IMPACT OF THE COVID-19 PANDEMIC ON OPIOID OVERDOSE DEATHS: A SPATIOTEMPORAL ANALYSIS

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INTRODUCTION

There were an estimated 100,306 drug overdose deaths in the United States in 2021, an increase of 28.5% from the 78,056 deaths during 2020.

Of those deaths, almost 76% involved a prescription or illicit opioid.

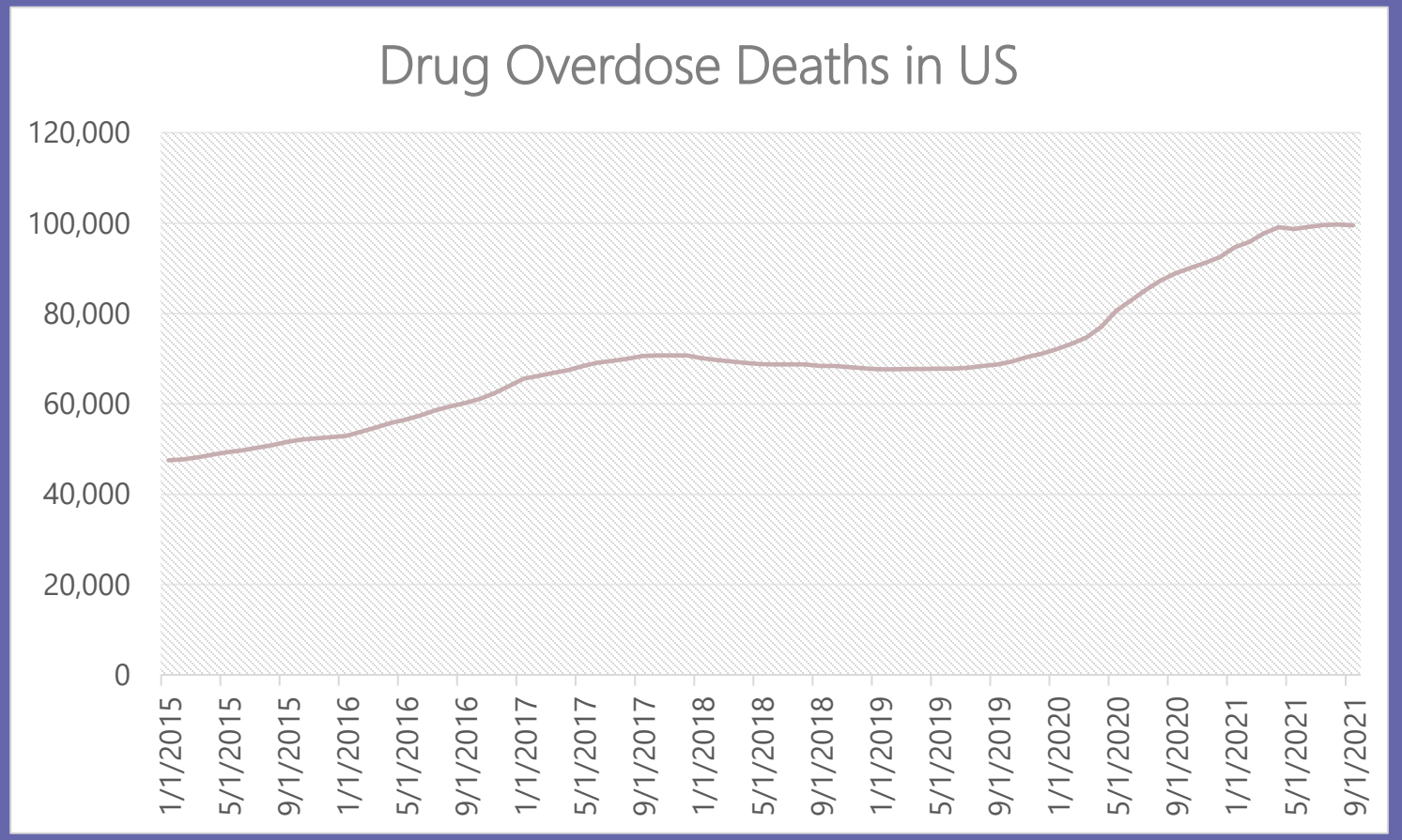
Drug overdose remains a leading cause of injury-related death in the United States

209 people

Die every day because of overdoses involving prescription and illicit opioids

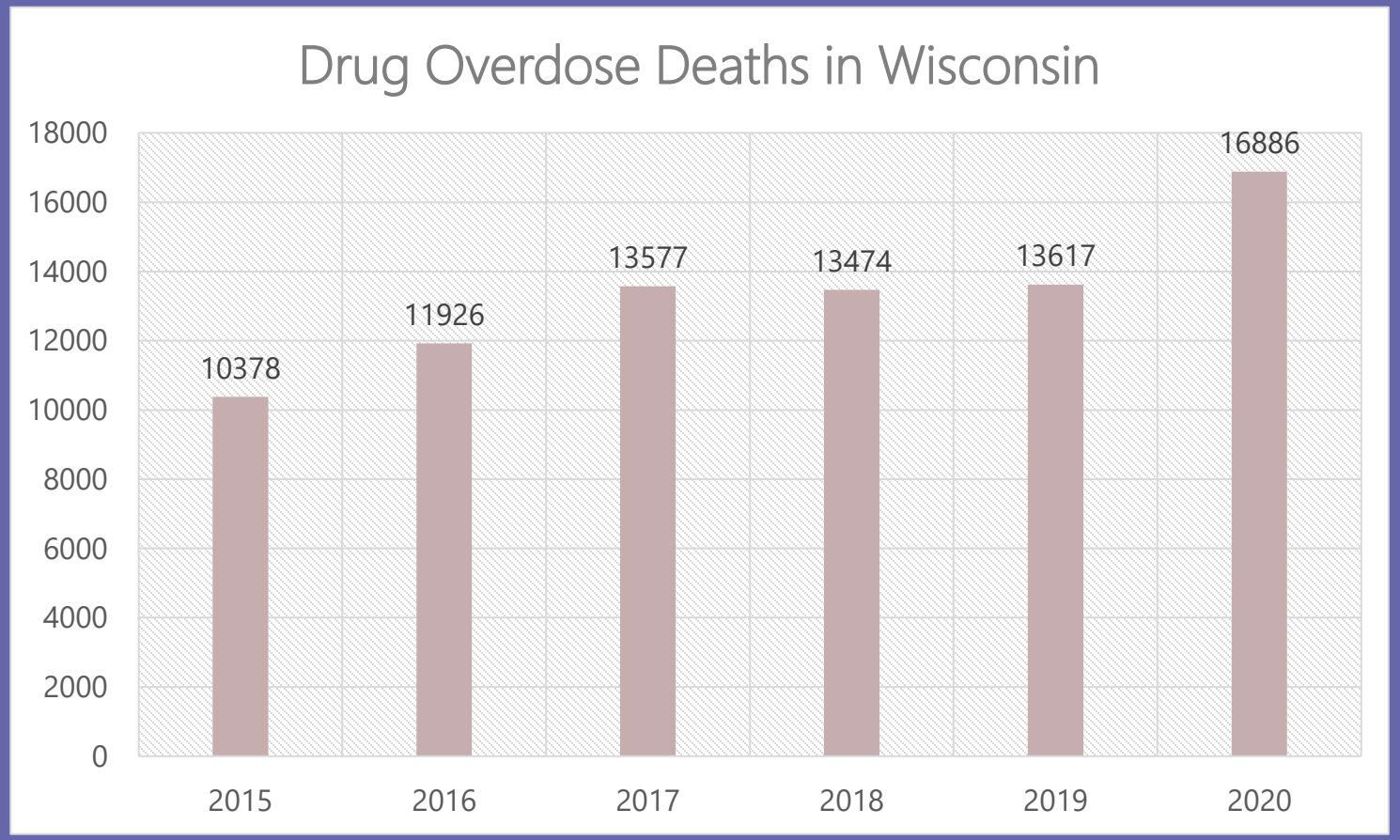
INTRODUCTION

Drug overdose deaths continue to increase in the United States.



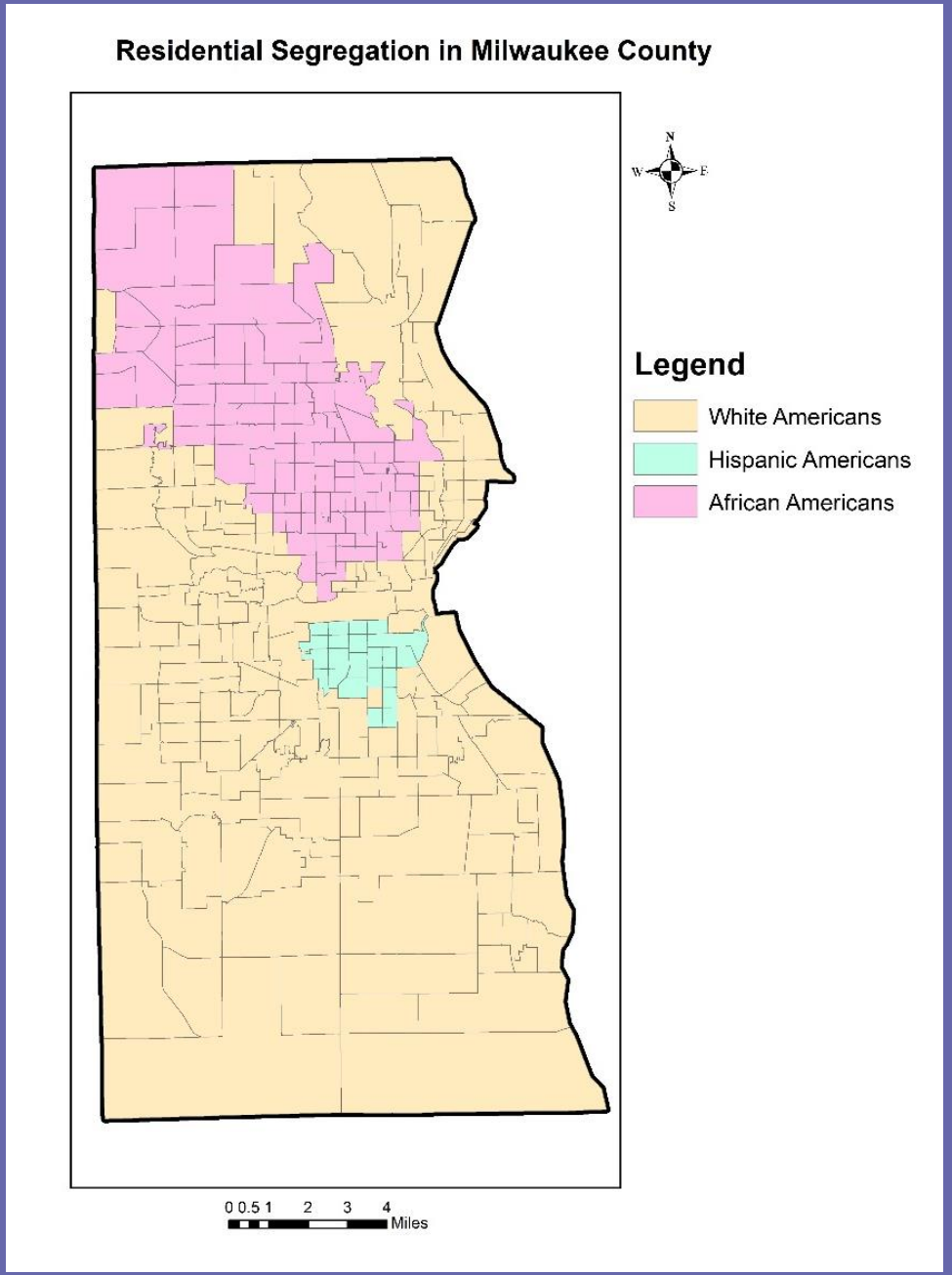
STUDY SITE

Drug overdose deaths continue to increase in the Wisconsin.



STUDY SITE

The hyper-segregated City of Milwaukee (population 590,157) exhibits concentrated urban poverty in neighborhoods occupied primarily by Black and Hispanic communities.



STUDY SITE

The numbers and percentages of OODs prior to and after the March 23rd, 2020 "stay-at-home"

OODs increased significantly in the post-intervention stage in Milwaukee County

Principal factors shaping OODs remained consistent in the pre- and post-intervention stages

	Pre-intervention		Post-intervention	
	Count	Percentage	Count	Percentage
Mode				
Accident	978	96.83%	336	95.18%
Suicide	15	4.49%	10	2.83%
Drug Evident in Toxicology Report				
Fentanyl	644	63.76%	311	88.10%
Heroin	431	42.67%	70	19.83%
Cocaine	373	36.93%	121	34.28%
Gender				
Male	690	68.31%	252	71.39%
Race				
Hispanic	91	9.01%	30	8.50%
Black	219	21.68%	89	25.21%
White	676	66.93%	223	63.17%
Geographic Discordance				
YES	280	27.72%	88	24.92%
NO	730	72.27%	265	75.07%
Age (years)				
0-30	201	19.90%	45	12.75%
30-40	265	26.24%	105	29.75%
40-50	222	21.98%	72	20.40%
50-60	229	22.67%	87	24.65%
60 and more	93	9.21%	44	12.46%

METHODOLOGY

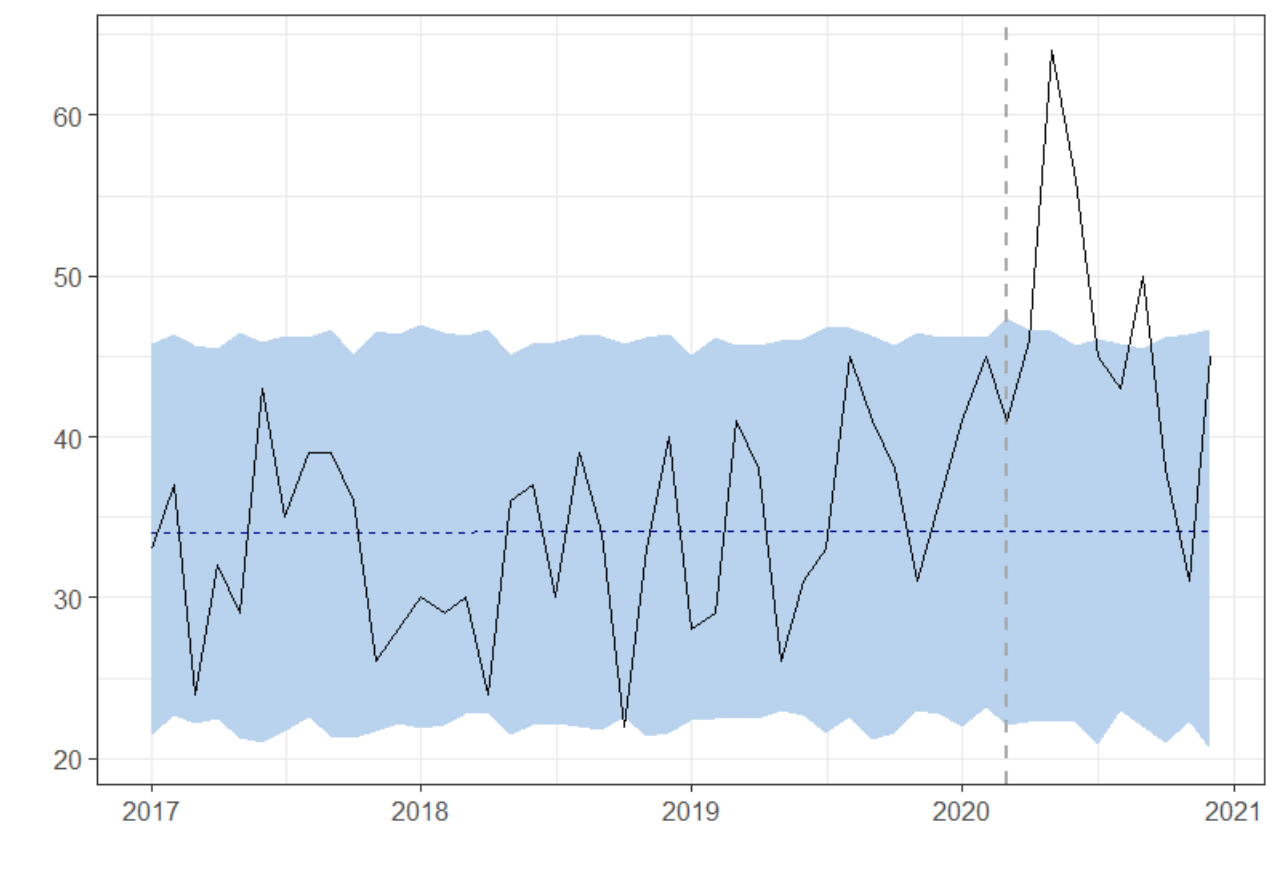
Interrupted time series

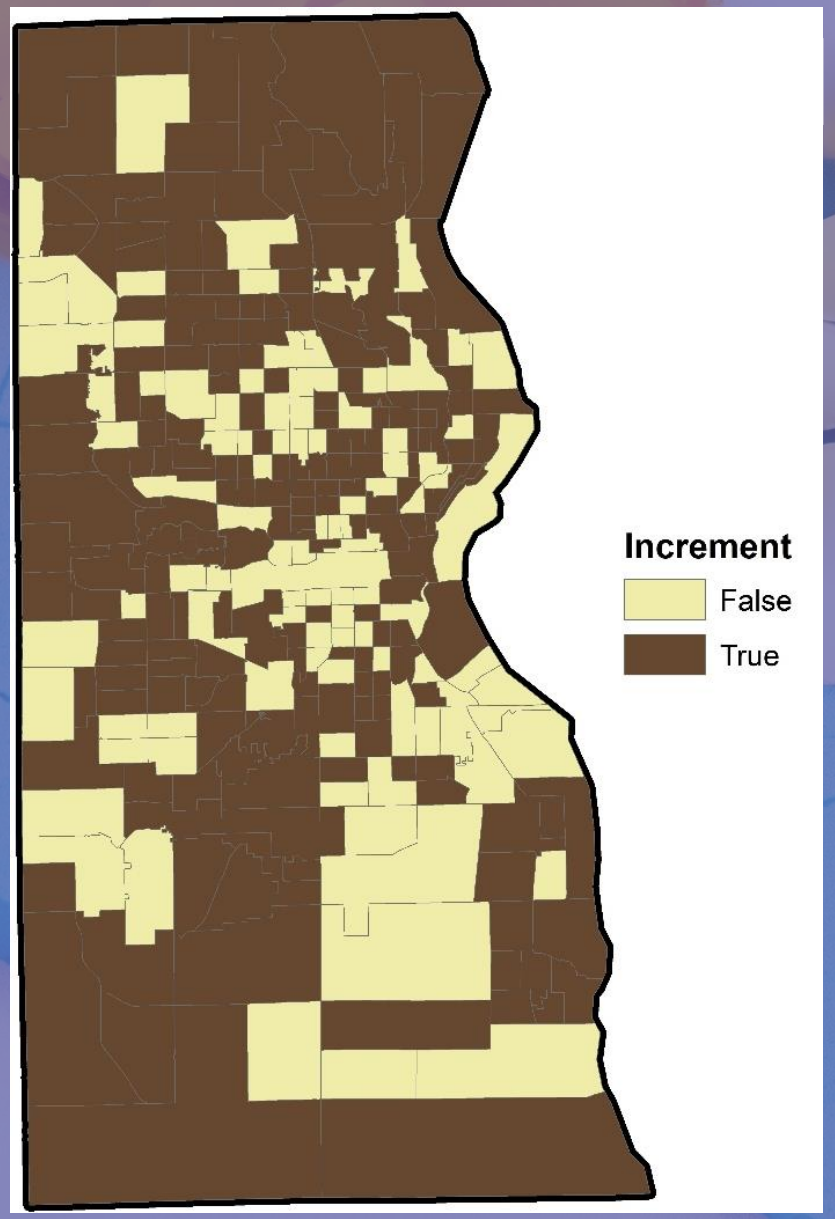
- Social phenomena exhibit autocorrelation and seasonal effects that can cause a temporary change in the rate of events;
- This is done by analyzing the change in the level and slope of the time series after an intervention has been applied and comparing to the structure of the temporal dynamic before the intervention.
- we investigate the effect of COVID-19 containment measures, specifically the “stay at home” order, on OOD trends in Milwaukee using Bayesian structural time-series (BSTS) models

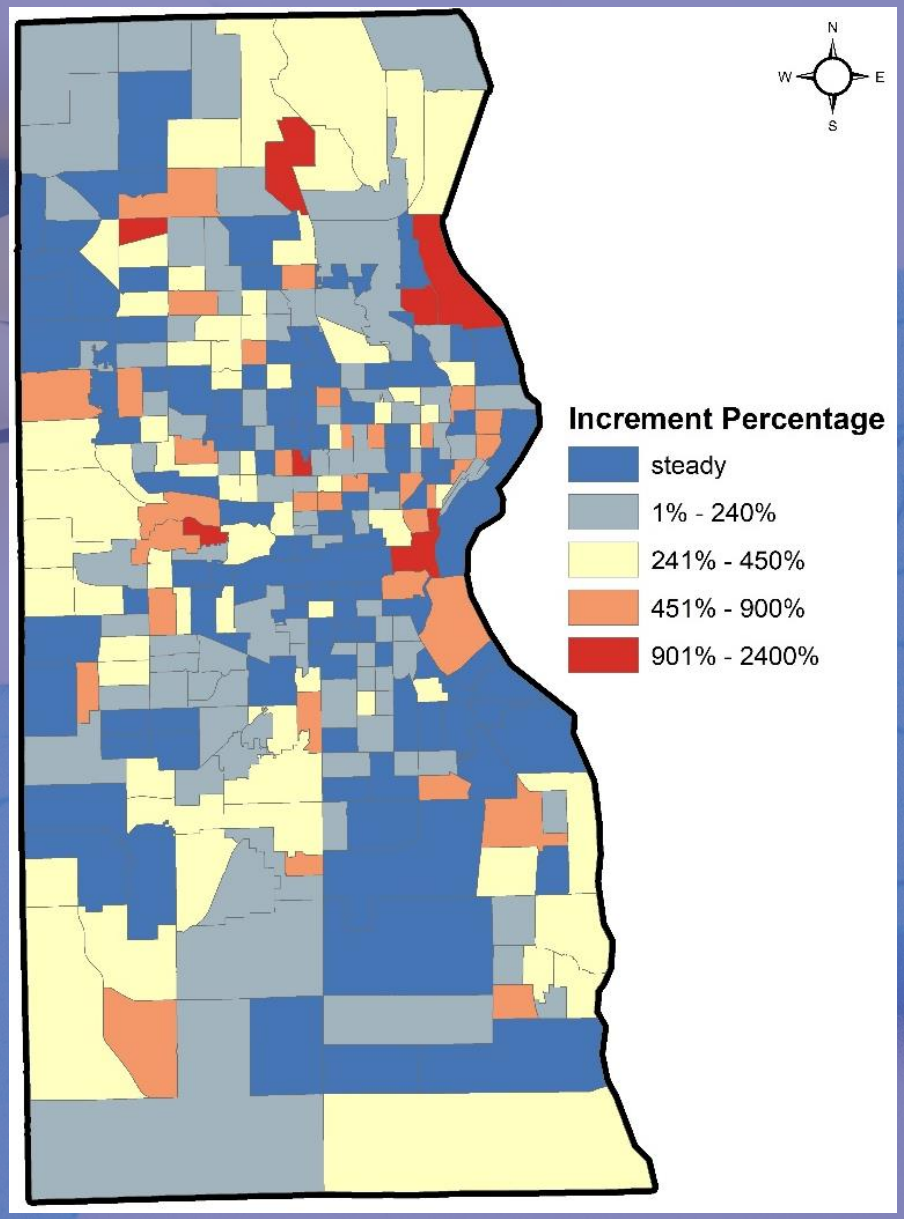
STUDY SITE

During the post-intervention period, the average number of monthly OODs was 38. In the absence of the pandemic and “lockdown”, we would have expected average monthly OODs of 26

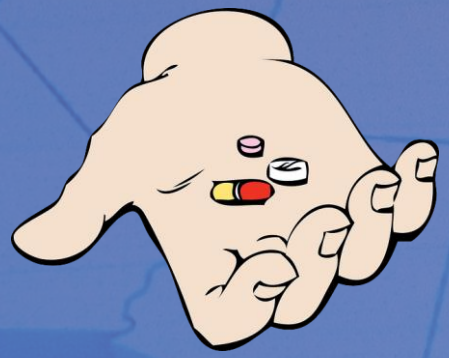
In relative terms, the overdose rate showed an increase of +45%.




Increment
False
True


N
W
E
S
Increment Percentage
steady
1% - 240%
241% - 450%
451% - 900%
901% - 2400%

DISCUSSION

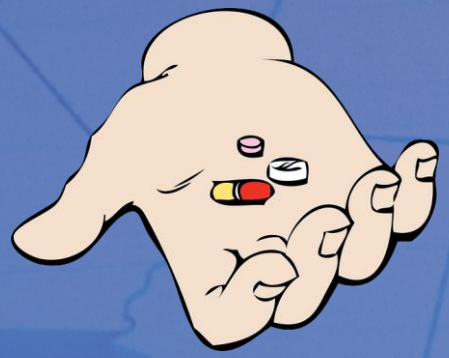


The increase in opioid overdose deaths (OODs) during the pandemic has been attributed to various factors:

1. COVID-19 containment strategies are disrupting existing opioid use disorder (OUD) treatment paradigms, which have focused on in-person examinations, medication distribution, counseling sessions, and group therapy.

2. The determination to distribute larger amounts of methadone essentially treats all patients as though they were in a stable condition.

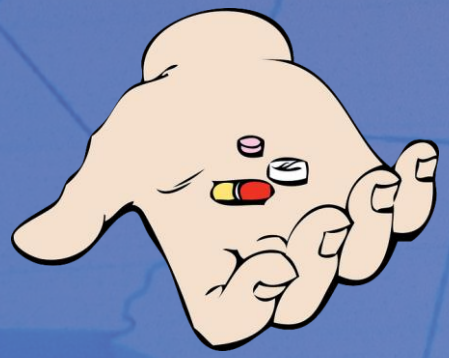
DISCUSSION



3. Covid-19 pandemic imposed tremendous pressure on public health, so they had to offer less support in terms of harm reduction initiatives such as targeted overdose education, naloxone distribution, and policies to improve bystander assistance during a witnessed overdose, syringe service programs, or naloxone distribution

4. Drug precursors supply chains interruption, probable shut down of abroad synthesis labs, and border closures and their possible effect on drug shipping due to the pandemic disrupted drug supplies

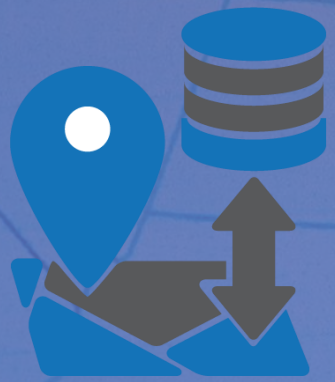
DISCUSSION



5. Enforced shelter in home orders can isolate people when they use drugs and make it more likely that they will be alone while doing so (lack of the presence of a bystander or witness to the overdose), leading to limited emergency medical response access, restricting naloxone administration, and increased risk of fatal overdose.

6. Isolation can have a severe influence on mental health, creating anxiety and depression, which can lead to drug abuse as a coping mechanism, and also increasing the chance of relapse in abstinent individuals

METHODOLOGY

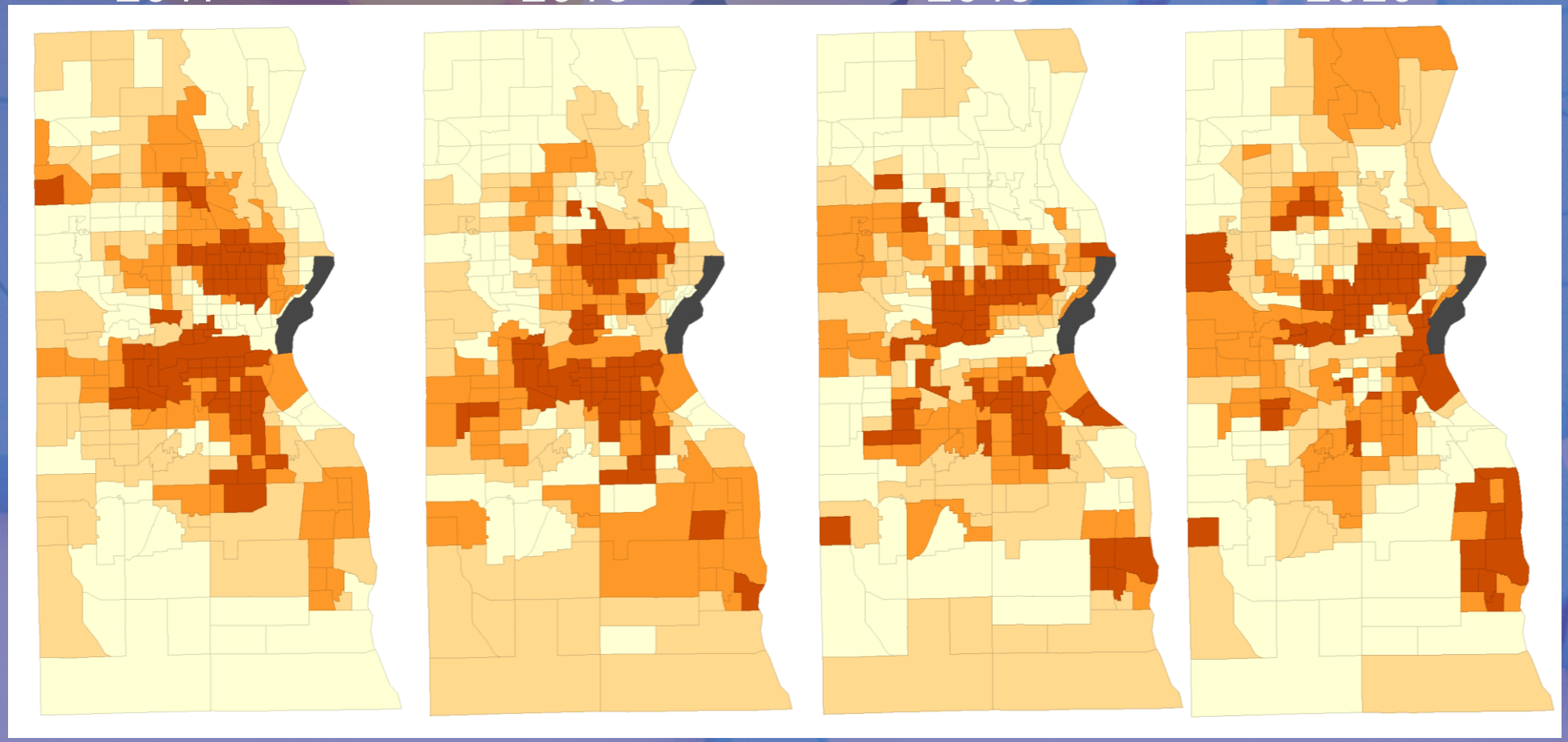


Spatial empirical Bayesian smoothing

- To control for the effects of population size, we computed OOD rates by census tract in Milwaukee County
- Raw rates exhibit intrinsic variance instability
  - rate's precision as a measure of underlying risk is inversely proportional to the size of the at-risk population leading to significant standard error in rates calculated from small populations.
- To reduce variation caused by the size of the population, spatial empirical Bayes smoothing techniques were applied

HISTORICAL OVERDOSE MAPS

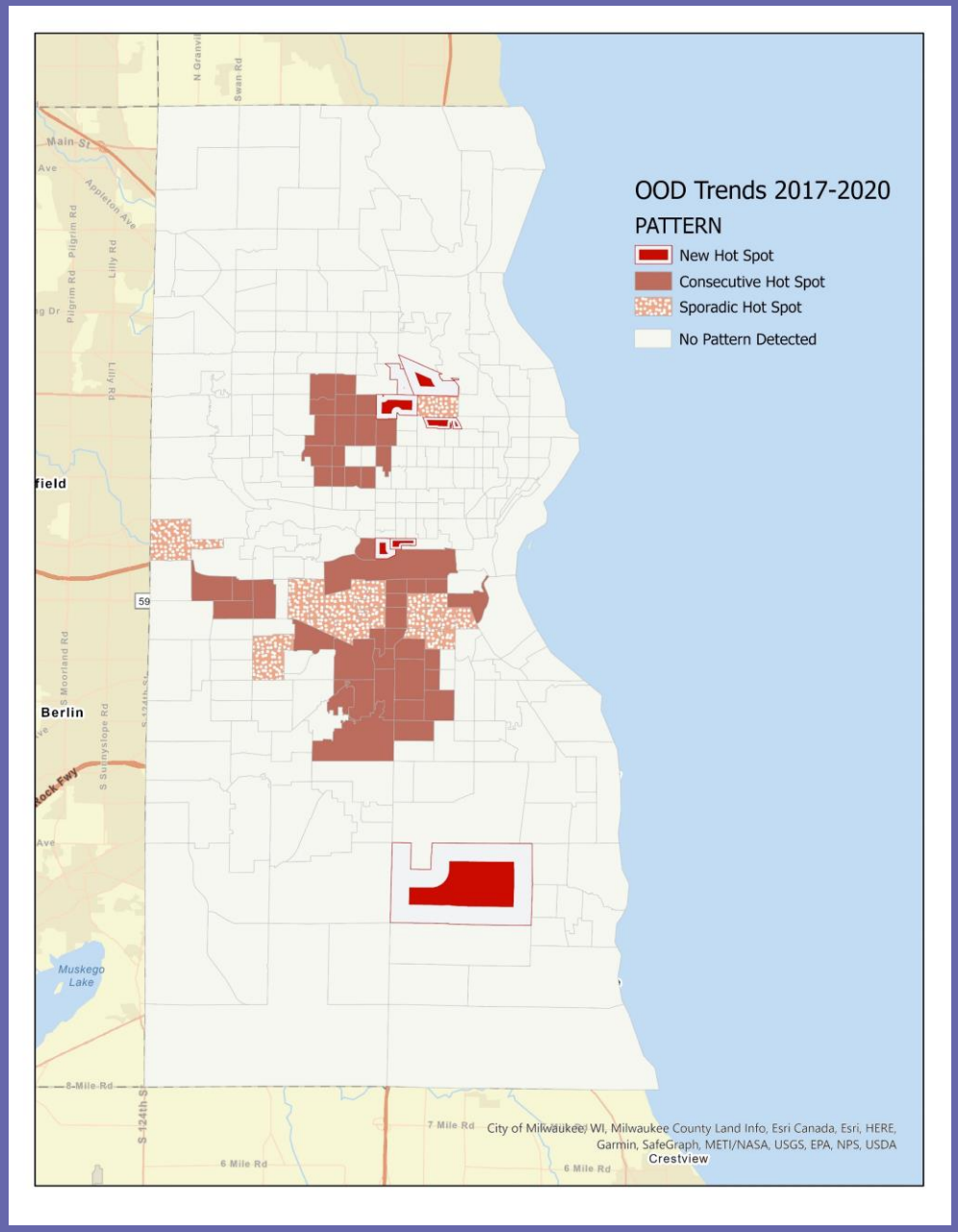
2017 2018 2019 2020



SPATIOTEMPORAL ANALYSIS

Space Time Cube

The Mann-Kendall trend test is performed on every location with data as an independent bin time-series test.

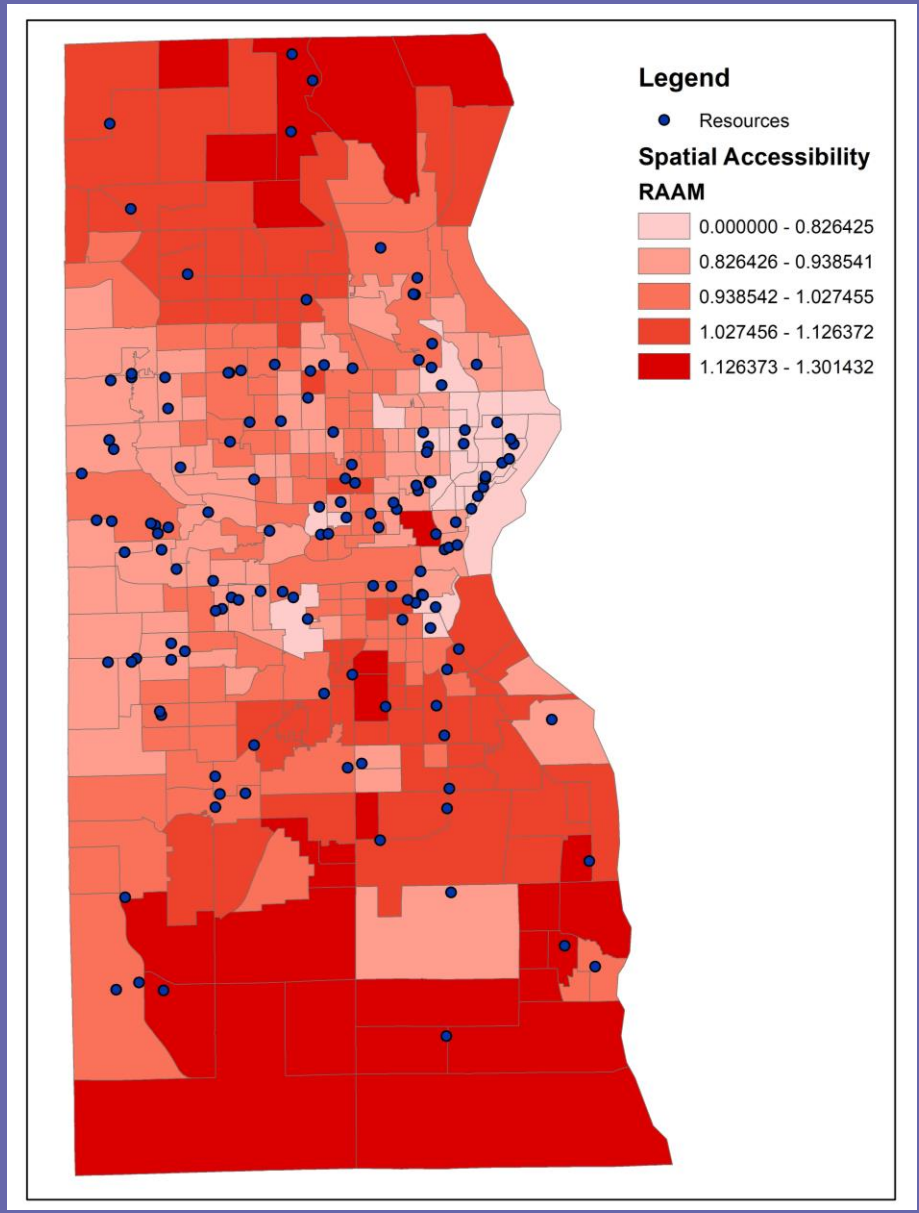


SPATIOTEMPORAL ANALYSIS

	PROPORTION	WHITE	BLACK	HISPANIC	MEDIAN AGE	BACHELOR'S DEGREE OR HIGHER	MEDIAN HOUSEHOLD INCOME	INTERNET SUBSCRIPTION	DON'T HAVE HEALTH INSURANCE
PERSISTENT LOW OOD	3%	83%	8%	5%	41.7	38.16%	$87079	85%	1%
PERSISTENT HIGH OOD	6%	35%	39%	24%	31.4	10.63%	$36351	69%	10%

ACCESSIBILITY

- Rational Agent Access Model (RAAM): A model that optimizes the allocation of patients to providers by minimizing travel times and congestion at the provider (Saxon and Snow 2019)

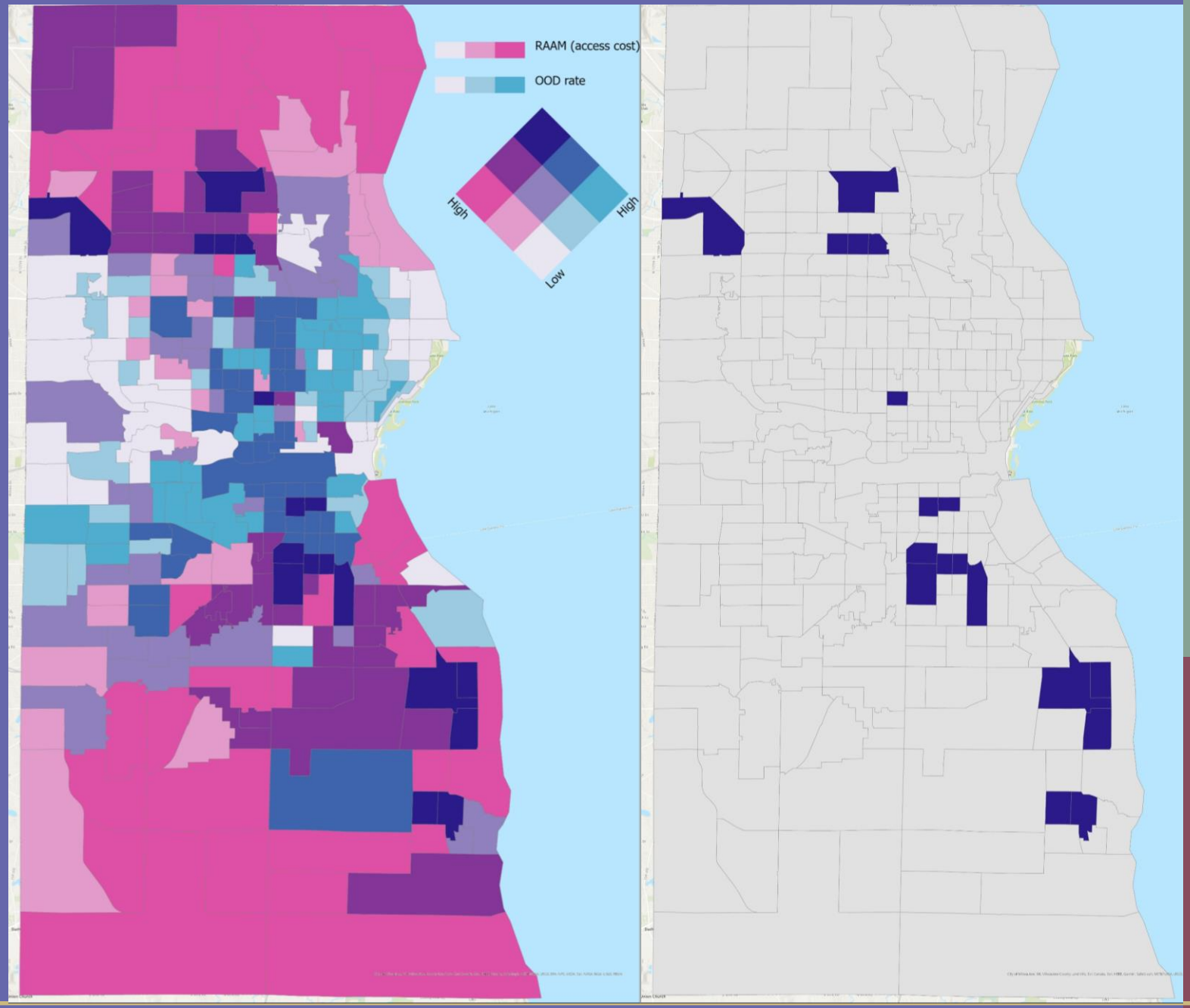


ACCESSIBILITY

- Bivariate Colors Map

  To Identify OOD resource deserts for vulnerable populations

- To provide a detailed perspective for assessing the inequality of healthcare resources and detailed references for the allocation of medical resources in the future



Foundation for Opioid Response Efforts

Northwestern Mutual data science INSTITUTE

UWMILWAUKEE MARQUETTE UNIVERSITY

MEDICAL COLLEGE OF WISCONSIN

UWM

CITY OF MILWAUKEE HEALTH DEPARTMENT

The project is a collaboration among academic researchers, and WisHope, a non-profit peer recovery community organization.

WISHOPE

- We will use the findings to guide qualitative assessment of influential factors through our peer network.
- Findings will be disseminated through a public dashboard and provided to local health departments, support organizations, and community leaders with recommendations for optimizing the response to the opioid crisis.

REFERENCES

Forati, A. M., Ghose, R., & Mantsch, J. R. (2021). Examining Opioid Overdose Deaths across Communities Defined by Racial Composition: a Multiscale Geographically Weighted Regression Approach. Journal of Urban Health, 98(4), 551-562.

Ghose, R., Forati, A. M., & Mantsch, J. R. (2022). Impact of the COVID-19 Pandemic on Opioid Overdose Deaths: a Spatiotemporal Analysis. Journal of Urban Health, 1-12.