Social Determinants of Health and Overdose Mortality Trajectories in Ohio: A Latent Profile Analysis

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Jaeho Lee[1], Avery Zheng[2], Tianyi Evans Gu[2], William Kazanis, PhD[3,4], Suzanne Tamang, PhD[3,4]

[1]Brown University, Providence, RI, USA; [2]Phillips Academy Andover, Andover, MA, USA;
[3]Department of Medicine, Division of Immunology and Rheumatology, Stanford University, Stanford, CA, USA;
[4]Palo Alto VA Medical Center for Implementation to Innovation, Palo Alto, CA, USA

Introduction

Recent studies highlight that the opioid overdose crisis in Ohio is evolving rapidly, with distinct trends emerging across different counties. [1] While some regions follow broader national trends, others display rapid increases in overdose mortality—a symptom of variations in socioeconomic conditions, access to healthcare, and local policy initiatives among other factors. [2] Thus, by analyzing regional differences, policymakers can develop more effective local interventions to improve community health outcomes.

Objective

This study aimed to identify previously hidden trajectories of overdose mortalities in Ohio's 88 counties from 2010-2020 using Latent Profile Analysis (LPA). Subsequently, these latent classes were assessed in conjunction with social determinants of health via a significant variable analysis utilizing a Benjamin-Hochberg procedure.

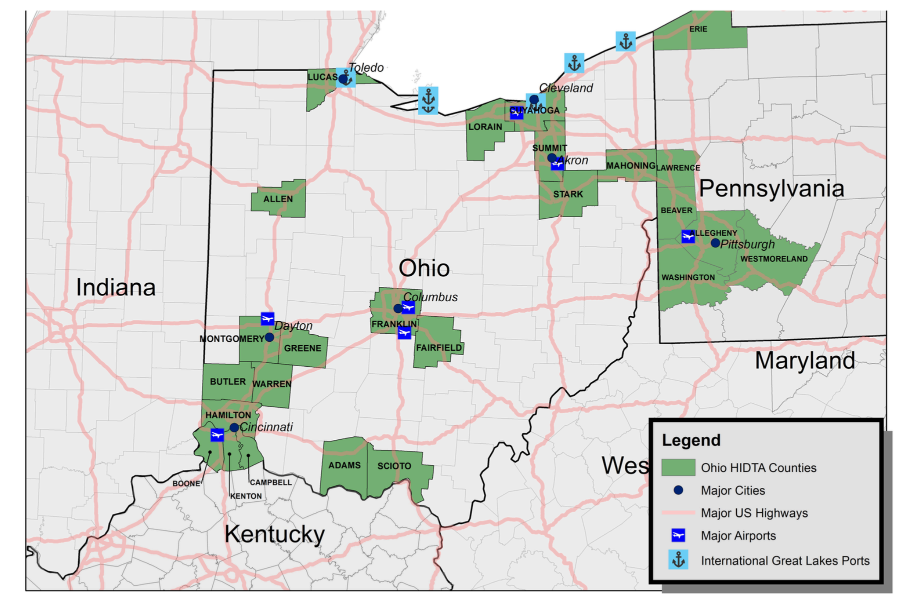
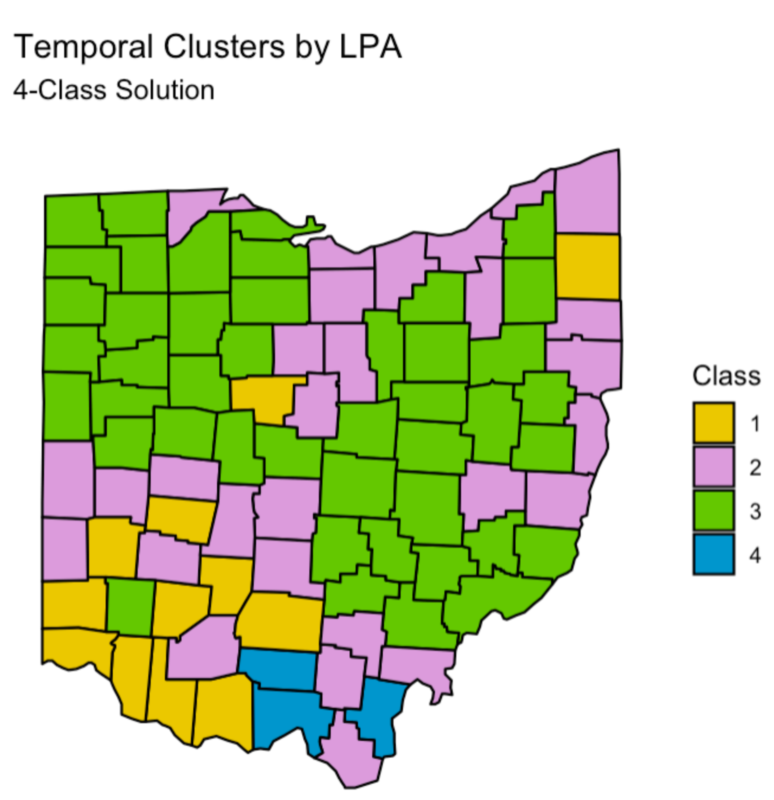
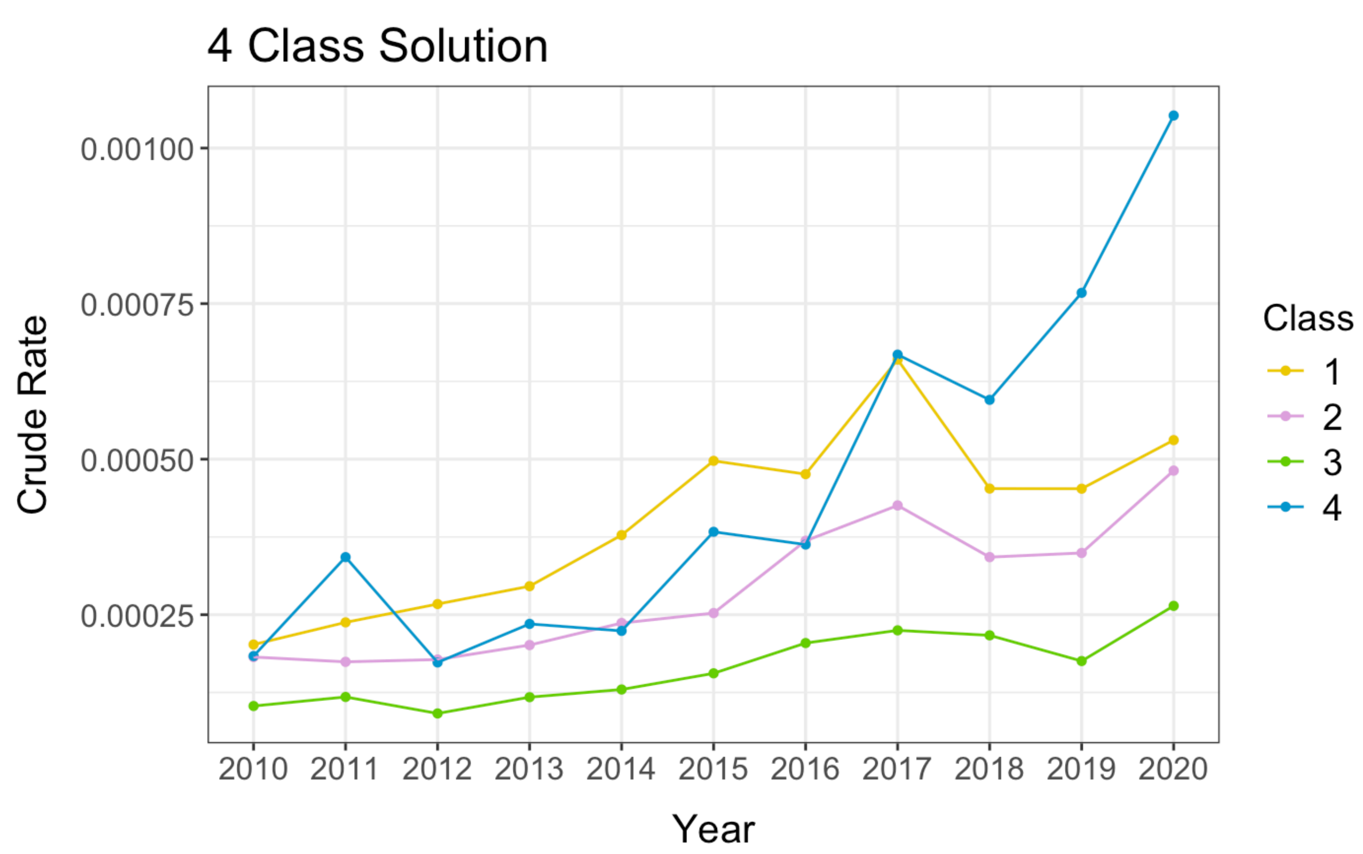


Image from https://ohiohidta.net/designated-counties

Methodology: LPA

- Regression imputation was performed on missing overdose data for instances that were suppressed due to low death counts
- Latent profile analysis was used to find 4 classes of mortality trajectories (optimal by BIC)
- All numeric SDOH variables for 2020 were analyzed by class, and significant variables were determined (Benjamini-Hochberg adjusted p-value < 0.05, |Cohen's d| > 0.8)



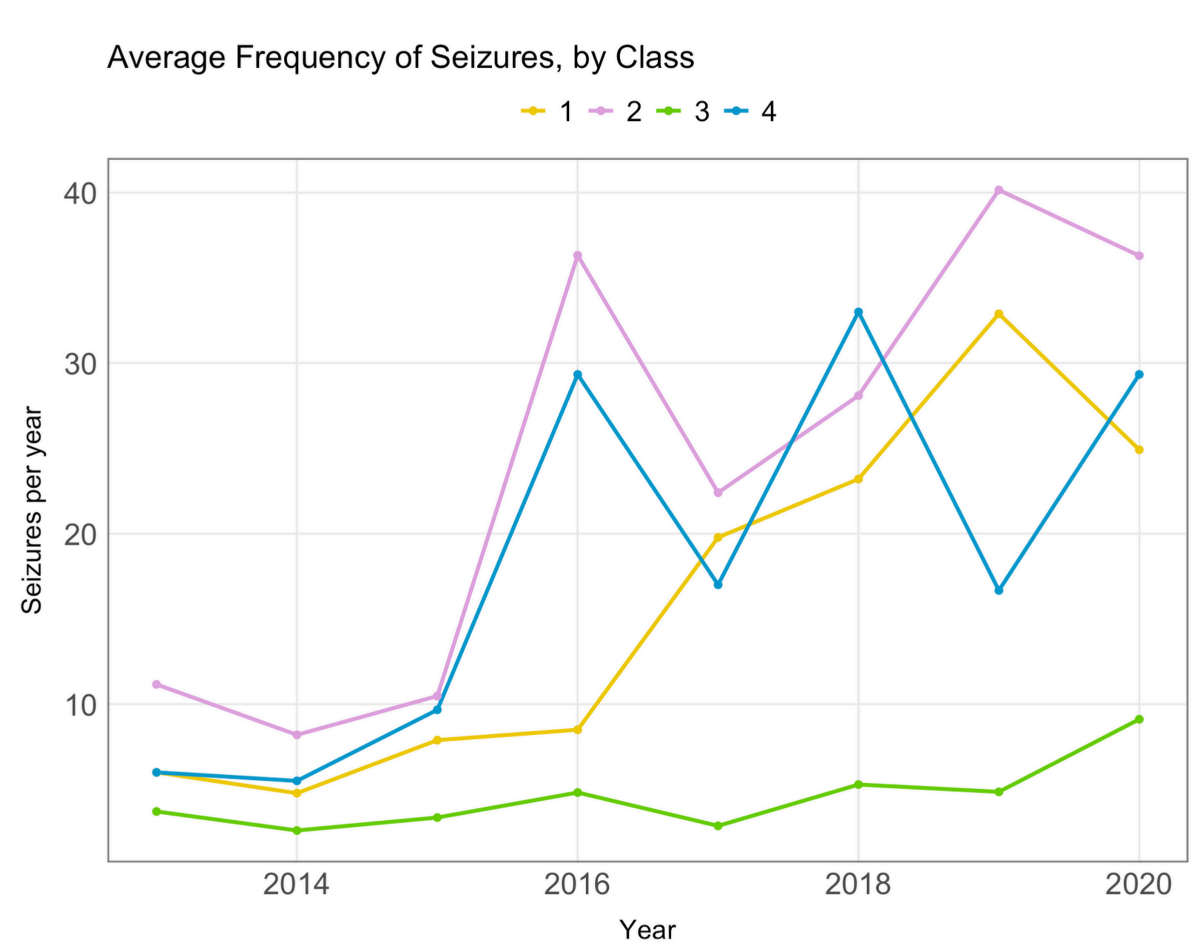


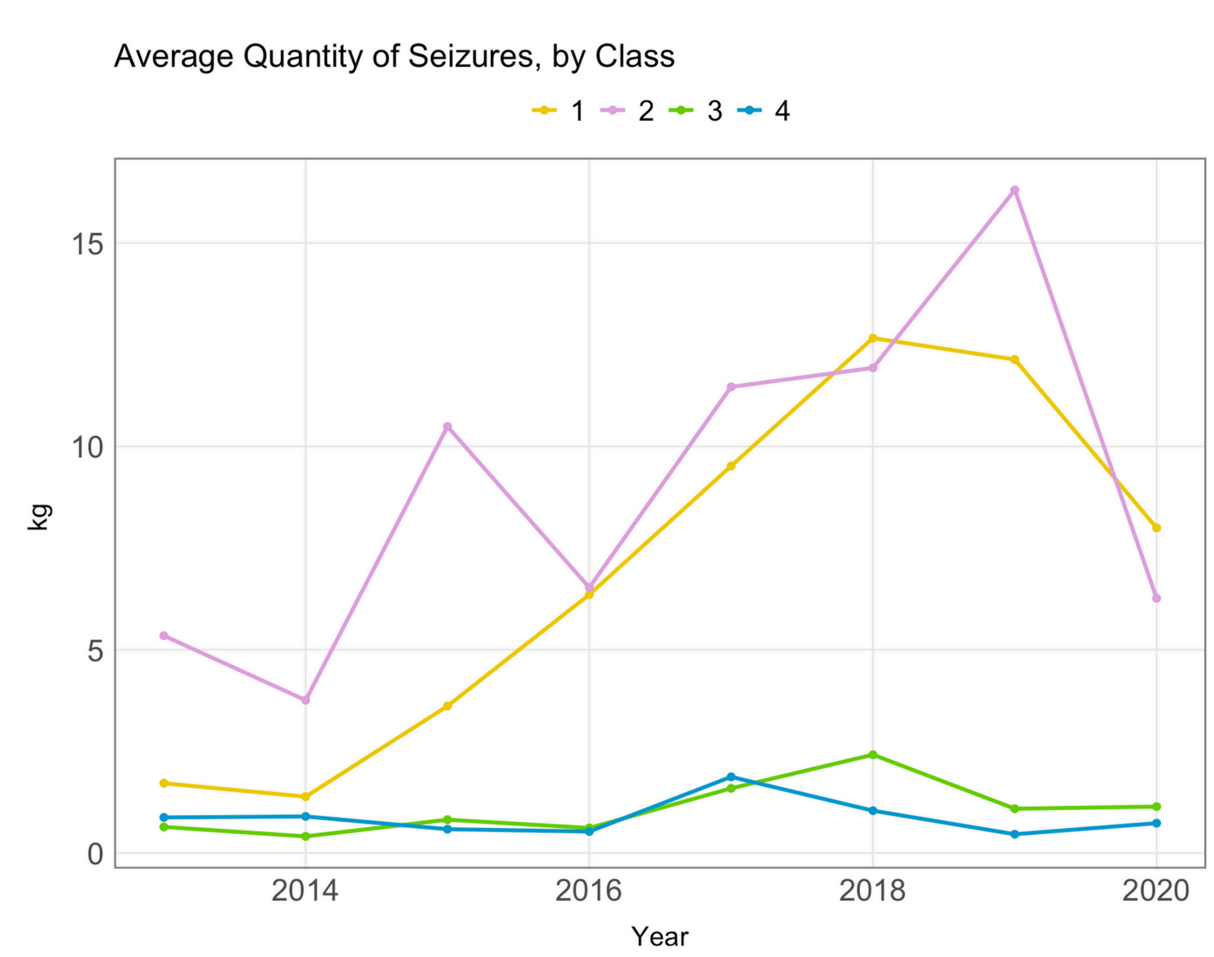
Dataset: HIDTA

- County income (2017–2022) and opioid overdose outcomes (2017–2022) analyzed alongside HIDTA seizure data (2013–2020)
- HIDTA dataset structure: One row per seizure event reported by participating counties; includes date, county, drug type, and quantity.
- Seizure quantities were reported in mixed units (e.g., DU and kg); we converted all quantities to kilograms for comparability, then normalized per capita (kg per person).
- County–year panels were created by merging HIDTA metrics with income and overdose data on county and year to enable cross-sectional and over-time comparisons.
- Key metrics were (i) Rate of seizures (number of seizures per 100,000 residents per year) and (ii) Quantity seized per capita (kg/person per year).
- Map above indicates all HIDTA counties in Ohio

Analysis & Results

The LPA model fit was optimized at four clusters, supported by a relative entropy of 0.967 and within-class average posterior probabilities of 0.9993, 0.9739, 0.9812, and 0.9999. Of the significant SDOH variables for each cluster, we find that in the fastest-growing and highest-average trajectories (which comprise 16 counties), "Economic Context" variables are statistically overrepresented by a two-proportion z-test. HIDTA data (shown to the right) was used to further validate our clusters, with each exhibiting a different combination of frequency and quantity of seizures. For three trajectories, both quantity and frequency were had a statistically significant difference from the combined data in the other trajectories. Yet, in one trajectory, while frequency was significantly different from other counties, the quantity seized did not exhibit the same pattern.





Conclusion & Next Steps

- Targeted interventions in the most affected counties should address both public health outreach and underlying economic disparities
- HIDTA seizure patterns indicate local variation in drug trafficking activity and law enforcement practices
- These local variations help explain regional differences in overdose mortality
- Policy design should integrate economic supports alongside public health strategies in high-burden counties

References

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