Annick Bórquez, PhD

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Division of Infectious Diseases and Global Public Health,
Department of Medicine,
University of California San Diego

Glocal Fellowship, 04/04/2024


GERMANY
Paris
FRANCE
Bay of Biscay
ITALY
SPAIN
Mediterranean Sea
BBC NEWS

Microbiology, BSc.

Lyon 1

THE UNIVERSITY of EDINBURGH

HIV Epidemiology (MSc, PhD, postdoc)

Imperial College London

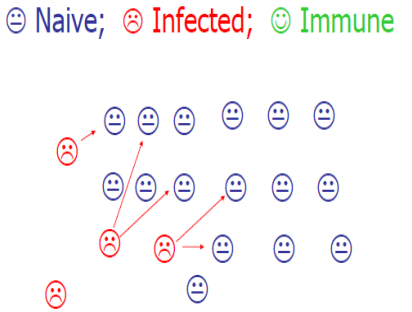
- HIV among key populations in Latin America
- Mathematical modeling

Substance use epidemiology (postdoc, faculty)

UC San Diego

Mathematical modeling of epidemics: what is it?

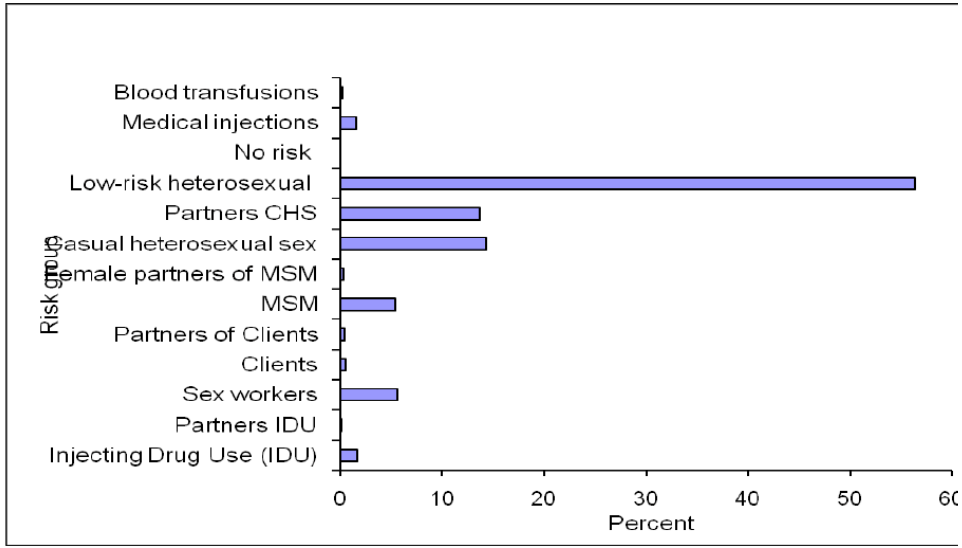
- **Method to simulate individuals, their behaviors and their contacts over time, leading to the transmission of infectious diseases**
  - Statistical models describe associations between variables and the outcome (i.e. infection)
  - Mathematical models reproduce the ”mechanisms” (i.e. the behaviors) which produce the outcome
- **Attempt to mimic the real world through a simplified representation**
- **Two main types of models:**
  - Individual or agent-based models (ABM)
  - Deterministic models

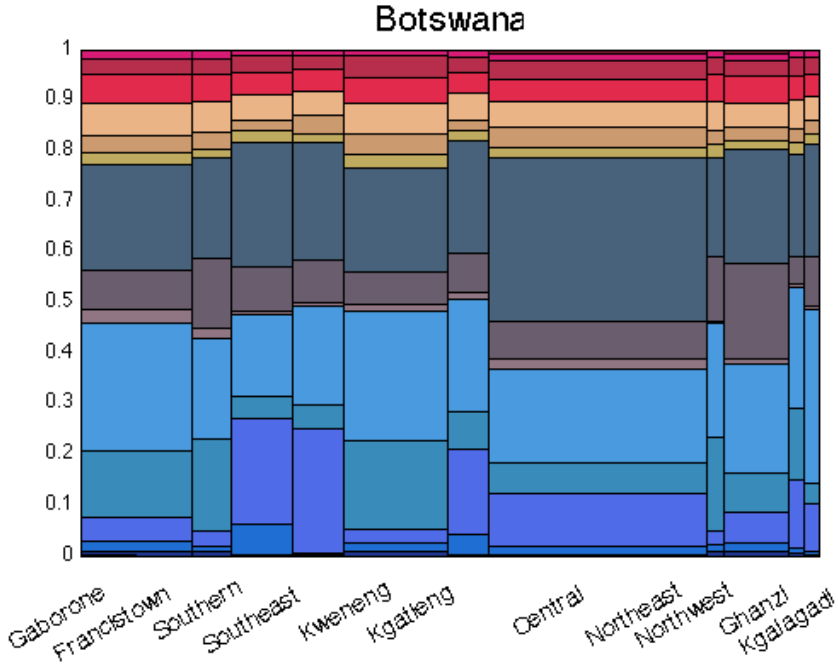


SIR

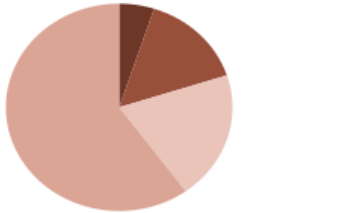
Know your epidemic, know your response

Figure 4.14: Distribution of new infections by mode of exposures

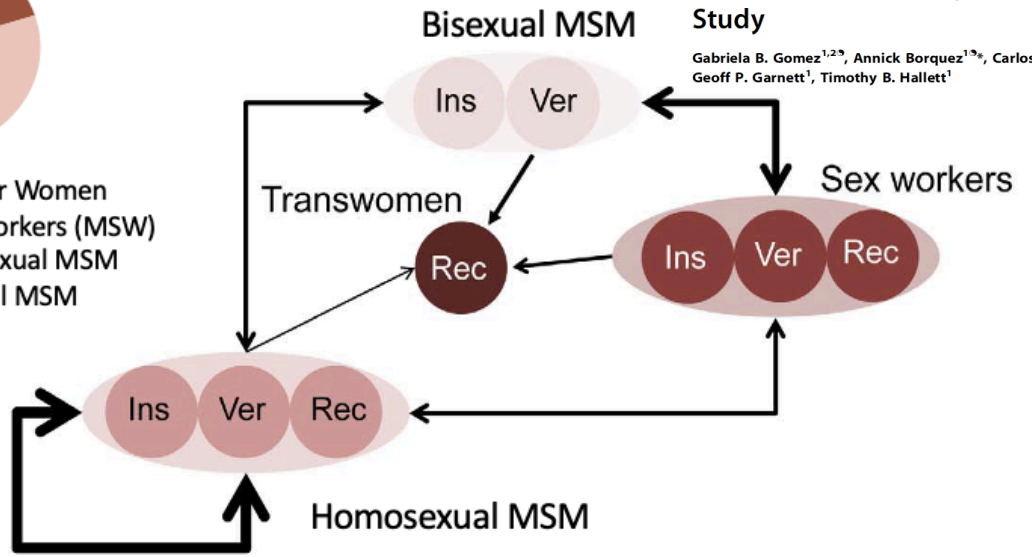




PrEP impact on HIV incidence among MSM and TW in Peru



- Transgender Women
- Male sex workers (MSW)
- Bi/heterosexual MSM
- Homosexual MSM



OPEN ACCESS Freely available online

PLOS | MEDICINE

The Potential Impact of Pre-Exposure Prophylaxis for HIV Prevention among Men Who Have Sex with Men and Transwomen in Lima, Peru: A Mathematical Modelling Study

Gabriela B. Gomez[1,2☯], Annick Borquez[1☯*], Carlos F. Caceres[3,4], Eddy R. Segura[4], Robert M. Grant[5], Geoff P. Garnett[1], Timothy B. Hallett[1]

HIV prevention among transgender women

HIV risk and preventive interventions in transgender women sex workers

Dr Tonia Poteat, PhD • Andrea L Wirtz, MHS • Anita Radix, MD • Annick Borquez, PhD • Alfonso Silva-Santisteban, MD • Madeline B Deutsch, MD • et al. Show all authors

The impact and cost-effectiveness of combined HIV prevention scenarios among transgender women sex-workers in Lima, Peru: a mathematical modelling study

Annick Bórquez, PhD • Juan Vicente Guanira, MPH • Paul Revill, PhD • Patricia Caballero, PhD • Alfonso Silva-Santisteban, MD • Sherrie Kelly, PhD • et al. Show all authors

ImPrEP Demonstration project among MSM and transgender women

PrEP delivery among over 9.500 MSM and TW
Between February 2018 and June 2021

South-South collaboration for knowledge exchange and dissemination of lessons learned and good practices

ImPrEP
profilaxis pre-exposición
Una decisión tuya

ImPrEP study components

1 PrEP delivery
- Feasibility of same day oral PrEP
- Uptake, retention, adherence
- HIV and STI incidence

2 PrEP awareness

Online Survey among:
- MSM/TW: awareness and willingness to uptake
- Providers: attitudes and willingness to prescribe

3 Sero-incidence

HIV sero-incidence study among individuals eligible to use PrEP according the ImPrEP protocol

4 Qualitative

Qualitative surveys among:
- Among MSM/TW to understand patterns of PrEP use
- Providers to inform scale up

5 Modeling & CEA

Mathematical modeling & economic studies to inform cost-effective scale up

6 Demand creation

Community mobilization and demand creation

encore

The Study

Be a part of a health research study exclusively for trans women and trans feminine people

Learn More | Contact Us

Digital cohort of 3500 transgender women across the U.S. supported by 6 city “hubs”

About ENCORE

What

ENCORE is a study exclusively for trans women and trans feminine people in the United States and Puerto Rico.

Who

ENCORE is a team of health, research, and trans-led community organizations.

Why

There are no national, long-term surveys for trans women, which are important to understand unique health risks for trans women, informing health programs for them, and understanding how their health and social experiences change over time.

Follow up of the LITE cohort study in Eastern and Southern U.S.

- ***Aim 1.*** **Determine the efficiency and acceptability of a novel, hub-supported digital cohort of racially/ ethnically diverse at-risk HIV-negative TW ages ≥ 18 years.** We will explore efficiency, barriers/facilitators to engagement, self-reported acceptability, and potential biases of those recruited, enrolled, and retained.

- ***Aim 2.*** **Estimate the prevalence and characterize patterns of syndemic experiences among TW.** Latent class analyses will be applied to baseline cohort data to identify syndemic classes and patterns of syndemics by age, race, ethnicity, and contextual factors.

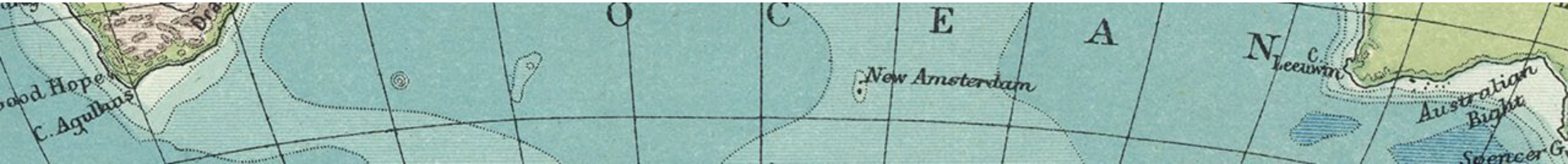
  - ***Subaim 2.1.*** Examine the role of contextual factors (virtual and physical) in driving syndemic experiences over time among TW using latent class trajectory analysis.

- ***Aim 3.*** **Estimate HIV incidence in TW, followed every 6 months for at least 24 months to identify tailored approaches for multi-level combination HIV prevention interventions.**

  - ***Subaim 3.1.*** Examine the **effect of syndemic experiences and contextual factors on HIV incidence** among TW in the US.

  - ***Subaim 3.2.*** Characterize the **PrEP continuum among TW and associations with HIV incidence over time**, including uptake of newly emerging formulations, longitudinal patterns of HIV risk and adherence, and the role of syndemic classes and contextual factors in PrEP uptake, adherence, and retention.

- ***Aim 4.*** **Develop dynamic models of multi-level combination HIV prevention interventions and scale-up among TW to simulate the impact of evaluated interventions on HIV incidence through 2030, corresponding to the National HIV strategy**.



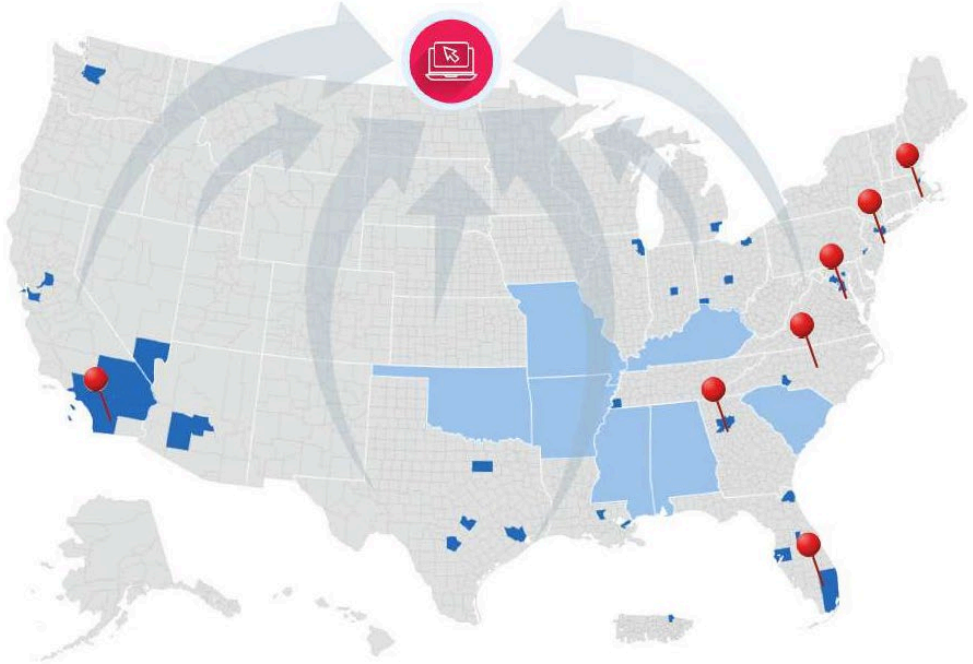
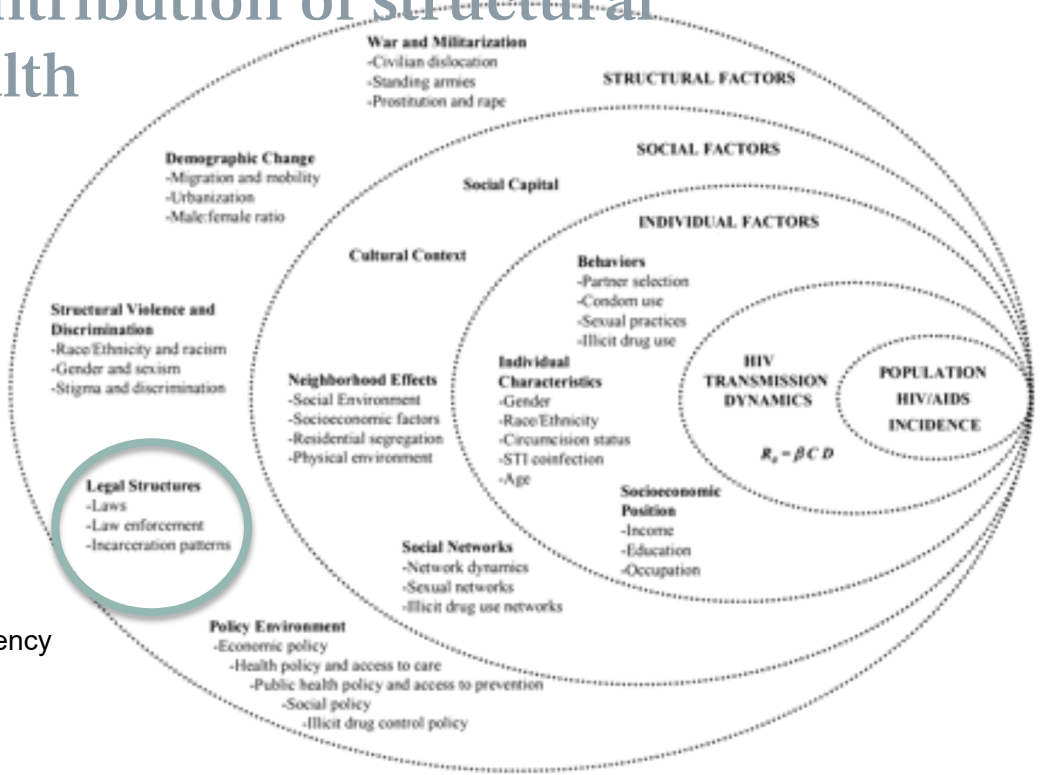


Figure 2 Conceptualization of hub-supported digital cohort with hubs (red) relative to EHE counties and states (dark and light blue).

Determining the contribution of structural determinants of health



From: The Social Epidemiology of Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome

Epidemiol Rev. 2004;26(1):22-35.
doi:10.1093/epirev/mxh005

Drug law reforms

- Lack of monitoring
- Lack of evaluation
- Lack of dissemination of information

=> Especially relevant in challenging settings

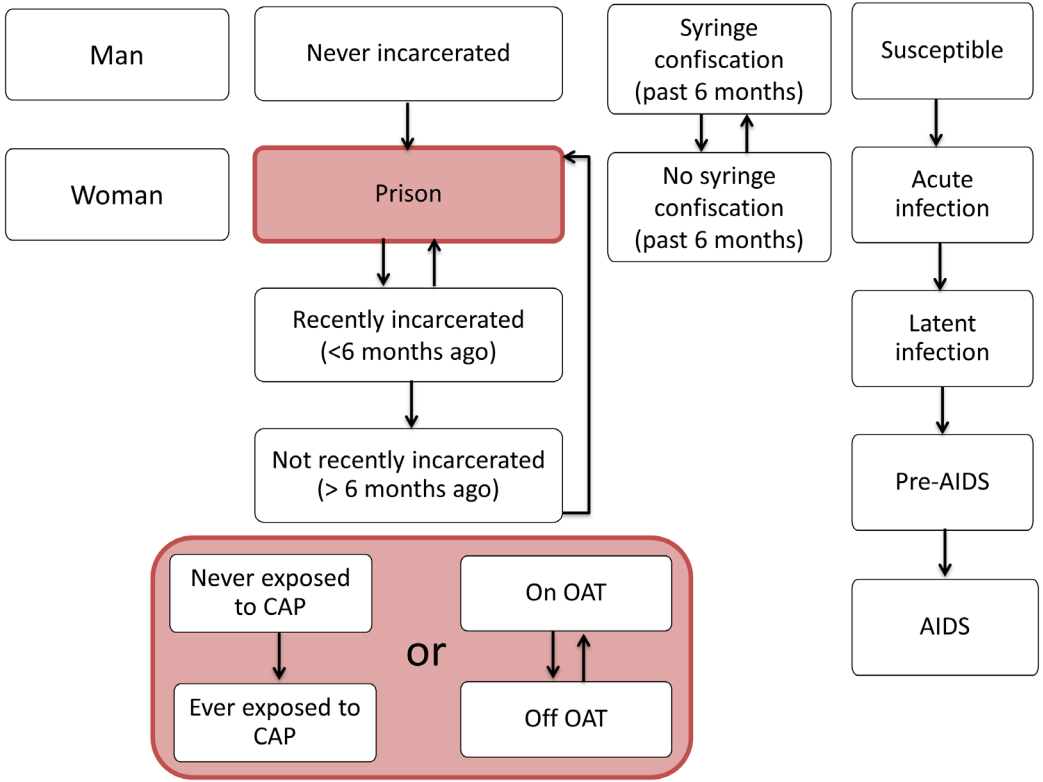
Drug law reform: Mexico

- "Reforma de Narcomenudeo" depenalizes possession of a selection of drugs for personal consumption[1,2] => decrease incarceration rates and police harassment and mandates drug treatment at 3rd apprehension => increase **treatment rates**
- To be enforced from 2012 but so far, no substantial changes observed.[1,2] Limited enforcement could generate a misleading message regarding the effectiveness of reform

⇒ **Crucial to produce scientific evidence of its potential impact**

1. Mackey TK et al. Mexico's "ley de narcomenudeo" drug policy reform and the international drug control regime. *Harm reduction journal* 2014; **11**(1): 31.
2. Werb D. et al. Mexico's drug policy reform: cutting edge success or crisis in the making? *International Journal of Drug Policy* 2014;.

Model diagram

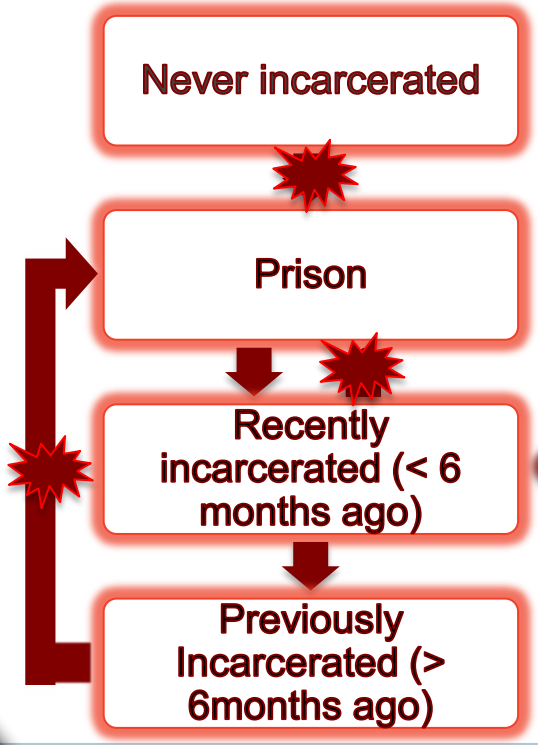


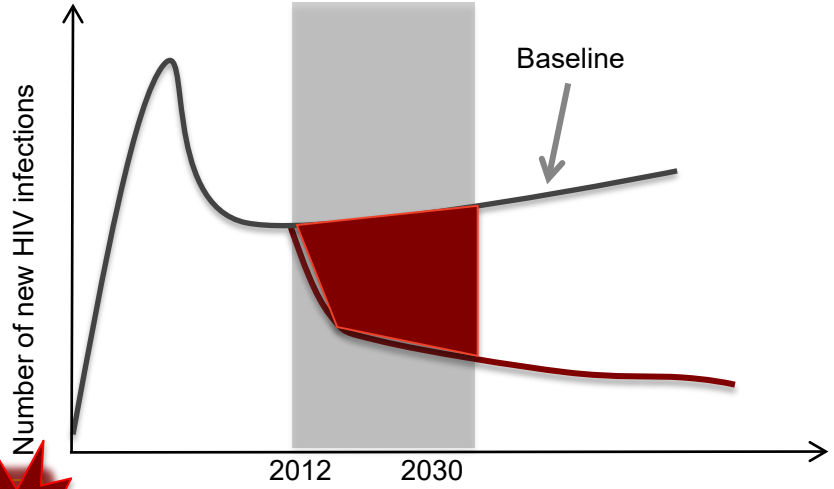
*In prison, no syringe confiscation by the police occurs as there is no interaction with the police

CAP: Compulsory abstinence program

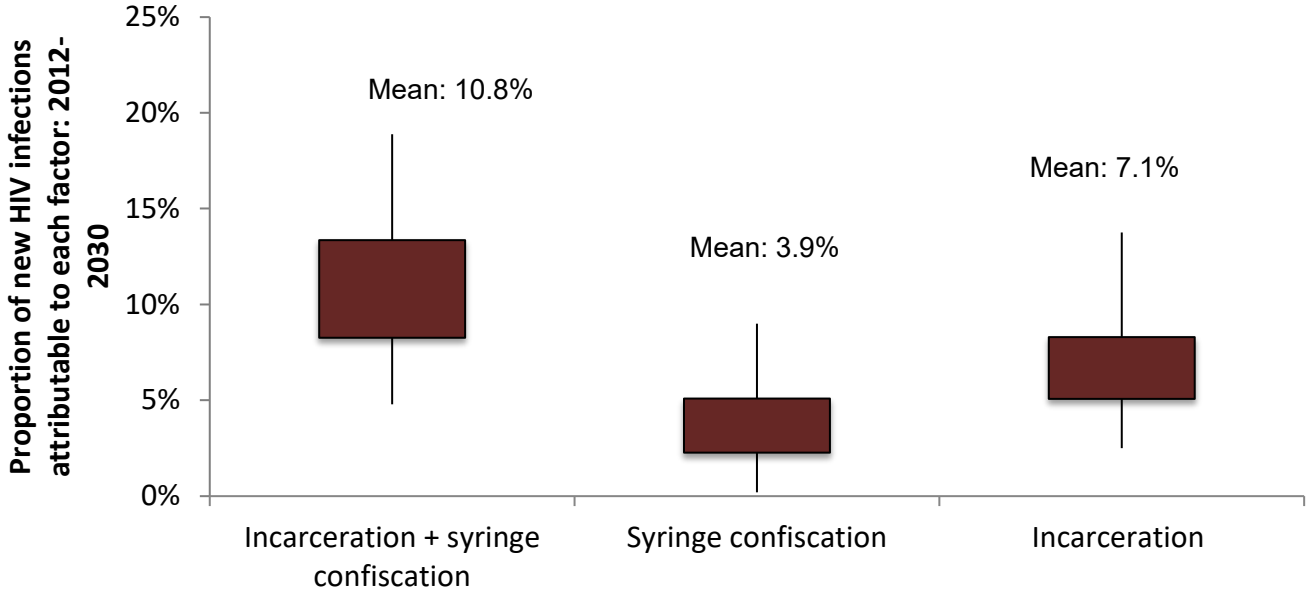
Relative risk of receptive syringe sharing by type of exposure among PWID in Tijuana

	Any receptive needle sharing Past 6 months	Relative risk	95%CI	p-value
Incarceration	Recent vs. None	1.40	1.21 1.63	<0.0001
	Not recent vs. None	1.11	0.99 1.26	0.07
Syringe confiscation	Recent vs. Not	1.16	1.03 1.29	0.01
Involuntary treatment	Ever vs. Never	1.14	1.00 1.30	0.04

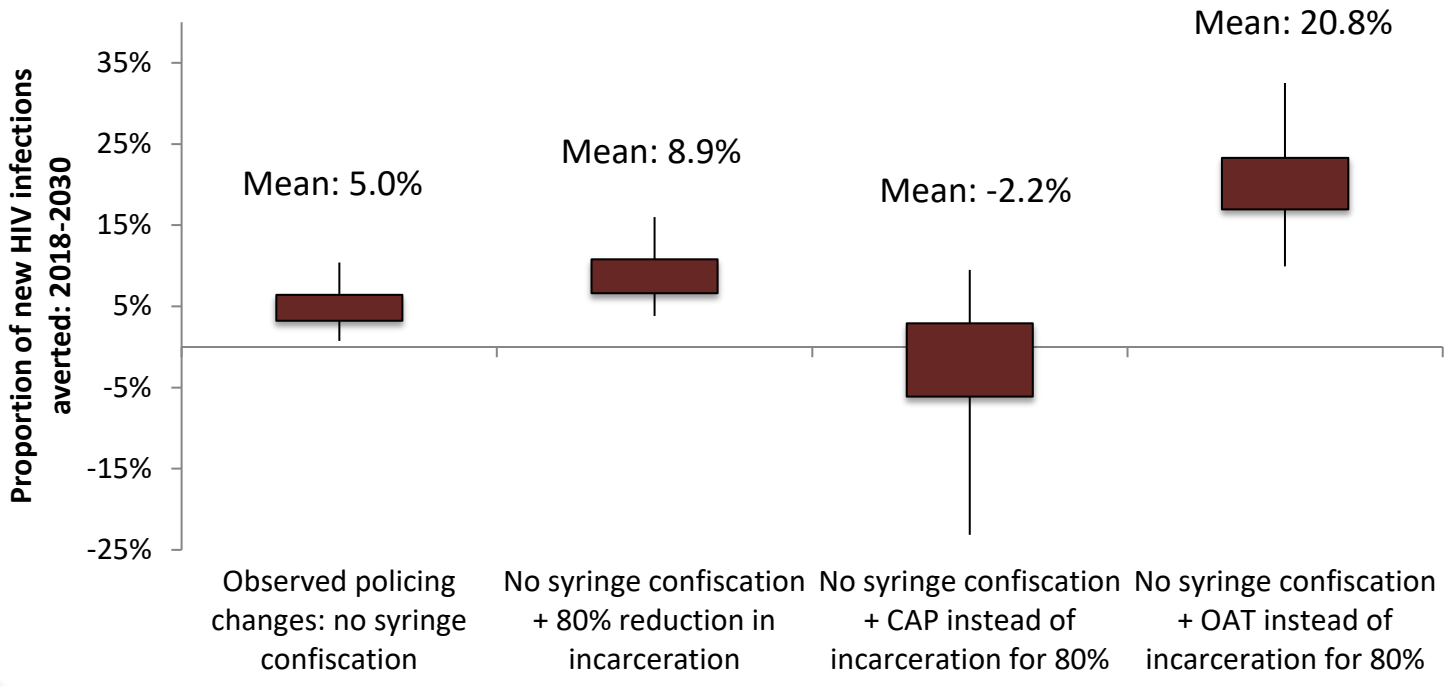

Never incarcerated
Prison
Recently incarcerated (< 6 months ago)
Previously Incarcerated (> 6months ago)


Number of new HIV infections
Baseline
2012
2030

Contribution of incarceration and syringe confiscation to HIV incidence among PWID 2012-2030



Proportion of new infections averted 2018-2030 under different Narcomenudeo reform enforcement scenarios



The fatal overdose epidemic in the United States

- Over 1 million fatal overdoses since 1999
- A record of over 100,000 deaths in 2022
- It has escalated exponentially for decades
- Defined by drug, population and locality-specific outbreaks, as opposed to a uniform phenomenon

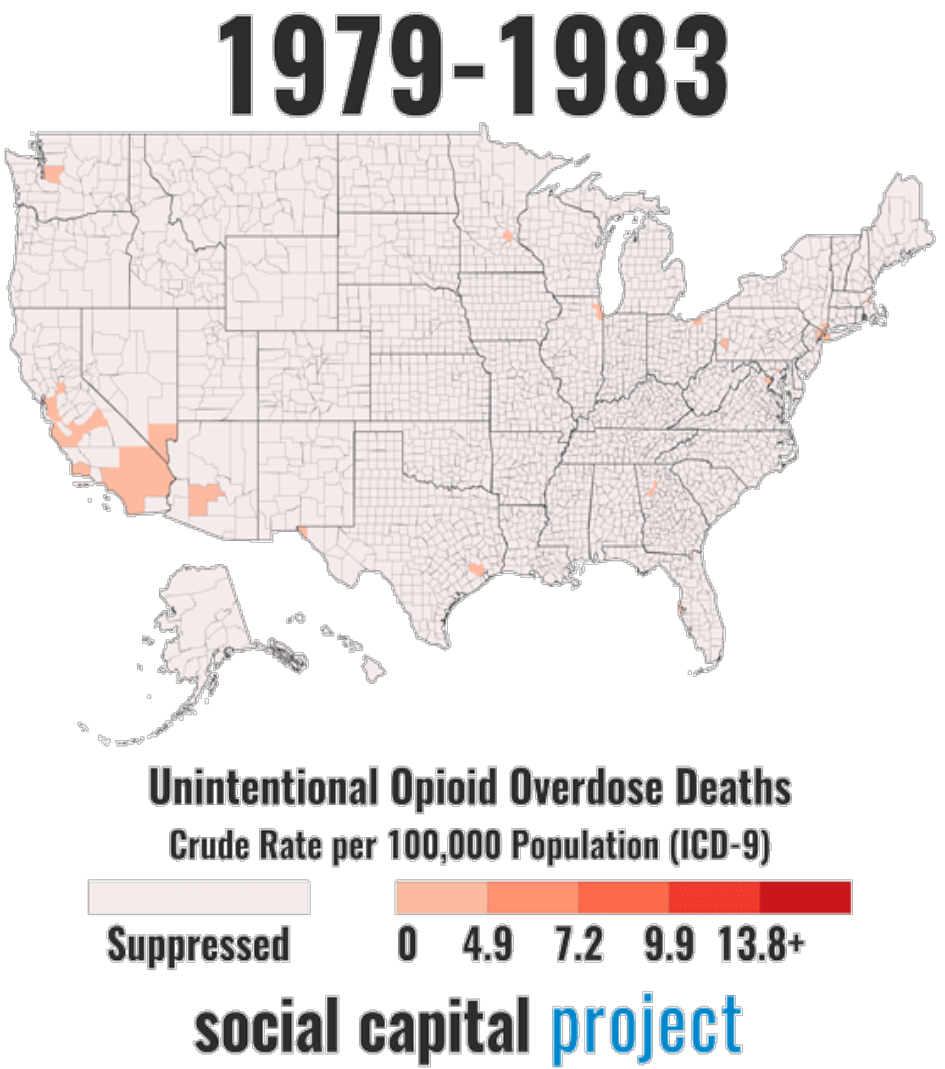
ELSEVIER

International Journal of Drug Policy
Volume 104, June 2022, 103677

Commentary

Fatal overdose: Predicting to prevent

Annick Borquez, Natasha K. Martin



Jalal et al. 10.1126/science.aau1184

Predicting county-level overdose death rates in the next year

Identifying counties at risk of high overdose mortality burden during the emerging fentanyl epidemic in the USA: a predictive statistical modelling study

Charles Marks, Daniela Abramovitz, Christl A Donnelly, Gabriel Carrasco-Escobar, Rocío Carrasco-Hernández, Daniel Ciccarone, Arturo González-Izquierdo, Natasha K Martin, Steffanie A Strathdee, Davey M Smith, Annick Bórquez

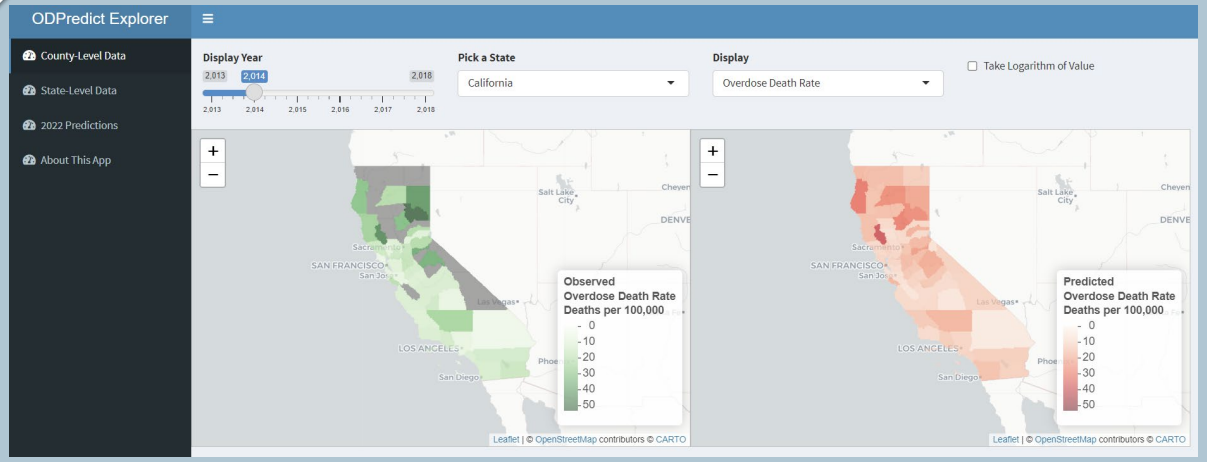
Summary

Background The emergence of fentanyl around 2013 represented a new, deadly stage of the opioid epidemic in the USA. We aimed to develop a statistical regression approach to identify counties at the highest risk of high overdose mortality in the subsequent years by predicting annual county-level overdose death rates across the contiguous USA and to validate our approach against observed overdose mortality data collected between 2013 and 2018.

Lancet Public Health 2021

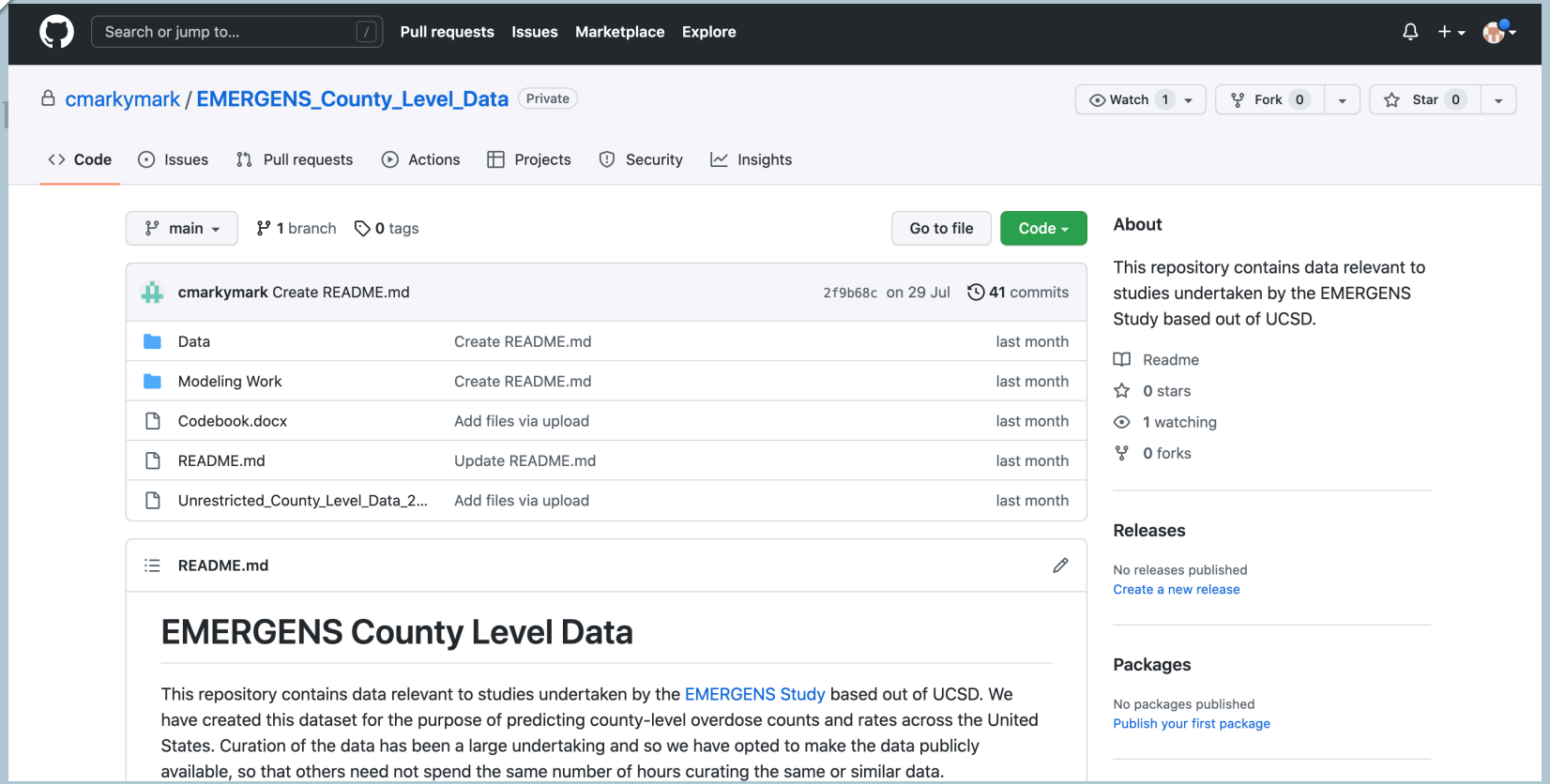
Published Online
June 9, 2021
https://doi.org/10.1016/S2468-2667(21)00080-3

- We developed a negative binomial model to predict next year's county-level overdose death rates from 2013-2018
- We validated the model against fatal overdose data
  - Through using standard metrics
  - Through comparing it to a heuristic benchmark: what if trends followed past year's changes?

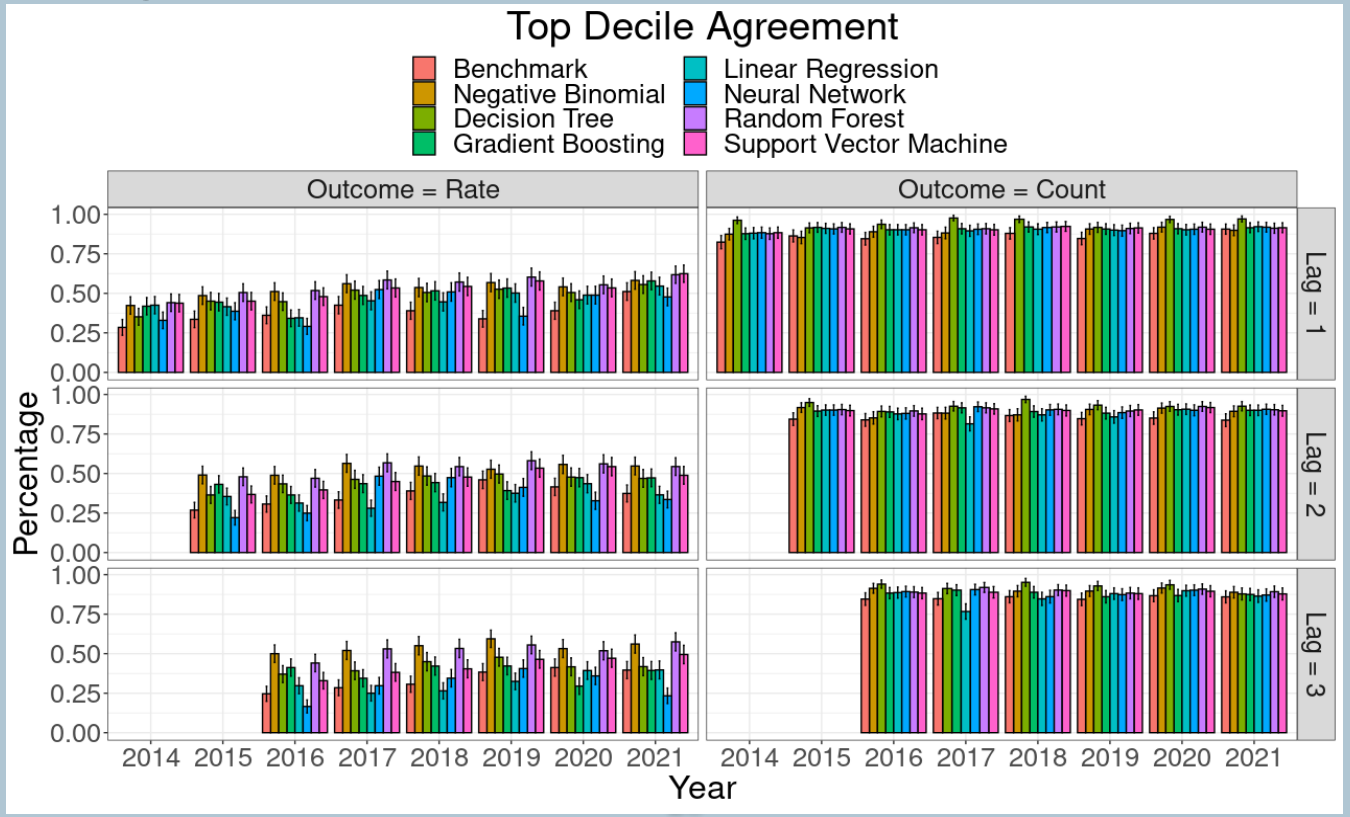


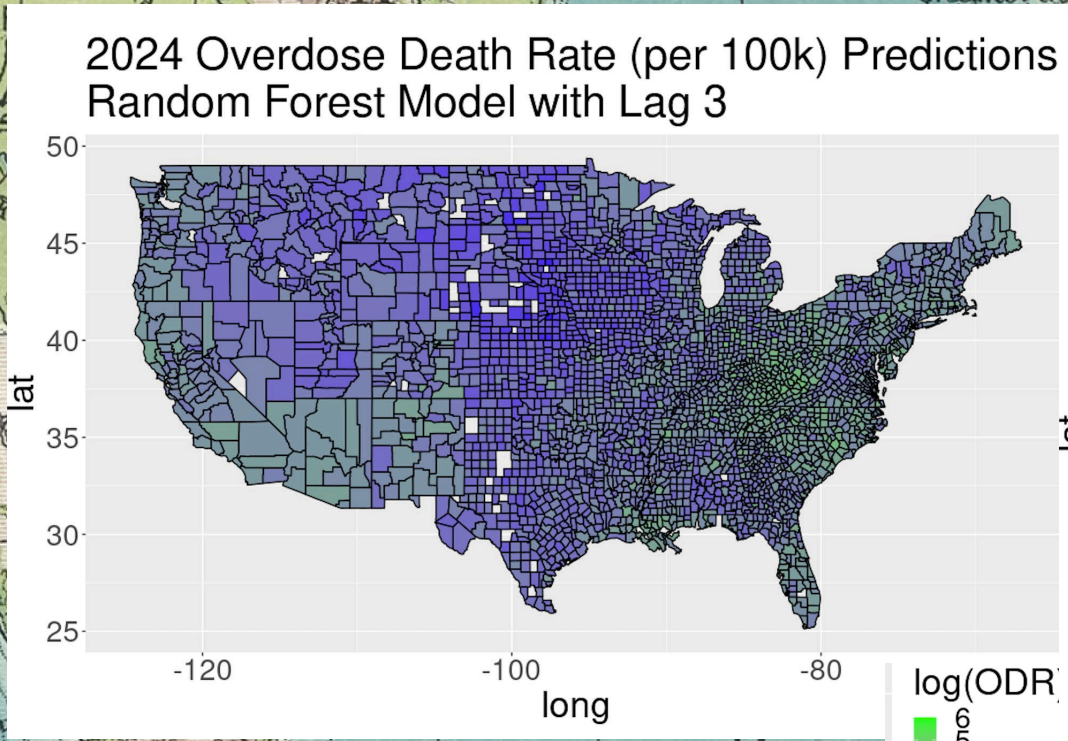
To help facilitate viewing the results of our initial study, we developed the OD Explorer Application

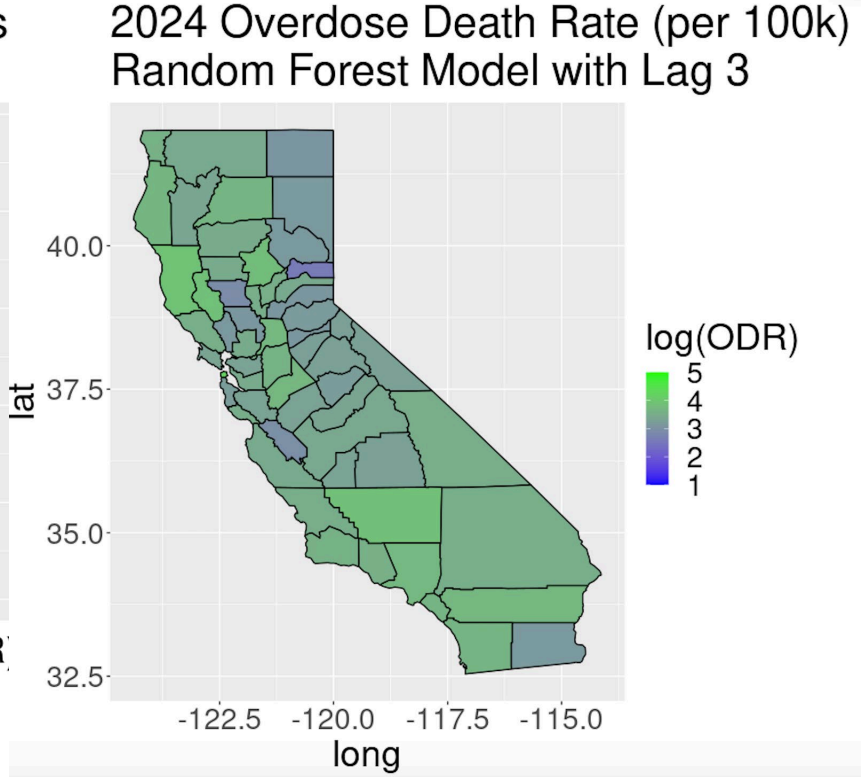
Users can compare our model's year-by-year predictions to the actual observed county-level overdose death rates


Search or jump to...
Pull requests
Issues
Marketplace
Explore
cmarkymark / EMERGENS_County_Level_Data
Private
Watch 1
Fork 0
Star 0
Code
Issues
Pull requests
Actions
Projects
Security
Insights
main
1 branch
0 tags
Go to file
Code
cmarkymark Create README.md
2f9b68c on 29 Jul
41 commits
Data
Create README.md
last month
Modeling Work
Create README.md
last month
Codebook.docx
Add files via upload
last month
README.md
Update README.md
last month
Unrestricted_County_Level_Data_2...
Add files via upload
last month
README.md
EMERGENS County Level Data
This repository contains data relevant to studies undertaken by the EMERGENS Study based out of UCSD. We have created this dataset for the purpose of predicting county-level overdose counts and rates across the United States. Curation of the data has been a large undertaking and so we have opted to make the data publicly available, so that others need not spend the same number of hours curating the same or similar data.
About
This repository contains data relevant to studies undertaken by the EMERGENS Study based out of UCSD.
Readme
0 stars
1 watching
0 forks
Releases
No releases published
Create a new release
Packages
No packages published
Publish your first package

Improving performance through developing machine learning models

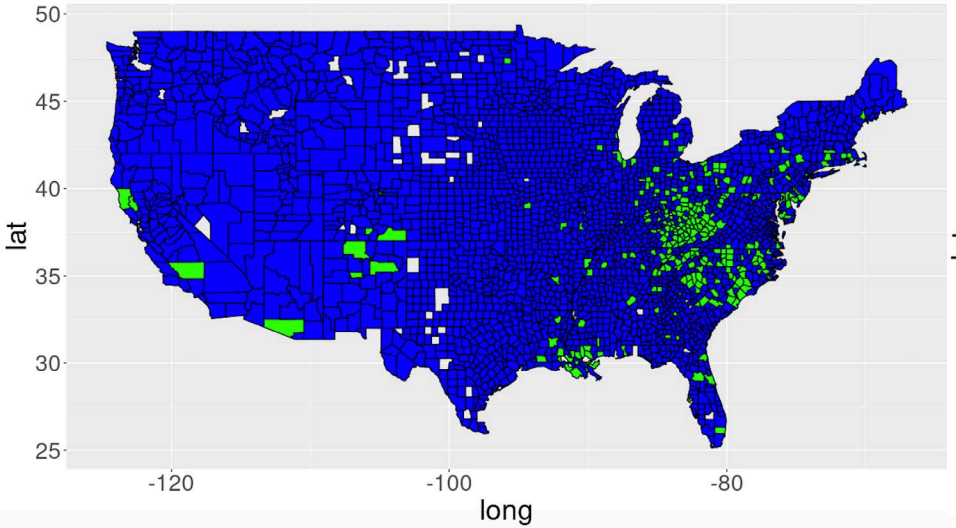



2024 Overdose Death Rate (per 100k) Predictions
Random Forest Model with Lag 3
lat
long
50
45
40
35
30
25
-120
-100
-80
log(ODR)
6
5
4
3
2
1

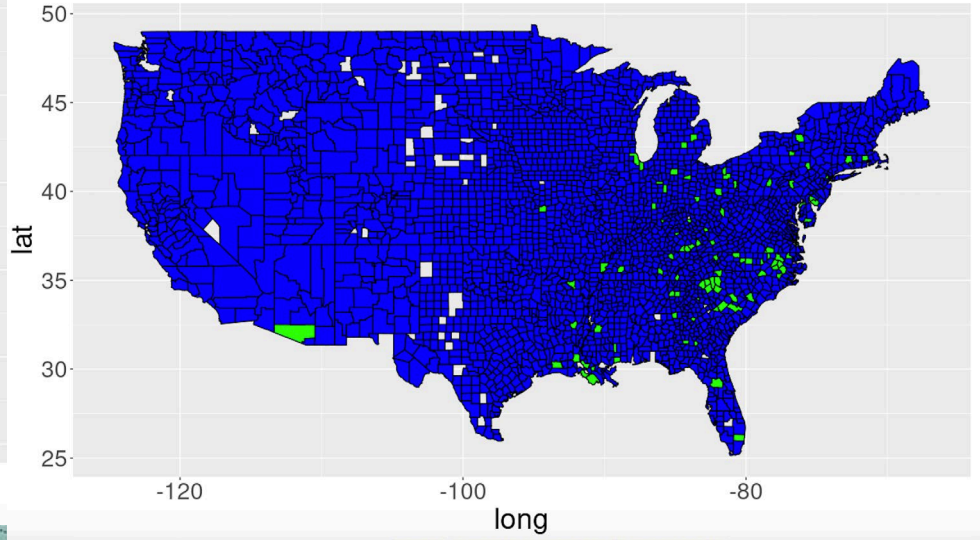

2024 Overdose Death Rate (per 100k)
Random Forest Model with Lag 3
lat
long
40.0
37.5
35.0
32.5
-122.5
-120.0
-117.5
-115.0
log(ODR)
5
4
3
2
1

Counties in and newly in the top mortality decile

2024 Predicted Top Decile Counties
Random Forest Model with Lag 3



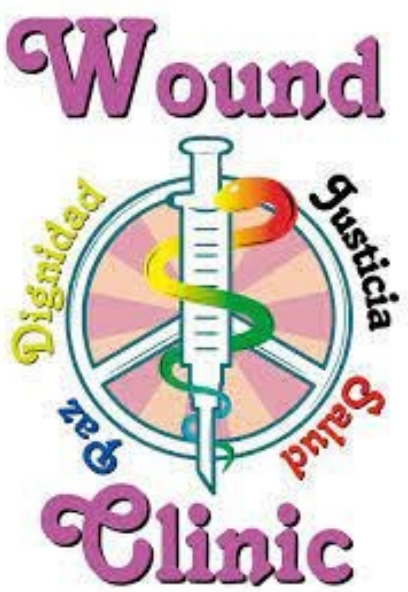
2024 Predicted Newly Top Decile Counties
Random Forest Model with Lag 3



Guiding harm reduction interventions

- La Frontera: characterizing impact of changing drug markets and cross border drug use on health among PWID (San Diego, PI Strathdee)
- Project HERO: helping everyone respond to overdose (Reno Nevada, PI Wagner)
- Evaluating the naloxone expansion program in San Diego county (PI HRCSD)
- Enhancing drug checking services in San Diego county (in collaboration with HRCSD)

Community engagement



Funding options for non-US citizens

From home country

- NIDA international fellowships (https://nida.nih.gov/sites/default/files/nidaip-resfellowappinst-508.pdf)
- Local collaborations between U.S. university and home country (e.g. UC and CONACyT)
- CFAR international pilot grants

Within the U.S.

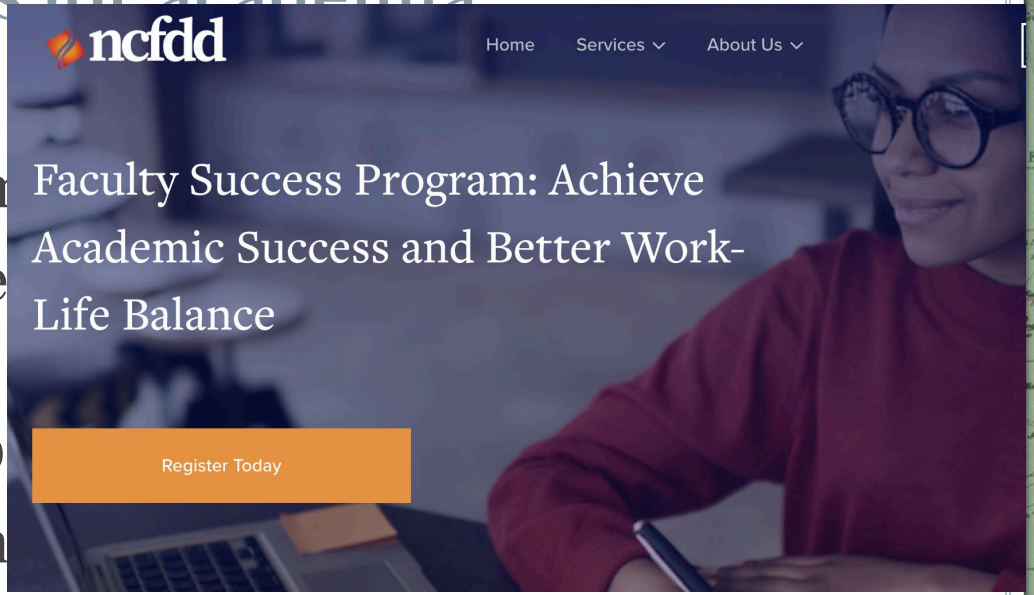
- K99/R00
- Administrative supplements
- CDC
- Avenir (DP2)
- CFAR newsletter shares funding announcements (HIV)

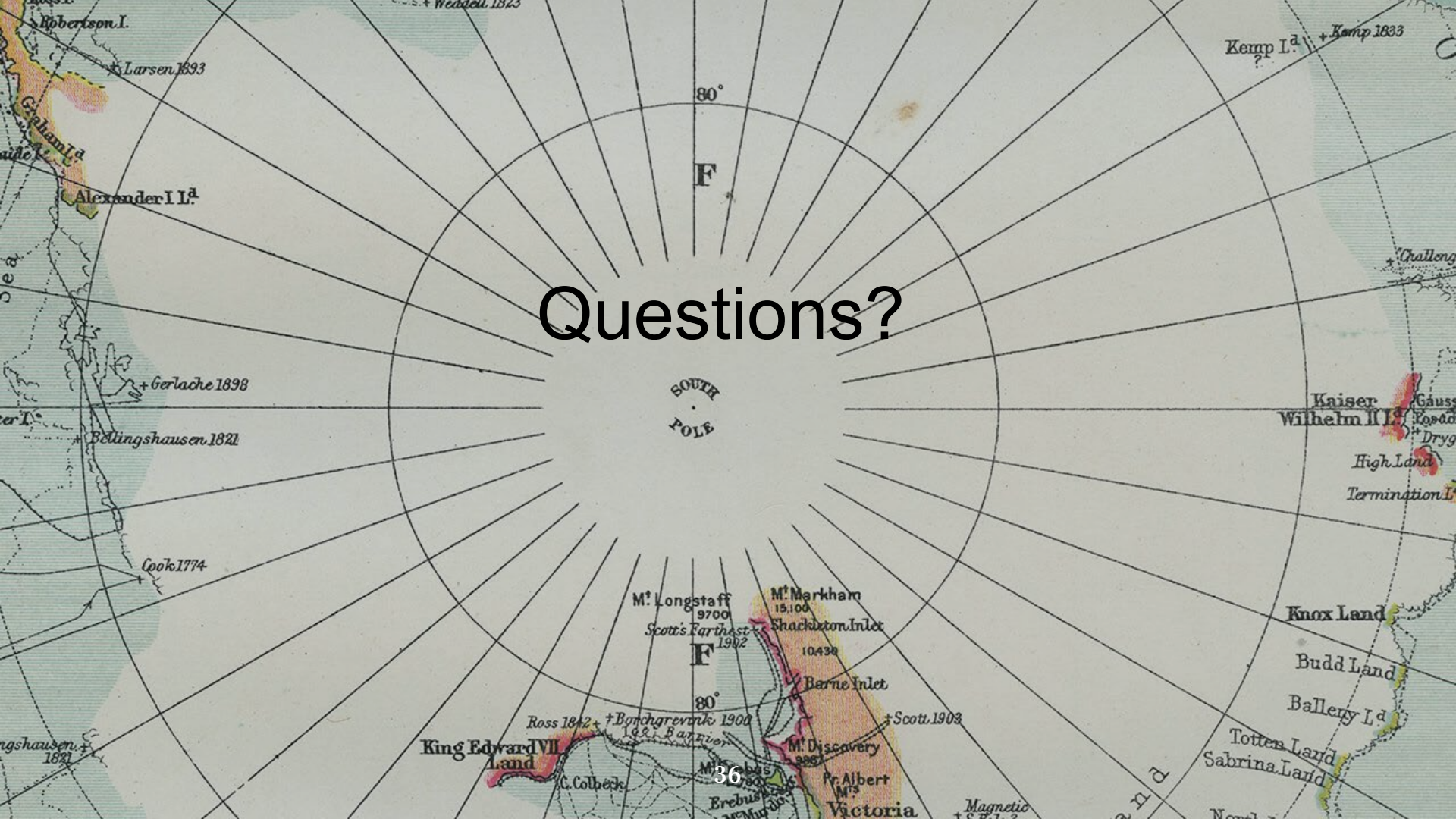
Grant writing resources

- Grant writing courses (NIH and UC)
- CFAR OK review
- CFAR repository (AID)
- Check NIH reporter to identify potential mentors and learn about currently funded research on your topic

Tips for academia

- Build a network of m
- Develop a specific e
  involved)
- Learn to tell a comp
- Keep it simple on th
- National Center for Faculty Development and Diversity




Questions?
SOUTH POLE
80°
F
Robertson I.
Larsen 1893
Alexander I I.d
Gerlache 1898
Bellingshausen 1821
Cook 1774
Kemp I.d
Kemp 1833
Kaiser Wilhelm II I.d
High Land
Termination I.
Knox Land
Budd Land
Balleny I.d
Totten Land
Sabrina Land
Mt Longstaff 9700
Scott's Farthest 1902
Mt Markham 15,100
Shackleton Inlet
10438
Borne Inlet
Scott 1903
Ross 1842
Borchgrevink 1900
Lt. R. Bernacchi
King Edward VII Land
C. Colbeck
Mt Discovery
Pr. Albert Mts
Victoria
Erebus
Terror
Magnetic