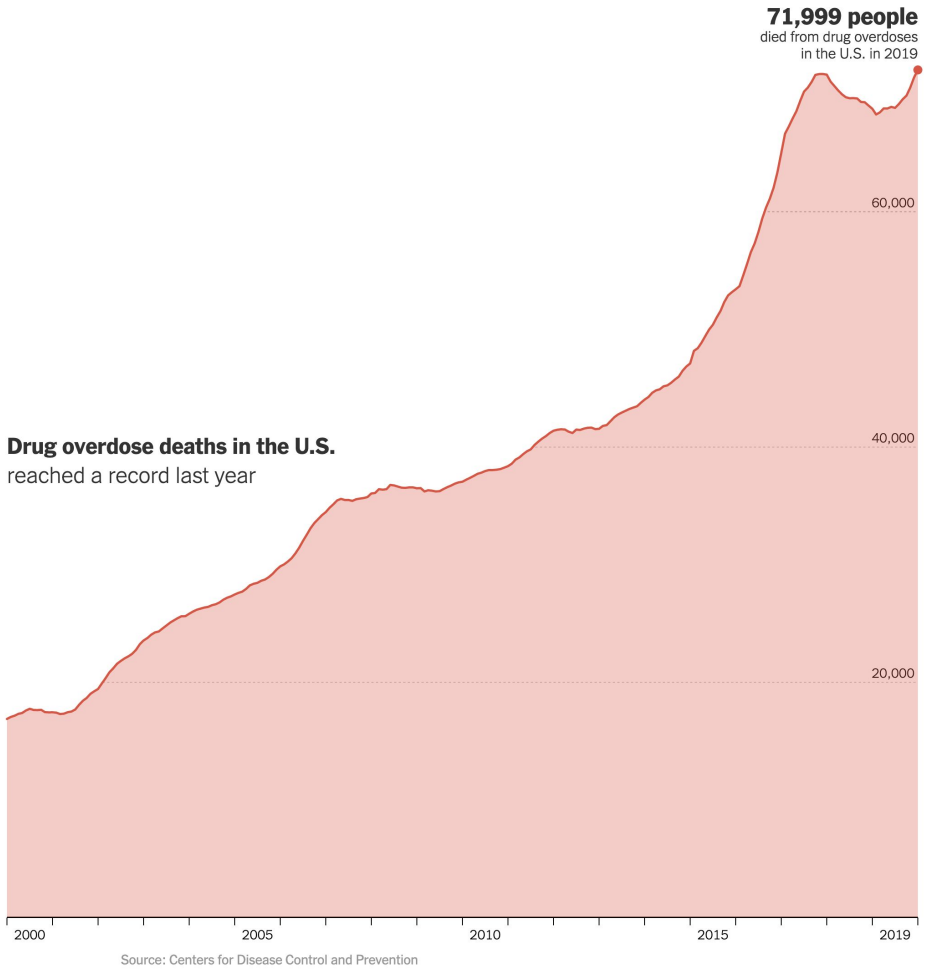


Source: https://www.nytimes.com/interactive/2020/07/15/upshot/drug-overdose-deaths.html

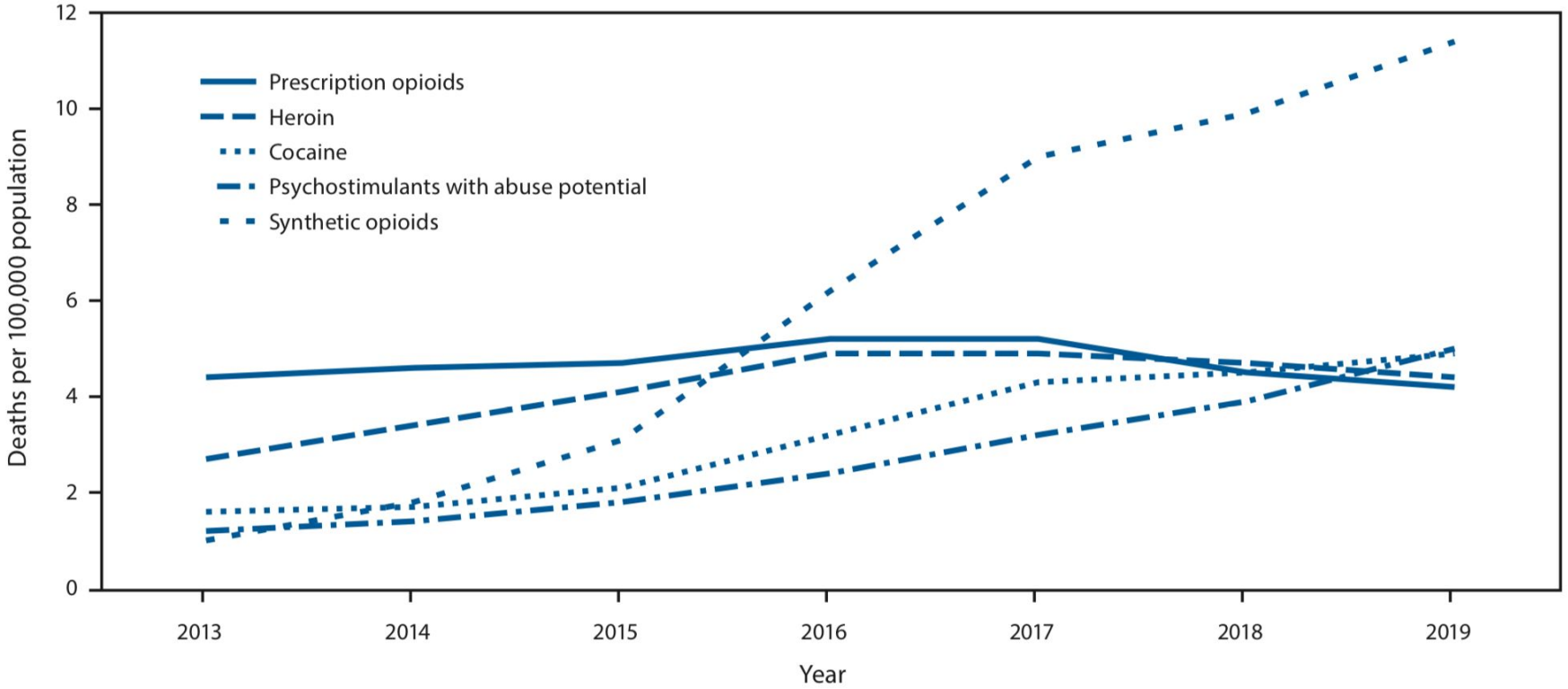
Every day, almost 200 Americans die of a drug overdose

Mortality from drug overdose has never been higher

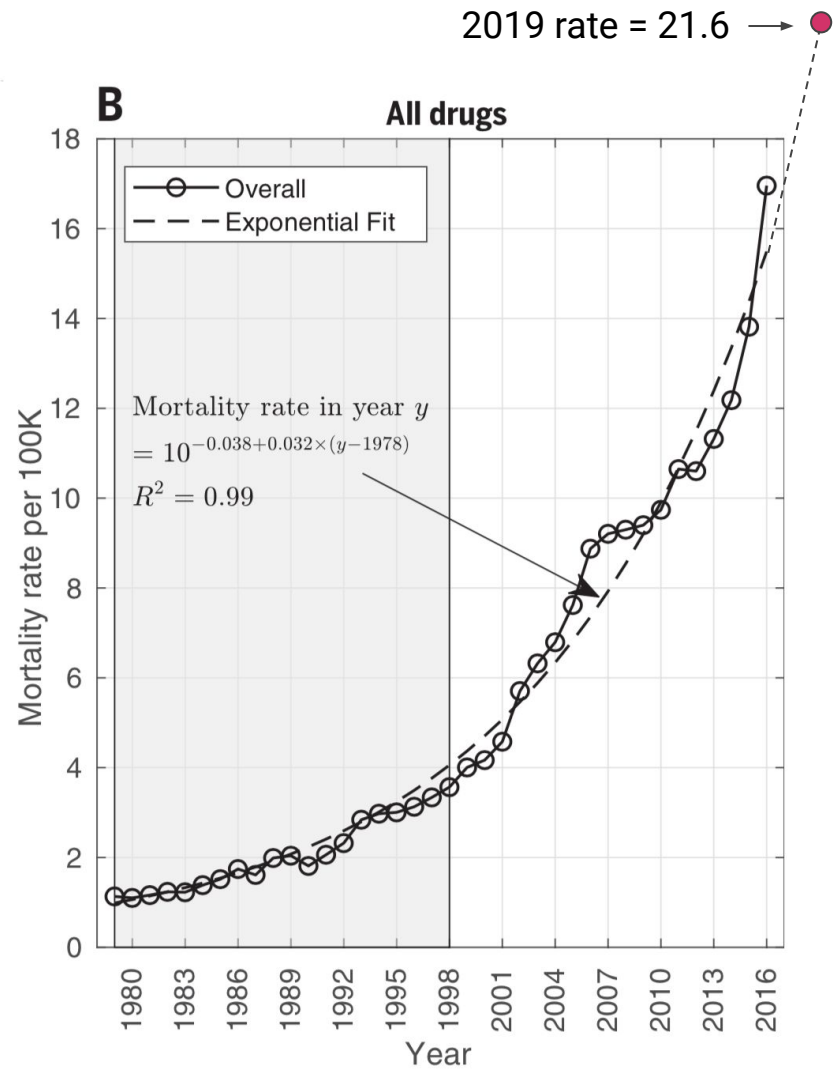
Deaths involving heroin and prescription opioids are stable

Deaths involving fentanyl, cocaine, and (meth)amphetamine are increasing

FIGURE 1. Age-adjusted rates* of drug overdose deaths† involving prescription opioids,§ heroin,¶ cocaine, psychostimulants with abuse potential,†† and synthetic opioids other than methadone§§,¶¶ — United States, 2013–2019**



Source: https://www.cdc.gov/mmwr/volumes/70/wr/mm7006a4.htm?s_cid=mm7006a4_w



Drug overdose deaths have been increasing exponentially for over three decades

Source: Jalal et al., *Science*, 2017

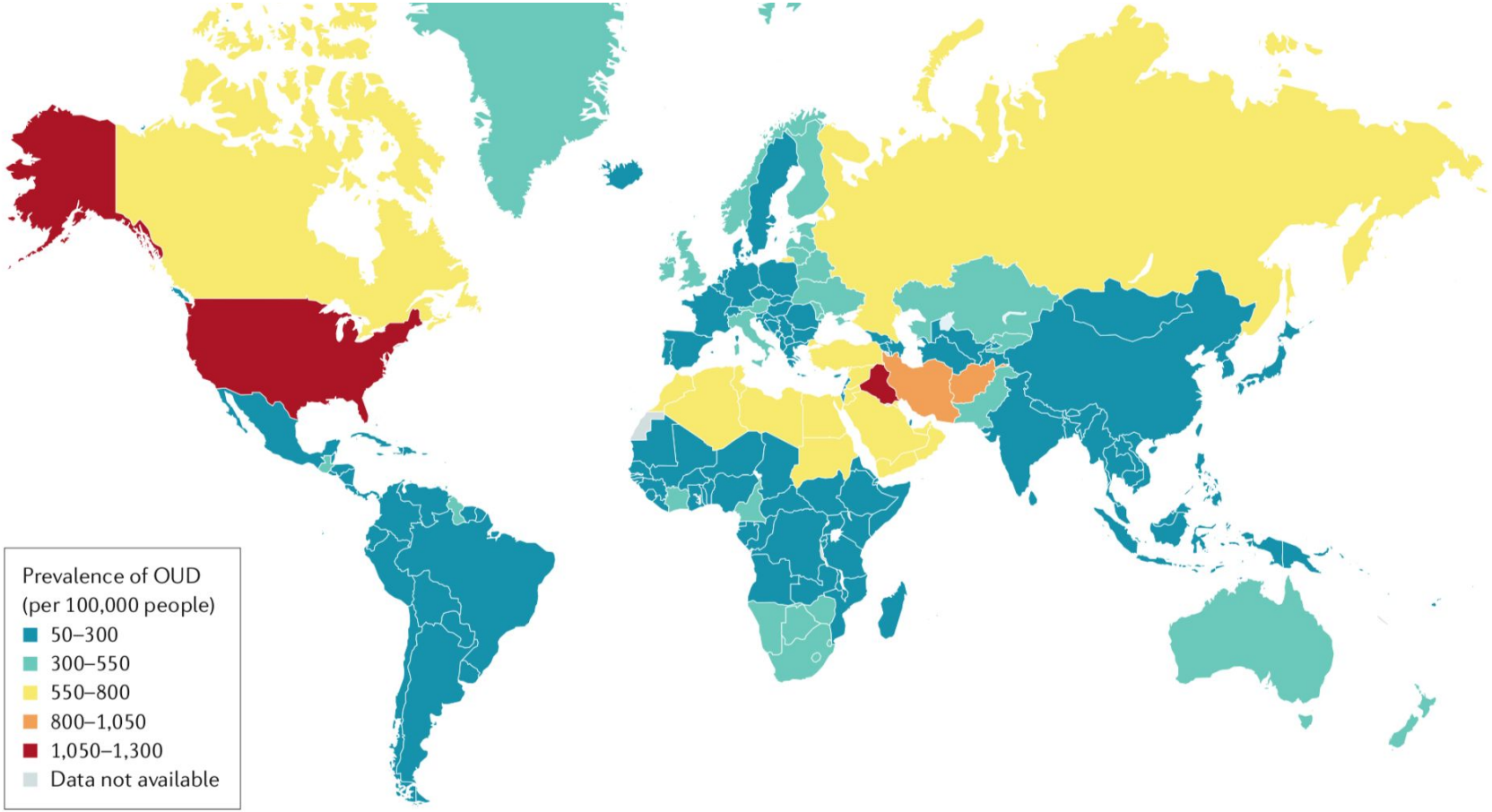


Fig. 1 | **Age-standardized prevalence of OUD per 100,000 people.** Age-standardized prevalence of opioid use disorder (OUD) per 100,000 people, based on data from the 2016 Global Burden of Disease study[8].

Source: Strang et al., *Nature Reviews Disease Primers*, 2020

Today's Objectives

1. Identify the social, structural, and environmental determinants of the opioid overdose crisis in the United States;
2. Appraise the effectiveness of various strategies to reduce overdose deaths;
3. Discuss the relative effectiveness of these strategies in the era of COVID-19.

Rising morbidity and mortality in midlife among white non-Hispanic Americans in the 21st century

Anne Case[1] and Angus Deaton[1]

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Contributed by Angus Deaton, September 17, 2015 (sent for review August 22, 2015; reviewed by David Cutler, Jon Skinner, and David Weir)

Deaths of despair?

- Increased alcohol & drug use
- Pain, disability, social isolation & depression
- Economic instability
- Financial insecurity

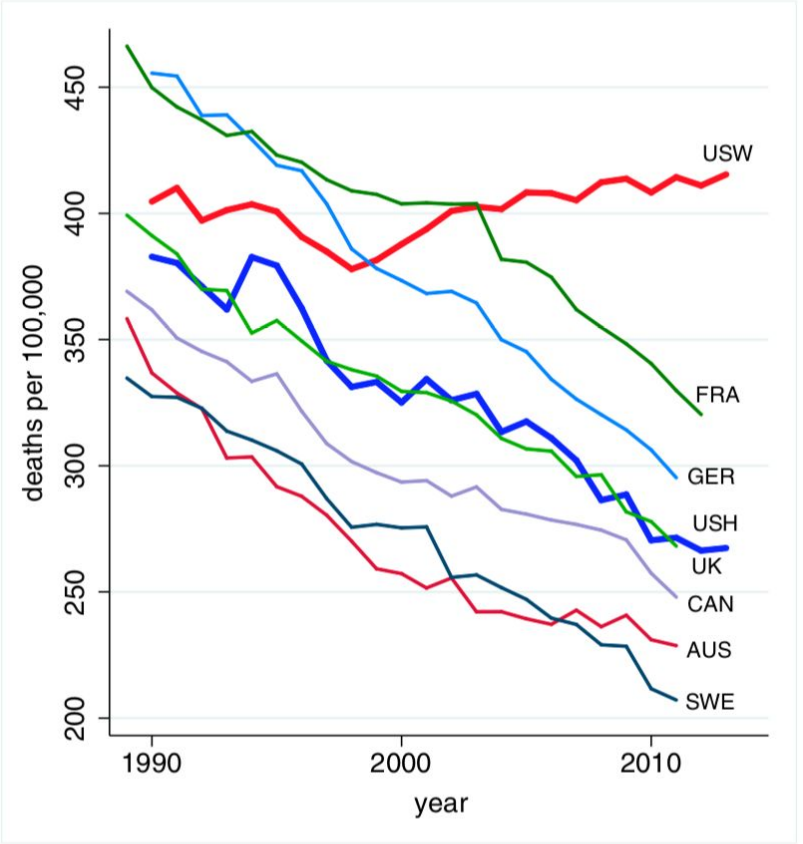
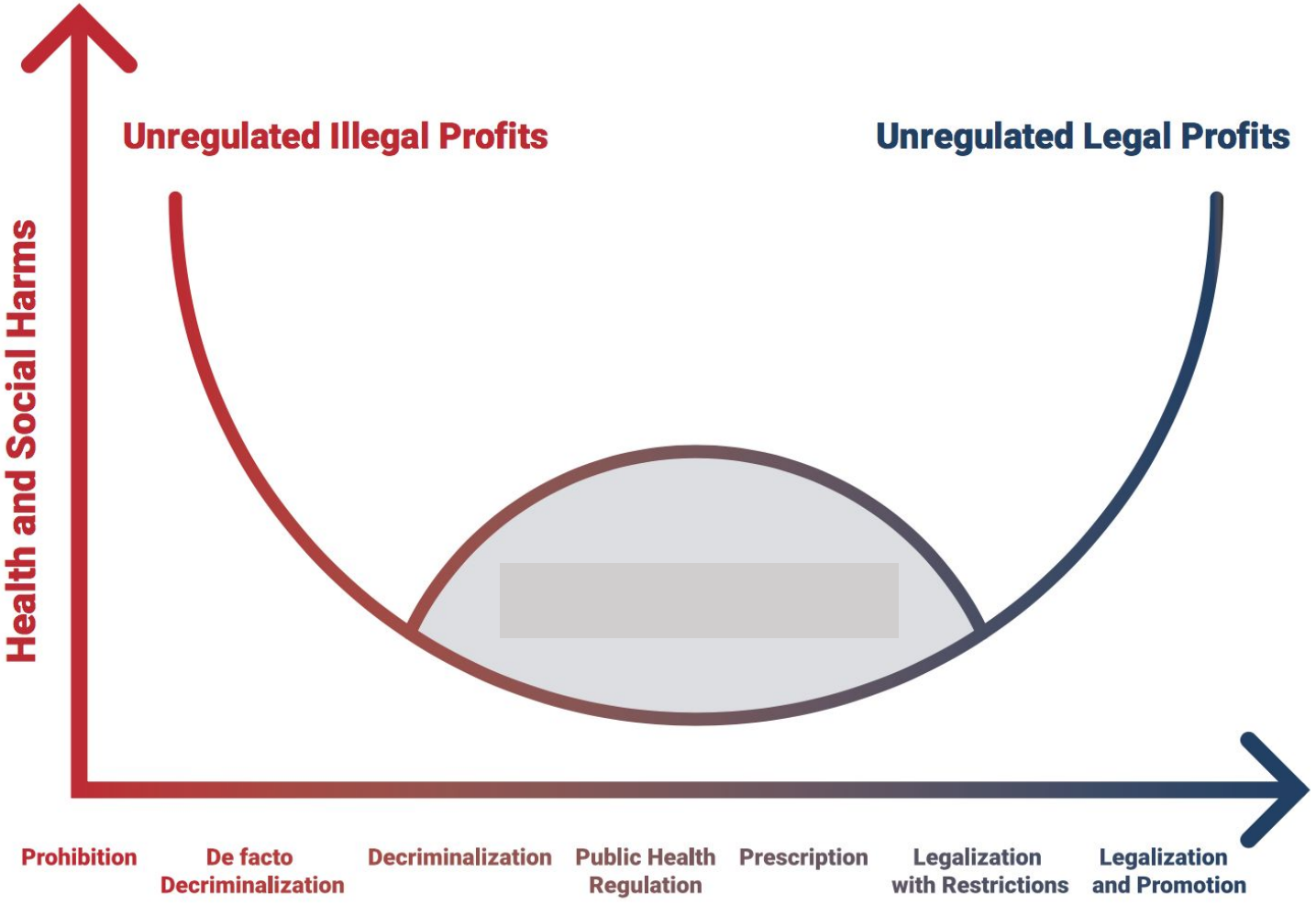


Fig. 1. All-cause mortality, ages 45–54 for US White non-Hispanics (USW), US Hispanics (USH), and six comparison countries: France (FRA), Germany (GER), the United Kingdom (UK), Canada (CAN), Australia (AUS), and Sweden (SWE).



Source: Adapted from Marks J. 1990. The Paradox of Prohibition. In: *Controlled Availability: Wisdom or Disaster.*[69]

Deaths of corporate malfeasance

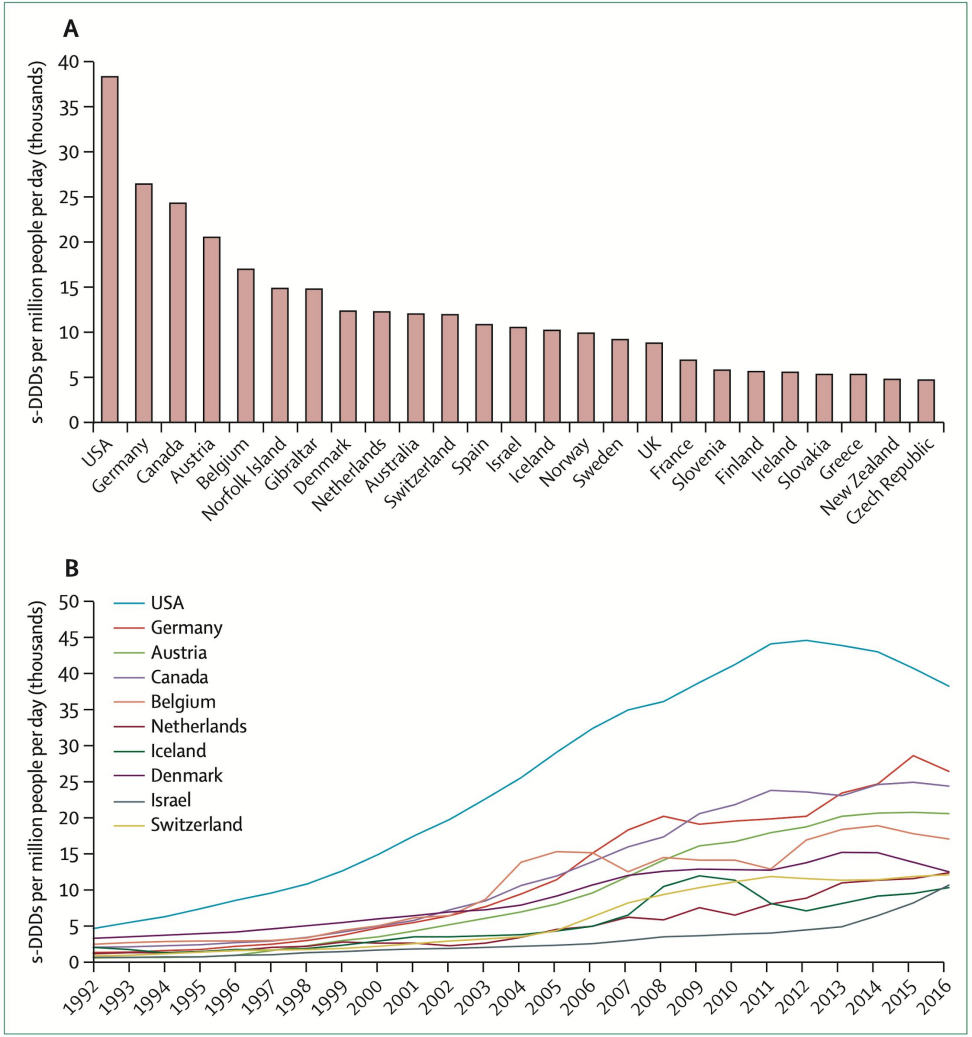


Figure 1: **Opioid analgesic consumption**

In 2016, the USA and Canada had the first and third highest rate of opioid consumption in the world

Even after peaking in 2012, the US continues to have a much higher opioid prescribing rate than any other country

Source: Degenhardt et al., *Lancet*, 2019

Industry Payments to Physicians for Opioid Products, 2013–2015

Scott E. Hadland, MD, MPH, MS, Maxwell S. Krieger, BS, and Brandon D. L. Marshall, PhD

Objectives. To identify payments that involved opioid products from the pharmaceutical industry to physicians.

Methods. We used the Open Payments program database from the Centers for Medicare and Medicaid Services to identify payments involving an opioid to physicians between August 2013 and December 2015. We used medians, interquartile ranges, and ranges as a result of heavily skewed distributions to examine payments according to opioid product, abuse-deterrent formulation, nature of payment, state, and physician specialty.

Results. During the study, 375 266 nonresearch opioid-related payments were made to 68 177 physicians, totaling $46 158 388. The top 1% of physicians received 82.5% of total payments in dollars. Abuse-deterrent formulations constituted 20.3% of total payments, and buprenorphine marketed for addiction treatment constituted 9.9%. Most payments were for speaking fees or honoraria (63.2% of all dollars), whereas food and beverage payments were the most frequent (93.9% of all payments). Physicians specializing in anesthesiology received the most in total annual payments (median = $50; interquartile range = $16–$151).

Conclusions. Approximately 1 in 12 US physicians received a payment involving an opioid during the 29-month study. These findings should prompt an examination of industry influences on opioid prescribing. (*Am J Public Health.* 2017;107:1493–1495. doi: 10.2105/AJPH.2017.303982)

database implemented under the Physician Payments Sunshine Act.[5,7] We used this novel data set to characterize industry payments to physicians related to opioid marketing.

METHODS

We extracted all payments between August 1, 2013 (when mandated reporting began), and December 31, 2015, that listed a US Food and Drug Administration (FDA)–approved opioid product. We included buprenorphine but examined buprenorphine and buprenorphine/naloxone marketed for addiction treatment separately from the buprenorphine transdermal patch marketed for pain control. We excluded remifentanil (which is marketed exclusively for anesthesia) and 2 fentanyl products (1 marketed exclusively for anesthesia, and 1 marketed exclu-

TABLE 1—Characteristics of Payments Involving Opioid Products to Physicians: Open Payments Program Database, United States, August 1, 2013–December 31, 2015

Nature of Payment	Total Payment Amount, $ (%)	Median Payment, $ (IQR)	No. of Payments (%)
Speaking fees or honoraria	29 190 854 (63.2)	2 010 (1 000–3 750)	9 161 (2.4)
Food and beverages	7 872 581 (17.1)	14 (11–18)	352 298 (93.9)
Consulting fees	5 886 461 (12.8)	1 000 (500–2 500)	2 145 (0.6)
Travel and lodging	2 904 940 (6.3)	537 (100–1 131)	4 048 (1.1)
Education	222 869 (0.5)	14 (5–25)	7 422 (2.0)
Other[a]	80 683 (0.2)	100 (14–500)	192 (0.1)

Note. IQR = interquartile ranges.

[a]Includes gifts, entertainment, and space rental or facility fees.

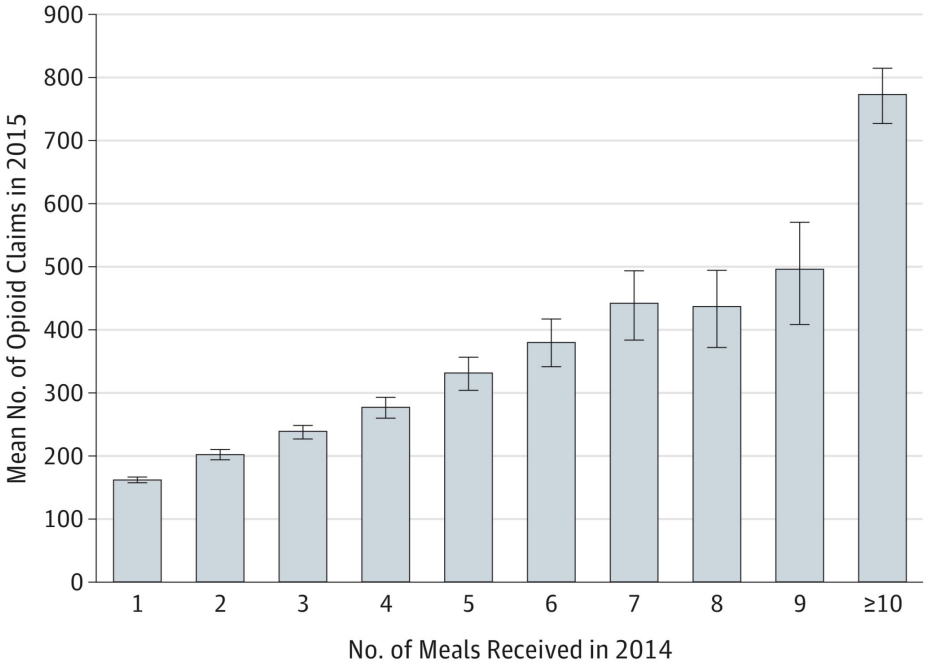
Source: Hadland et al. *American Journal of Public Health*, 2017

Effect of marketing on opioid prescribing

- We linked 2014 OpenPayments data with 2015 opioid prescribing information from all physicians who prescribed under Medicare Part D
- A total of 25,767 (7%) of physicians prescribing under Part D received 105,368 payments totaling $9,071,976 in 2014
- After adjusting for 2014 claims and overall changes in prescribing patterns, physicians who received ≥1 payment in 2014 had a 9.3% higher rate of opioid prescribing in 2015 (95%CI: 8.7% - 9.9%)

Source: Hadland et al. *JAMA Internal Medicine*, 2018

Figure. Mean Number of Opioid Prescription Claims in 2015 for 25 471 Physicians Who Received Any Industry Meals Related to Opioid Marketing During 2014



Analysis excludes 296 (1.1%) of the 25 767 physicians who received opioid marketing in 2014; these physicians received only nonmeal payments. Error bars represent 95% confidence intervals for the estimates.

Even ‘Low-value’ interactions between pharmaceutical manufacturers and providers are associated with increased rates of opioid prescribing

Source: Hadland et al., *JAMA Internal Medicine*, 2018

JAMA Network | Open™

Original Investigation | Substance Use and Addiction

Association of Pharmaceutical Industry Marketing of Opioid Products With Mortality From Opioid-Related Overdoses

Scott E. Hadland, MD, MPH, MS; Ariadne Rivera-Aguirre, MPP; Brandon D. L. Marshall, PhD; Magdalena Cerdá, DrPH, MPH

Source: Hadland et al. *JAMA Network Open*, 2019

Table 2. Association of Pharmaceutical Company Opioid Marketing With Prescription Opioid Overdose Deaths Across All US Counties[a]

Characteristic	aRR (95% CI)[b]		
	Model A	Model B	Model C
Marketing value, $ per 1000 population per year	1.09 (1.05-1.12)	NA	NA
No. of payments, per 1000 population per year	NA	1.18 (1.14-1.21)	NA
No. of physicians receiving payments, per 1000 population per year	NA	NA	1.12 (1.08-1.16)
Age group, %			
18-34 y	1.05 (1.03-1.07)	1.04 (1.02-1.06)	1.05 (1.03-1.06)
35-64 y	1.10 (1.07-1.12)	1.09 (1.07-1.12)	1.09 (1.07-1.12)
≥65 y	1.01 (0.99-1.02)	1.01 (0.99-1.02)	1.01 (1.00-1.03)
Male, %	0.93 (0.91-0.95)	0.94 (0.92-0.96)	0.94 (0.92-0.96)
White, %	1.01 (1.01-1.02)	1.01 (1.01-1.02)	1.01 (1.01-1.02)
High school or lower education, %	1.00 (1.00-1.01)	1.00 (1.00-1.01)	1.00 (1.00-1.01)
Unemployment, %	1.03 (1.01-1.04)	1.03 (1.02-1.05)	1.03 (1.01-1.04)
Poverty, %	1.03 (1.01-1.04)	1.03 (1.01-1.04)	1.03 (1.01-1.04)
Median household income ($1000)	1.00 (1.00-1.01)	1.00 (1.00-1.01)	1.00 (1.00-1.01)
Gini index[c]	1.01 (1.00-1.02)	1.00 (1.00-1.02)	1.01 (1.00-1.02)
Metropolitan area	1.21 (1.11-1.31)	1.13 (1.04-1.22)	1.20 (1.10-1.30)

Source: Hadland et al. *JAMA Network Open*, 2019

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

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

Full length article

Increased overdose mortality during the first week of the month: Revisiting the "check effect" through a spatial lens

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N=838 overdose deaths occurring in Rhode Island between 2014 and 2016

Table 1
Increases in overdose fatalities in Rhode Island (2014–2016) in the beginning of a month relative to the end of a month, stratified by decedent age and sex and substances deemed to be involved in death.

	Total Overdoses	Overdoses:First 7 Days	Overdoses:Last 7 Days	Ratio (95% CI)
Overall	840	225	193	1.17 (1.04–1.38)
Age				
18 to 24 years old	67	17	17	1.00 (0.85, 1.15)
25 to 34 years old	228	42	58	0.72 (0.65, 0.80)
35 to 44 years old	162	50	42	1.19 (1.09, 1.29)
45 to 54 years old	222	59	50	1.42 (1.33, 1.52)
55 years and older	159	47	33	1.42 (0.94, 1.30)
Sex				
Male	604	155	149	1.04 (0.99, 1.09)
Female	234	60	51	1.18 (1.10, 1.25)

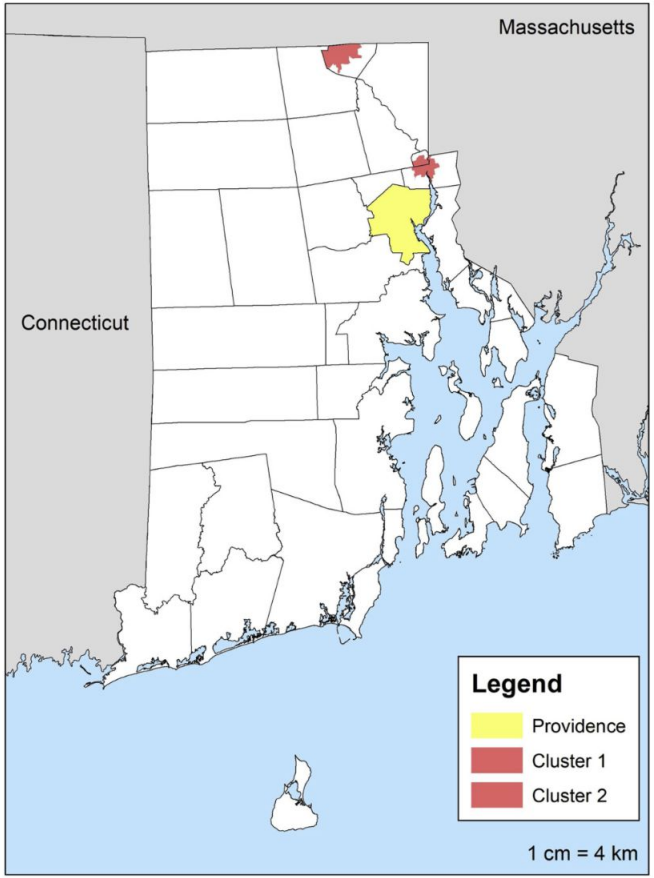


Fig. 2. Clusters of excess overdose fatalities within the first week of a month in Rhode Island.

Table 3
Multivariable logistic regression analyses of factors associated with a census block group being included within a cluster of excess overdoses occurring during the first week of the month, Rhode Island (2014–2016).

Neighborhood Characteristic	Adjusted Odds Ratio (95% Confidence Interval)
% 18 to 24 years old	0.65 (0.36, 1.18)
% Male	1.28 (0.78, 2.08)
% Black (Non-Hispanic)	1.42 (1.02, 1.98)
% Poverty	1.51 (1.14, 1.99)
% Labor Force Participation	1.18 (0.82, 1.71)
% High School Completion	0.76 (0.55, 1.04)
% Health Insurance	0.96 (0.62, 1.49)
% Disability	1.53 (0.97, 2.41)
% Public Assistance Receipt	0.72 (0.36, 1.42)
% Supplemental Security Income (SSI) Receipt	1.04 (0.67, 1.62)
% Housing Cost Burdened	1.42 (1.05, 1.91)

Note: All odds ratios are expressed per 10-unit increase in each of the continuous covariates.

Source: Goedel et al. *Drug Alcohol Dependence*, 2019

Does the weather influence risk of opioid overdose?

Cold weather might:

1. Have a direct biological impact on respiratory function
2. Increase one's likelihood of using drugs alone
3. Interrupt drug trafficking and drug selling patterns

BRIEF REPORT

Increased Risk of Opioid Overdose Death Following Cold Weather: A Case–Crossover Study

William C. Goedel,[a] *Brandon D. L. Marshall,*[a] *Keith R. Spangler,*[a,b,c] *Nicole Alexander-Scott,*[d] *Traci C. Green,*[a,e,f,g] *Gregory A. Wellenius,*[a,b] *and Kate R. Weinberger*[a,b]

Conducted a case-crossover analysis of 3,275 opioid overdose deaths in CT and RI between 2014 and 2017

Matched each case to a control day in the same year, month, and day of the week

Compared mean ambient temperature on the day of death, as well as average temp. up to 14 days before death

Used conditional logistic regression, adjusting for relative humidity and federal holidays

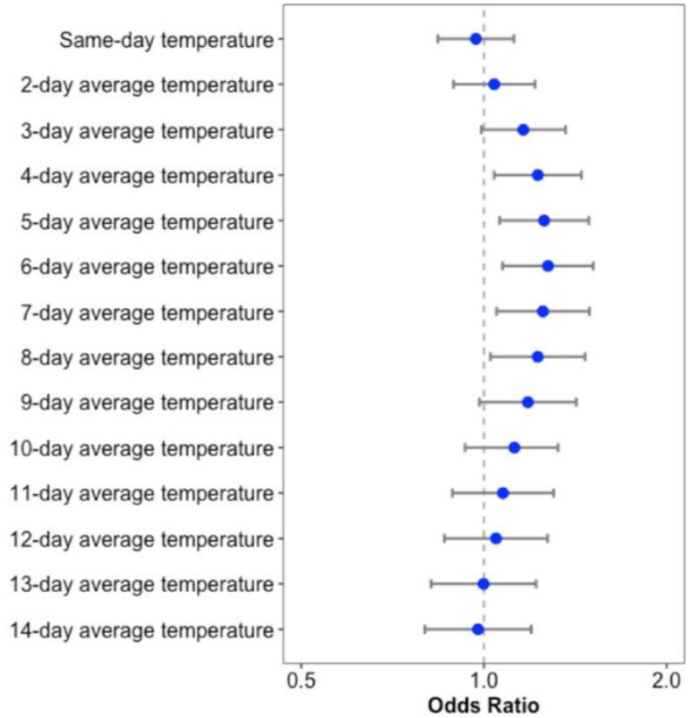


FIGURE 2. Odds of opioid-involved overdose death at an average temperature at 0°C relative to the odds of opioid-involved overdose death at an average temperature of 11°C among deaths occurring in Connecticut and Rhode Island, from January 2014 to June 2017 (n = 3,275). Note: Case and referent periods were matched on year, month, and day of week and all associations are adjusted for relative humidity and federal holidays.

Source: Goedel et al. *Epidemiology*, 2019

Odds of opioid overdose death was about 30% higher after periods of particularly cold weather (<0°C, or <32°F)

Strategies to reduce overdose death

A simple mathematical model for overdose deaths

$$D = N\beta\mu$$

where:

D = number of overdose deaths per year

N = number of people at risk of overdose per year

β = risk of overdose per person at risk per year

μ = risk of death per overdose per year

A simple mathematical model for overdose deaths

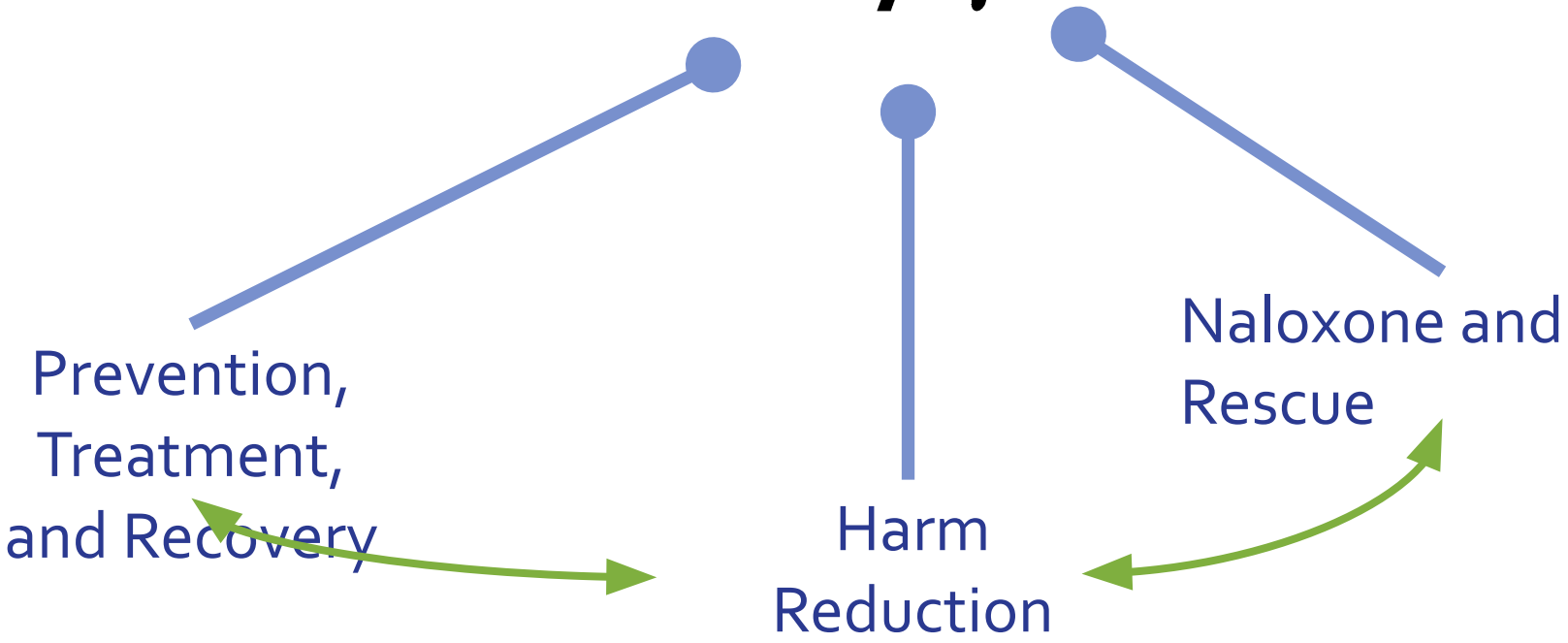
$$D = N\beta\mu$$

Some principles:

- Each term is equally important
- Design interventions to impact >1 term
- Avoid interventions that decrease one term but increase another

How to decrease overdose deaths

$$D = N\beta\mu$$



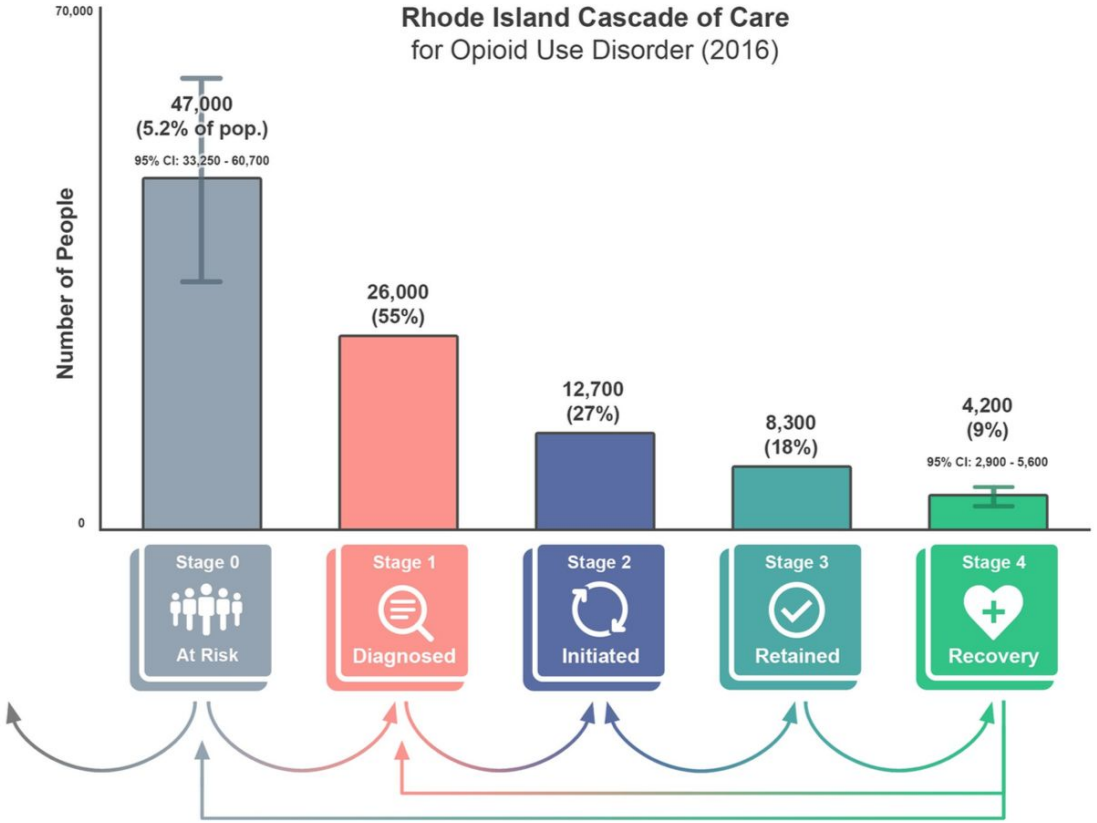


Fig 2. Results for the Rhode Island Cascade of Care. Stages 0 and 4 represent estimates from national survey data sources. Stage 1 represents statewide claims data from the HealthFacts RI all-payer claims database (APCD). Stages 2 and 3 represent combined estimates from the Rhode Island Prescription Drug Monitoring Program (PDMP) and the Behavioral Health On-Line Database (BHOLD), which include treatment claims for methadone and records for buprenorphine prescriptions. All estimates are approximate and considered preliminary. Credit: Maxwell Krieger, Brown University.

There are major gaps in the OUD care continuum:

- Screening/diagnosis
- Initiation of treatment

Source: Yedinak et al., *PLoS Medicine*, 2019

Drug checking programs

- Drug checking services are offered at supervised consumption facilities in Canada
- Rapid test strips detect fentanyl and analogs in urine or drug samples dissolved in water
- Fentanyl test strips are being distributed by harm reduction organizations throughout the US
- As of 2017, lack of research on uptake and acceptability of rapid fentanyl test strips, particularly among young people

News

STRAIGHT TALK »

B.C. expands access to fentanyl testing, asking users to check their drugs

The initiative makes B.C. the first jurisdiction in Canada to make drug-testing equipment widely available and to encourage people to bring illegal drugs to government facilities for testing

by Travis Lupick on November 10th, 2017 at 9:39 AM

6

Results from the first visit

Krieger *et al. Harm Reduction Journal* (2018) 15:7
https://doi.org/10.1186/s12954-018-0213-2

Harm Reduction Journal

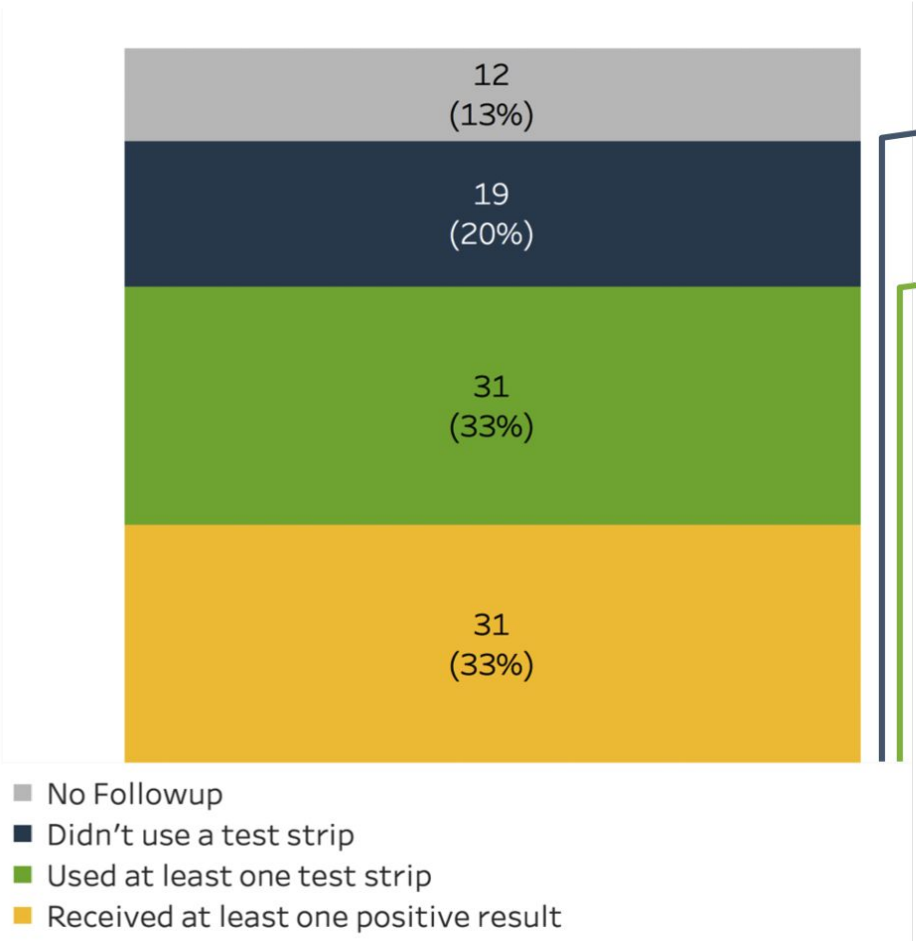
RESEARCH Open Access

High willingness to use rapid fentanyl test strips among young adults who use drugs

Maxwell S. Krieger[1], Jesse L. Yedinak[1], Jane A. Buxton[2,3], Mark Lysyshyn[2,4], Edward Bernstein[5,6], Josiah D. Rich[1,7], Traci C. Green[1,5,6,7], Scott E. Hadland[5,6] and Brandon D. L. Marshall[1*]

- Mean age was 27
- 56% identified as male, 41% as female, and 4% as trans, non-binary, genderqueer, or something else
- 56% identified as white, 15% black, 28% other/mixed race + 24% Latinx
- Half had ever injected, over 1/3 reported a prior overdose, and 2/3 had ever witnessed an overdose
- 95% of participants planned to use take-home test strips

Results from the follow-up visit



- 81 (87%) participants returned for a second visit
- 77% reported using at least one strip
- 50% who used one strip received a positive result

Krieger et al. *International Journal of Drug Policy* (2018)

Behavioral change after receiving a positive test

After receiving a positive result:

- 45% used smaller amounts
- 42% went slower when using
- 39% used with someone else around
- 36% did a tester shot
- 10% through their drugs out

Among participants who received a positive result:

- 68% reported a positive change in overdose risk reduction practices, compared to baseline ($p < 0.001$)

Source: Krieger et al. *International Journal of Drug Policy* (2018)

But it's (fentanyl) going to show up in the test, so it is kind of worth it. That's what I'm saying is, you could save your life by using this. Or you could not use it and do what you're going to do and be dead...I thought it came out positive, so I got rid of the fentanyl (Respondent 17, white male, age 20, urine testing group).

Source: Goldman et al., *Harm Reduction Journal*, 2019

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20, urine testing group).

Everything was useful. Those tests opened my eyes, and it has saved my life, and I can gladly say I haven't taken any more because I was going to take two bags. If I had took those two bags, I think I wasn't even going to be here right now (Respondent 39, male of non-disclosed race, age 28, residue testing group).

Source: Goldman et al., *Harm Reduction Journal*, 2019

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non-disclosed race, age 28, residue

I would say we were definitely a lot more cautious about what we were doing, like definitely a lot more ready for something to, you know, go wrong...I definitely, like, would pace myself a lot slower with the drugs. And you know, it was like I said, it's kind of sad to say but we were almost expecting an overdose or such. And so, if that did happen, you know like at least somebody could be like, oh and jump on it and act fast (Respondent 22, white male, age 22 , urine testing group).

Source: Goldman et al., *Harm Reduction Journal*, 2019

Senate Passes Bill Legalizing Fentanyl Test Strips

The Senate passed legislation on Tues

the possession and distribution of test

Fentanyl test Strips handed

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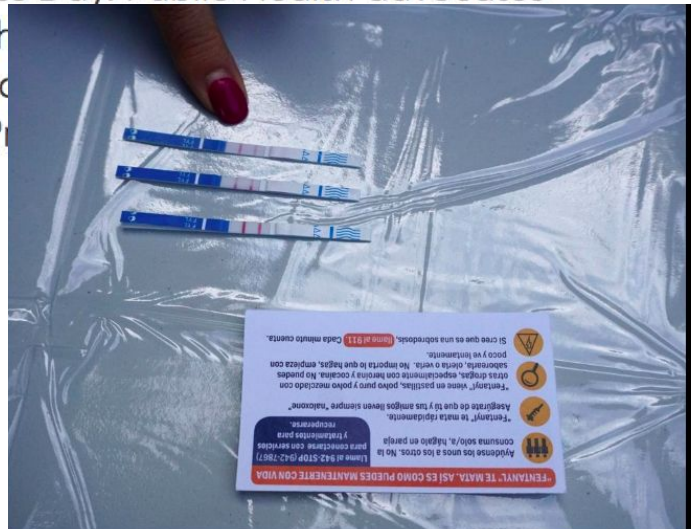


The COVID-19 pandemic is worsening the overdose crisis

Overdose & COVID-19: Manifold Hypotheses

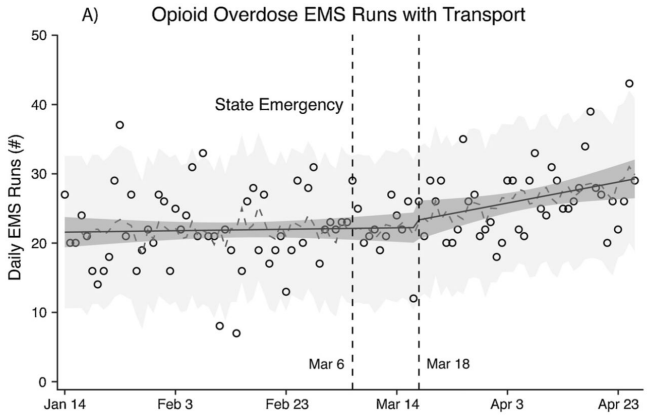
1. Changes in the illegal drug supply as supply chains have been disrupted by travel restrictions and border measures

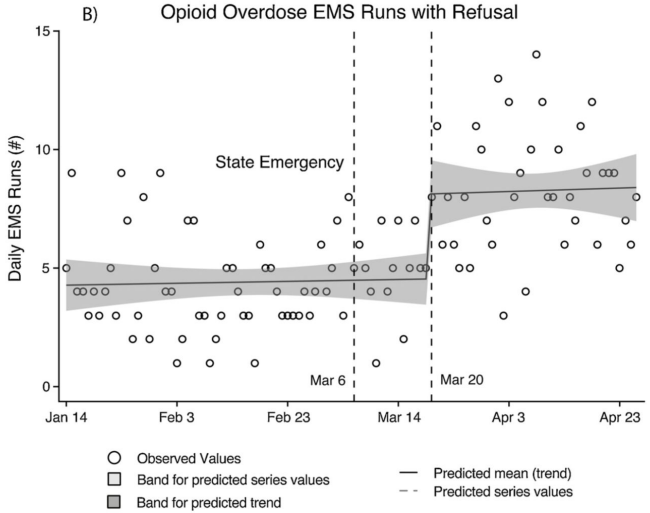
2. Less access to supports and services for people who use drugs, such as syringe service programs & supervised consumption sites (in Canada)

3. Discontinuation of therapies and return to use among persons in treatment

4. Multiple COVID-19 related stressors, including unemployment, financial losses, eviction, isolation, and depression leading to increased use of substances and recurrence of use

5. Increase in the number of people using drugs in private & alone

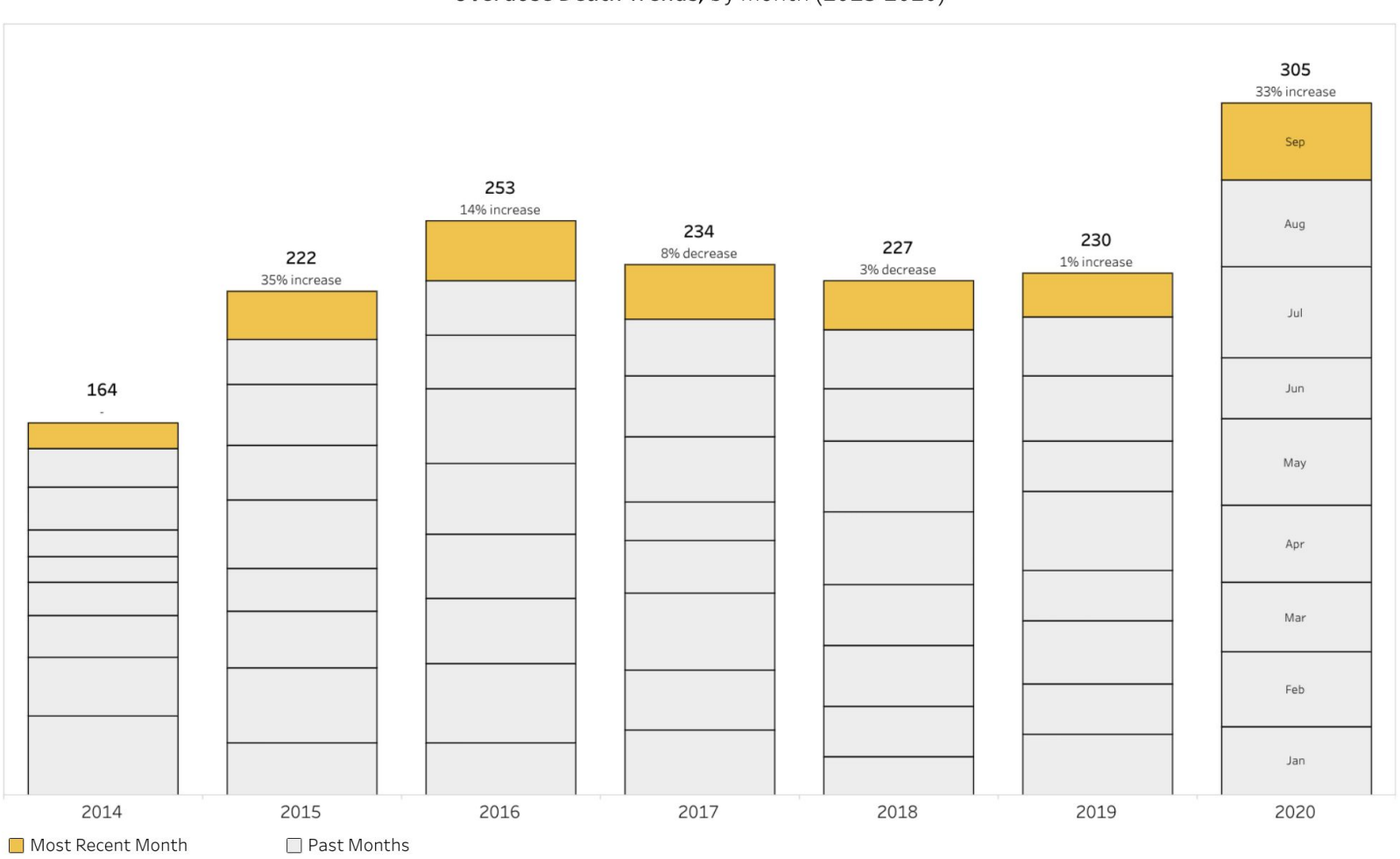




Source: Slavova et al., *Drug and Alcohol Dependence*, 2020

In Kentucky, there has been a 17% increase in EMS runs for suspected opioid overdose since COVID-19 and a 71% increase in runs with refusal to transport

There has been a 50% increase suspected opioid overdose runs with deaths at the scene



Source: RIDOH (https://health.ri.gov/data/drugoverdoses/)

Brown/Ecosystem Updated Analyses: New Findings

STUDY PERIOD: Jan-Aug 2019 vs. Jan-Aug 2020

POPULATION

- Nearly all increase among men (among 58 excess deaths, 55 are men)
- Significant increases among men with depression + men with anxiety
- Significant increases among people age 50-59 with anxiety

ENVIRONMENT

- The majority of overdose decedents in 2020 died at home (45% vs 53%)
- Modest proportional increase across all contributing causes of death except heroin

Source: https://preventoverdoseri.org/presentation-archive/

Acknowledgements

- Jesse Yedinak, MPA, Maxwell Krieger, BS, Jackie Goldman, ScM, Seashore Li, MD, PhD, and my dedicated team of Brown University staff & students!
- William Goedel, PhD, Alex Macmadu, MSc, and Dhruv Gaur
- State agency partners, including EOHHS, BHDDH, and RIDOH
- Key Collaborators:
  - Magdalena Cerdá, Associate Professor, Department of Population Health, NYU
  - Scott Hadland, Assistant Professor of Pediatrics, Boston University
  - Jody Rich, Professor of Medicine, Brown University
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Thank you!

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Title of Program: VCBH Monthly Lecture Series FY2021

Title of Talk: ***Social, Structural, and Environmental Dirvers of the Opioid Overdose Crisis***

Speaker/Moderator: Brandon Marshall, PhD

Planning Committee Members: Stephen H. Higgins, PhD, Philip Ades, MD, Diann Gaalema, PhD

Date: February 17, 2021

Workshop #: 21-265-06

Learning Objectives

Claiming Instructions

Vermont Center on Behavior and Health Monthly Lecture Series FY 2021- Social, Structural, and Environmental Drivers of the Opioid Overdose Crisis 02/17/2021

Use the following link to access the claiming app, or scan the QR code below.

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DISCLOSURE:
Is there anything to disclose? ☐ **Yes or** ☒ **No**
Please list the Potential Conflict of Interest (*if applicable*): ****

All Potential Conflicts of Interest have been resolved prior to the start of this program.
☒ **Yes or** ☐ **No** ***(If no, credit will not be awarded for this activity.)***

(CMIE staff members do not have any interests to disclose)

All recommendations involving clinical medicine made during this talk were based on evidence that is accepted within the profession of medicine as adequate justification for their indications and contraindications in the care of patients. ☒ **Yes**

COMMERCIAL SUPPORT ORGANIZATIONS *(if applicable)*: This activity is free from any commercial support

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