The Opioid Hydra:
Identifying Opioid Clusters and Implications for Counterdrug Efforts

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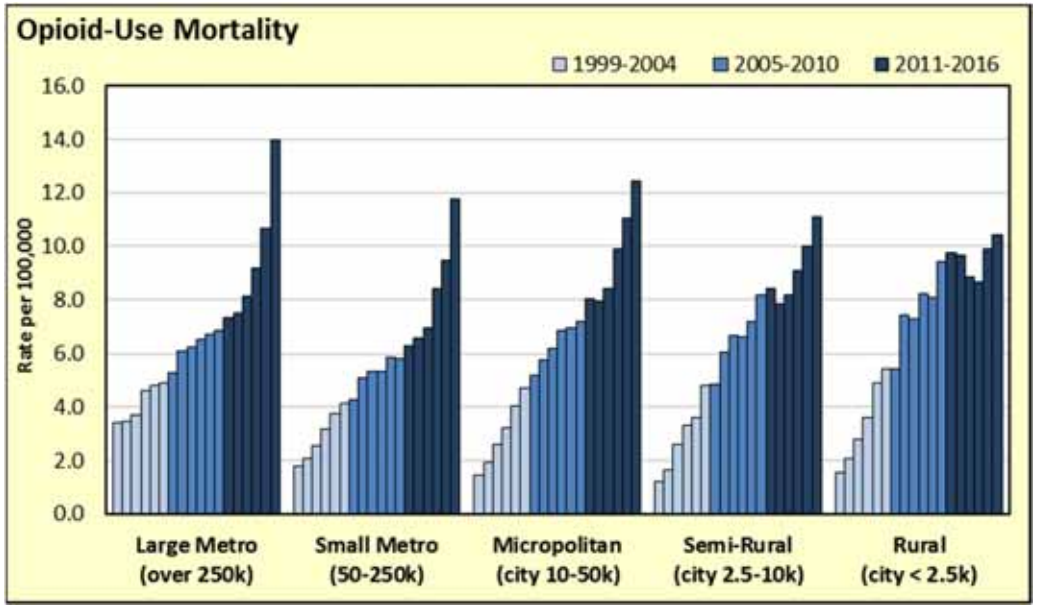
WHY THE CONCERN OVER OPIOIDS?



Opioid deaths up 416% between 1999-2016.
355,000 total dead
117 die each day
66% of all OD deaths due to opioids
$80 billion per year in economic losses

WHY THE CONCERN OVER OPIOIDS?

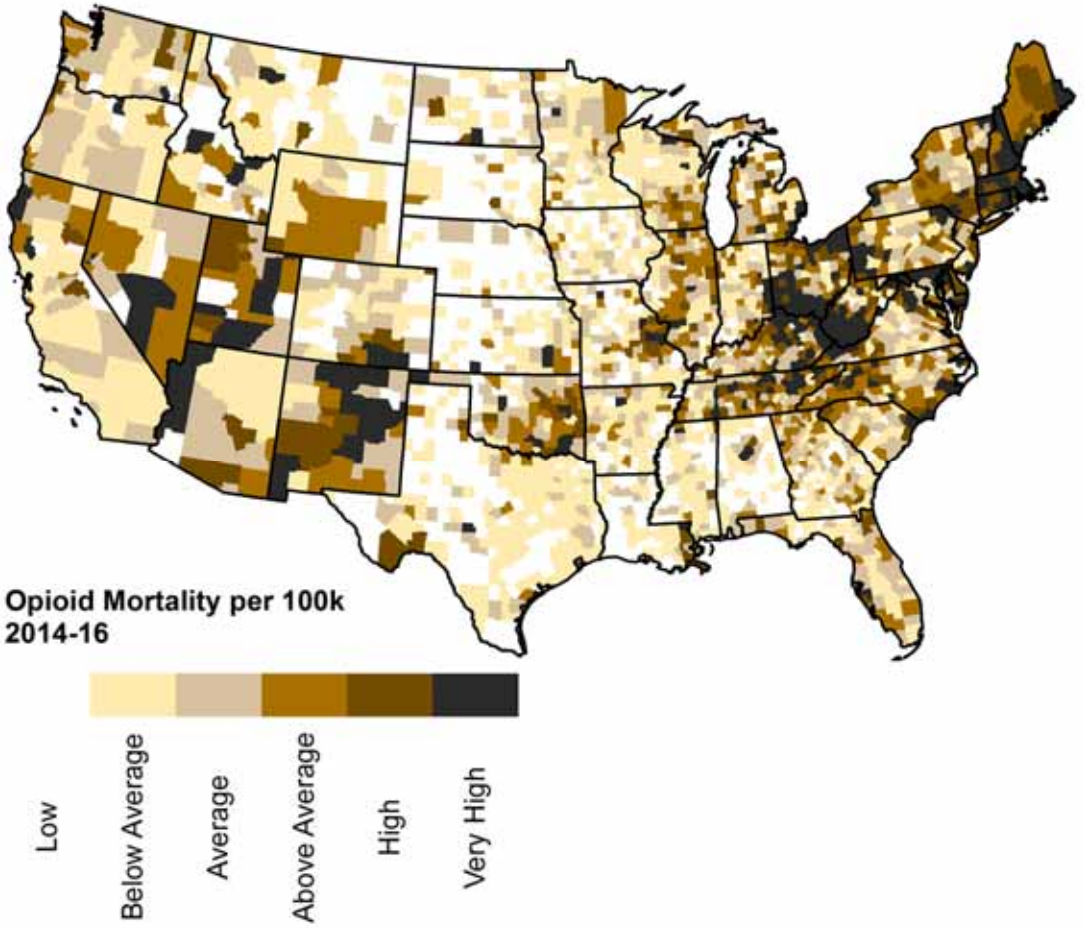
Smallest places hardest hit …

- 778% gain in micropolitan areas
- 723% gain in rural areas
- 387% gain in metros

Less equipped to handle health and criminal justice impacts.

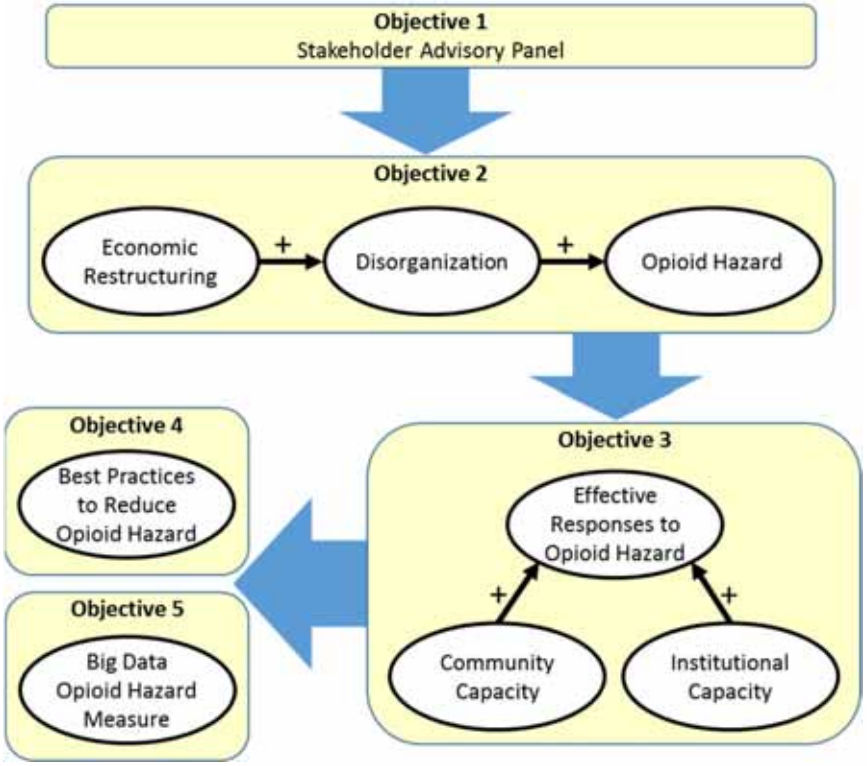
Smaller population means addiction takes a larger toll.

Limited resources for counterdrug activities.



Opioid Risks and Resilience in Non-Metro Communities

- Identify economic, social, and government causes of opioid risk over time.
- Identify effective local responses that promote resiliency or vulnerability.
- Develop and deploy a real-time opioid risk indicator using Big Data methods.
- Disseminate place-based best practices.
- 1st year of 5-year project. Funded by AFRI-USDA.



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THE UNIVERSITY OF IOWA

SYRACUSE UNIVERSITY

USDA NIFA

United States Department of Agriculture
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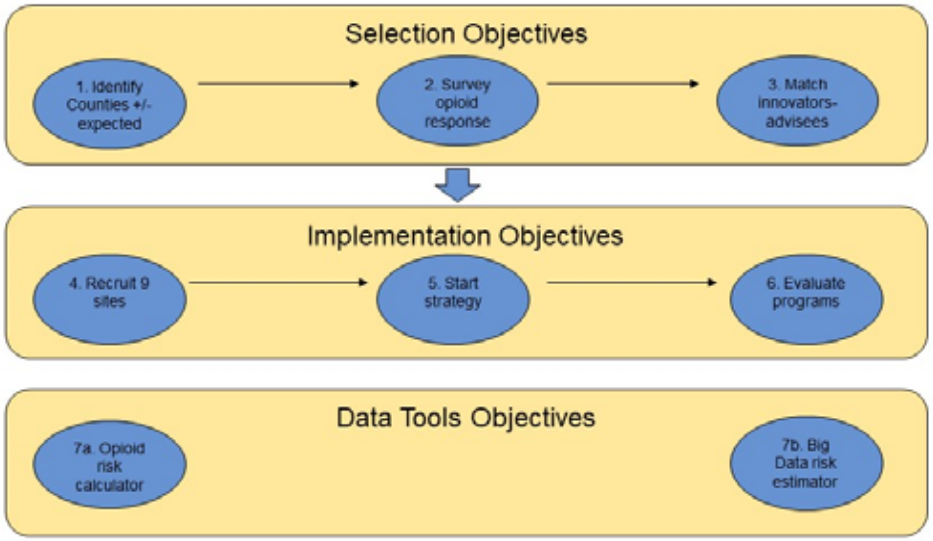
Building Drug Intelligence Networks to Combat the Opioid Crisis in Rural Communities

- Objective 1: Identify communities that are responding better and worse than expected to the opioid crisis with CDC mortality files.
- Objective 2: Survey police in rural communities to discern the level of opioid response.
- Objective 3: Use matching algorithms and survey and mortality data to match innovators and potential advisees. (similar problems; divergent death rates, divergent response).



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Building Drug Intelligence Networks to Combat the Opioid Crisis in Rural Communities

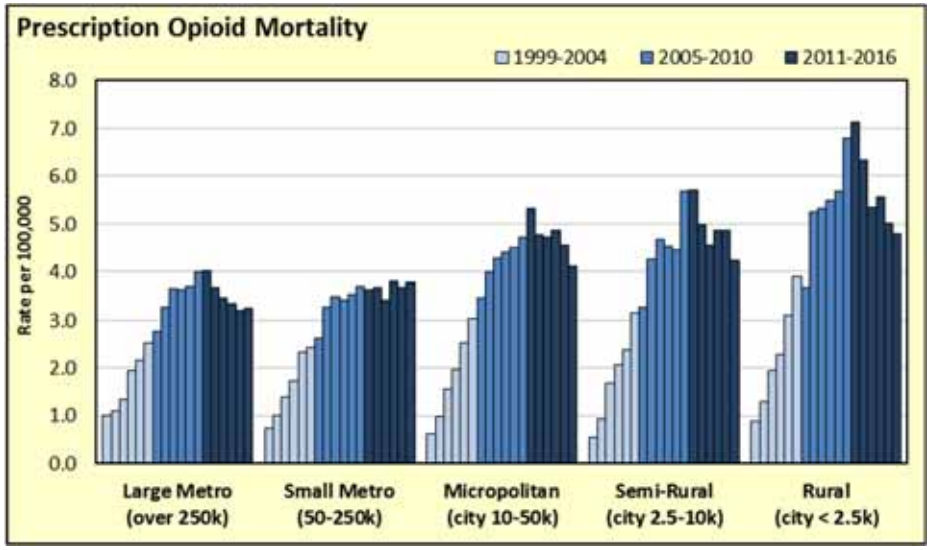
- Objective 4: Recruit 3 innovator sites and 6 advisee sites in three states (PA, IA, MO).
- Objective 5: Develop partnerships and start a locally designed opioid intelligence strategy.
- Objective 6: Evaluate the programs.
- Objective 7: Create real-time data tools to assess local opioid risks using secondary and big media data.

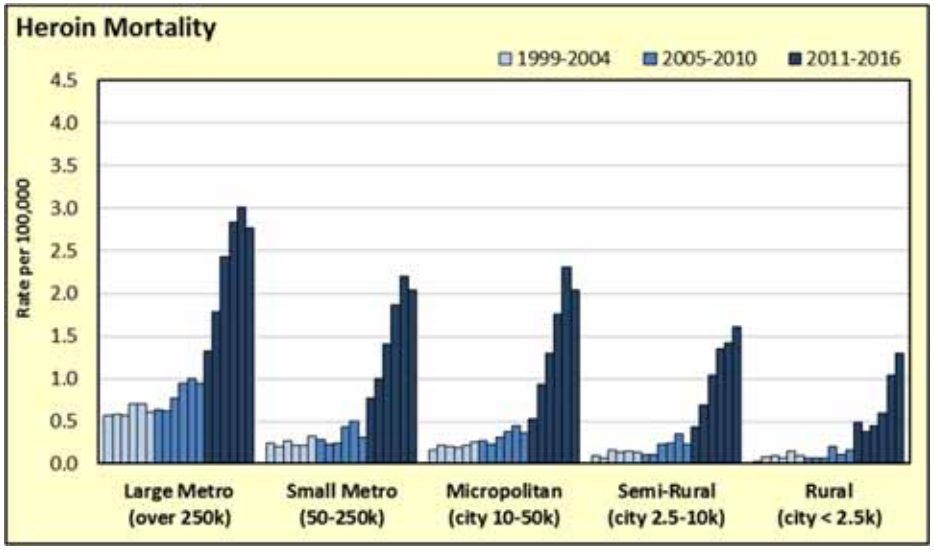
Year 1 of a 3 year U.S.D.O.J-N.I.J funded project

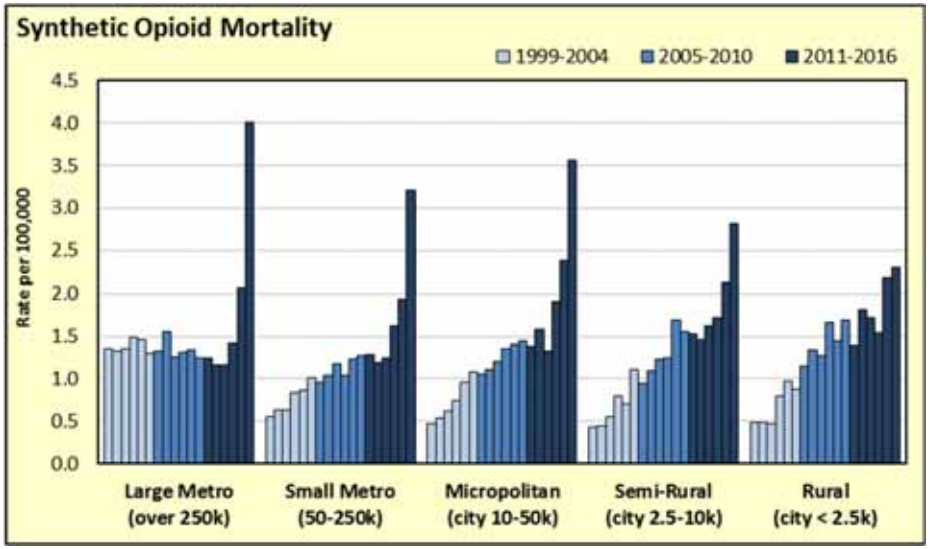
OUR RESEARCH PROJECTS

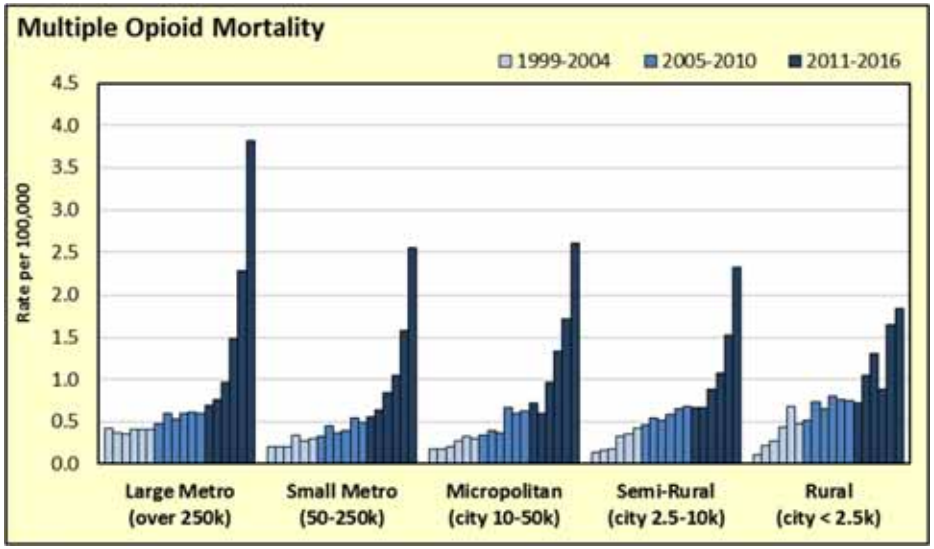
QUESTIONS?

OUR MOTIVATION









OUR MOTIVATION

Research questions …

Are there different clusters of opioid mortality by space?
Do the clusters differ by type of opioid drug?
Do these clusters share different path trajectories?
What are the implications for counterdrug interventions?

Data …

- Multiple Cause of Death, NCHS CDC
- Decennial Census and ACS, U.S. Census
- Uniform Crime Reports, FBI
- QuintilesIMS Transactional Data Warehouse

Methods …

- Latent Class Analysis
- Mean difference tests.

Multiple Cause of Death, NCHS CDC

Mortality Indicators

- Prescription opioids alone
- Heroin/opium alone
- Synthetic opioids or unknown narcotics alone
- Multiple-Causes = 2 or more opioids and/or behavioral causes

ICD-10 ((40-44, X60-64, X85, Y10-14) and (T40.0-40.4 or T40.6)) or (F11.0-11.9)

Time and Place

- Place of residence. N=3,079 counties in conterminous U.S. (with modifications).
- Pooled mortality for 2002-04, 2008-10, and 2014-16.
- Age-adjusted rates per 100,000.

Latent Profile Analysis

- Multivariate distributions are mixtures of distinct classes with unique distributions with $\boldsymbol{\theta}_k = (\boldsymbol{\mu}_k , \boldsymbol{\Sigma}_k)$

$$f\left(x_i \mid \theta\right) = \sum_{1}^{K} \lambda_k \, f_k\left(x_i \mid \theta_k\right)$$

- LPA/LCA seeks to identify classes in a distribution. Several advantages over other classification techniques.
- Free parameters identified. EM used to obtain MAP estimators using 5,000 initial starting values to avoid local maxima.
- Winsorized at 0.5th and 99.5th percentile. Standardized (z) to compare rates.

Results

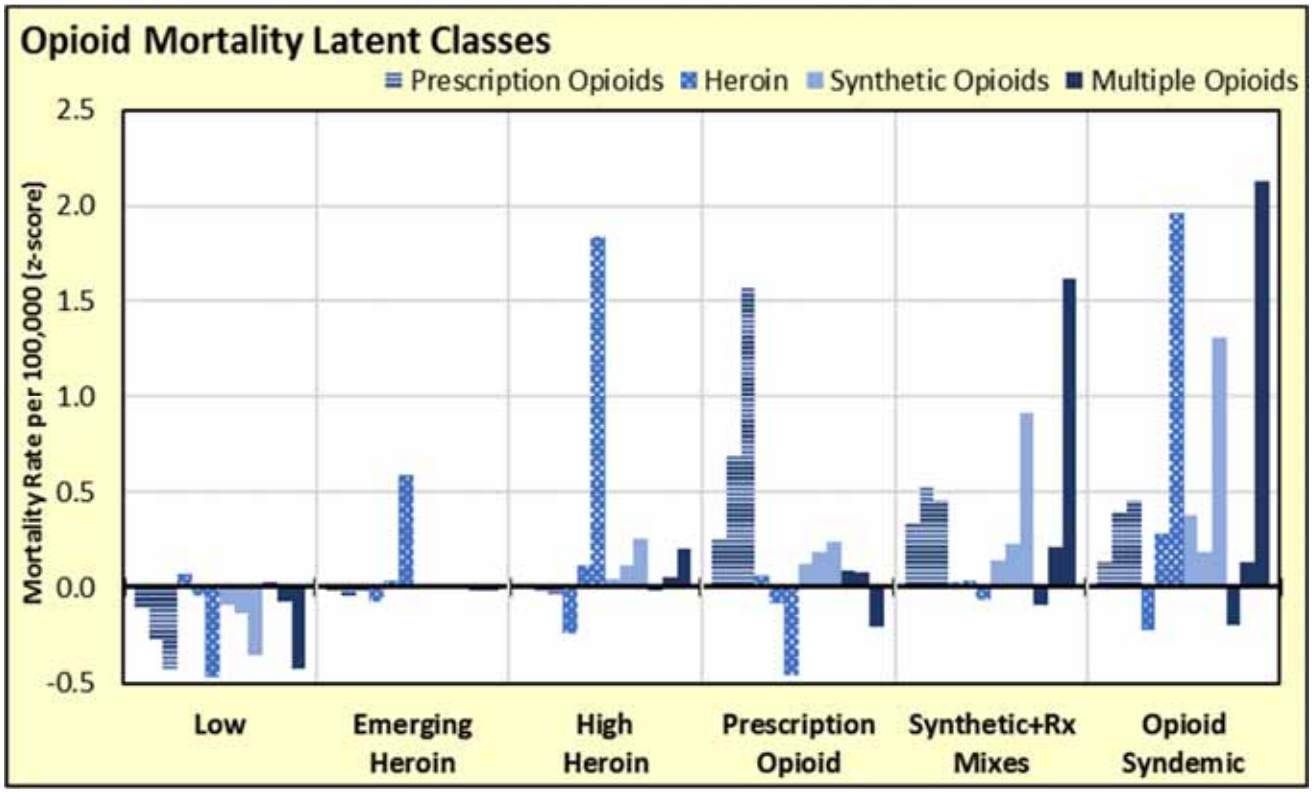
- LPA finds evidence for 5 classes.
- For interpretation, a 6 class solution was favored (split heroin class)
- Counties with Bayes posterior probabilities *Pr*<0.7 excluded.

DATA AND METHODS

Class Stage	BIC SSA	Relative Entropy	VLMR Test	LMR Test
1	59,670	1.000	*n.a.*	*n.a.*
2	51,830	0.696	7,884***	7,776***
3	49,006	0.952	2,867***	2,828***
4	46,613	0.967	2,437**	2,404**
5	44,873	0.947	1,784***	1,760***
6	43,360	0.943	1,557	1,535
7	42,128	0.950	1,276	1,258
8	41,239	0.944	932	920
9	40,192	0.945	876	864
10	39,227	0.947	1,007†	993†
11	38,616	0.951	654†	645†
12	38,049	0.950	611	603

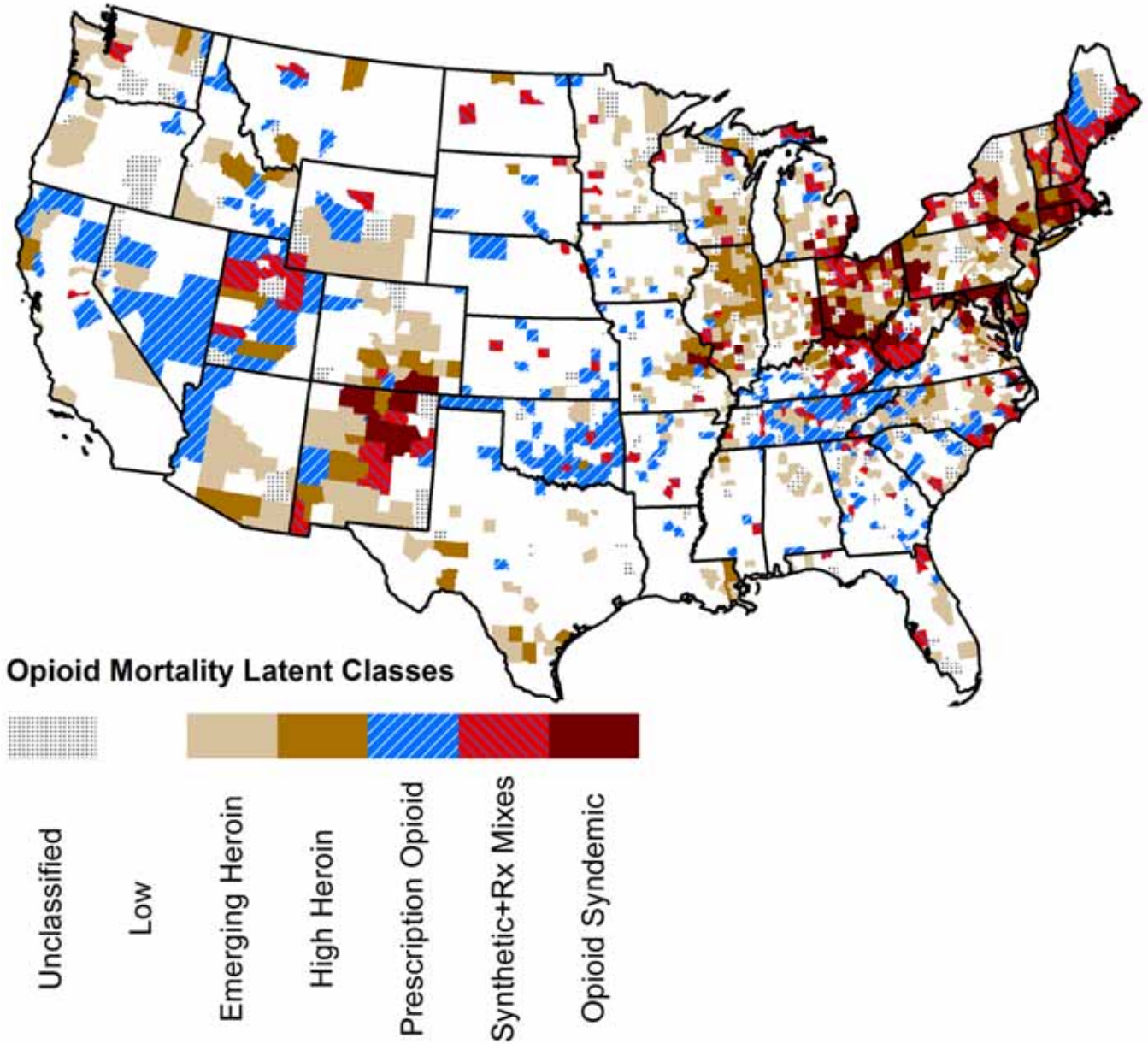
Notes: BIC-SSA is the sample-size adjusted Bayesian information criterion. VLMR is the Vuong-Lo-Mendell-Rubin Likelihood Ratio Test. LMR is the Lo-Mendell-Rubin Likelihood Ratio Test. Mortality rates (age-adjusted) per 100,000. †$p<0.10$, *$p<0.05$, **$p<0.01$, ***$p<0.001$

OPIOID MORTALITY CLASSES



Low (n=1,703)
Emerging Heroin (n=448)
High Heroin (n=164)
Rx Opioid (n=275)
Synthetic+Rx Mixes (n=211)
Opioid Syndemic (n=129)
Unclassified (n=149)

OPIOID MORTALITY CLASSES



OPIOID MORTALITY CLASSES

QUESTIONS?

Struggling Suburbs

Aging suburbs and exurbs …

- High home values, yet slowing appreciation
- Near large metros in IL, OH, MO, PA & VA

Well-off, for now …

- Higher HH incomes, but falling
- Lower poverty rates, but rising
- Growing income inequality *(most of opioid classes)*

Professional job base …

- More jobs in professional, FIRE, business, & healthcare services
- *However, falling labor force participation*

Struggling Suburbs

Connected!

- Located near border crossings & large urban areas
- Follows interstates & known drug trafficking corridors

Mostly heroin …

- 8.0 deaths/100k vs. 0.3 in low class. Highest in rural places.
- Some heroin+synthetic mixes in metro places

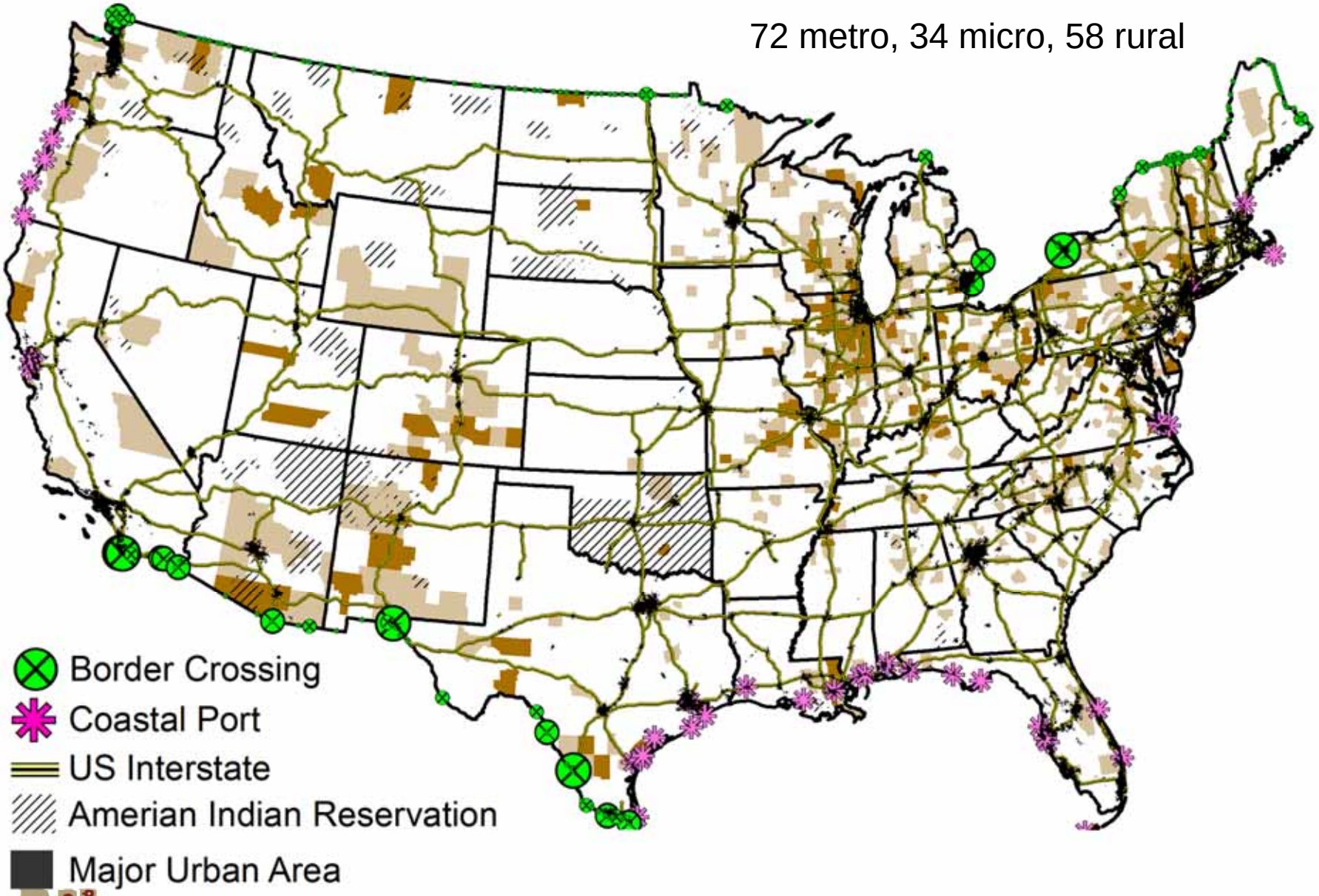
Why heroin and not Rx?

- Lowest opioid prescribing rates
- Lowest work disabled population

Emerging Heroin Class?

- Lower heroin ODs, better socioeconomic conditions

EMERGING & HIGH HEROIN PLACES



The Left Behind

Rural, white, and older, but scenic …

- Smallest & most rural, but high natural amenities *(most of opioid classes)*
- Remote places, not connected by interstates or near urban areas.
- The South … TN, OK (reservations?), GA, KY, NC

At-risk for drugs …

- More non-opioid drug deaths
- Higher opioid prescribing rates
- More & growing work disabled people *(most of opioid classes)*

Community decline …

- Low social capital
- Vacant homes high and growing
- Low & slow growing home values *(most of opioid classes)*

The Left Behind

Economic disadvantage …

- Low & falling labor force participation *(most of opioid classes)*
- Low & slower growing incomes *(most of opioid classes)*
- High & growing poverty *(most of opioid classes)*

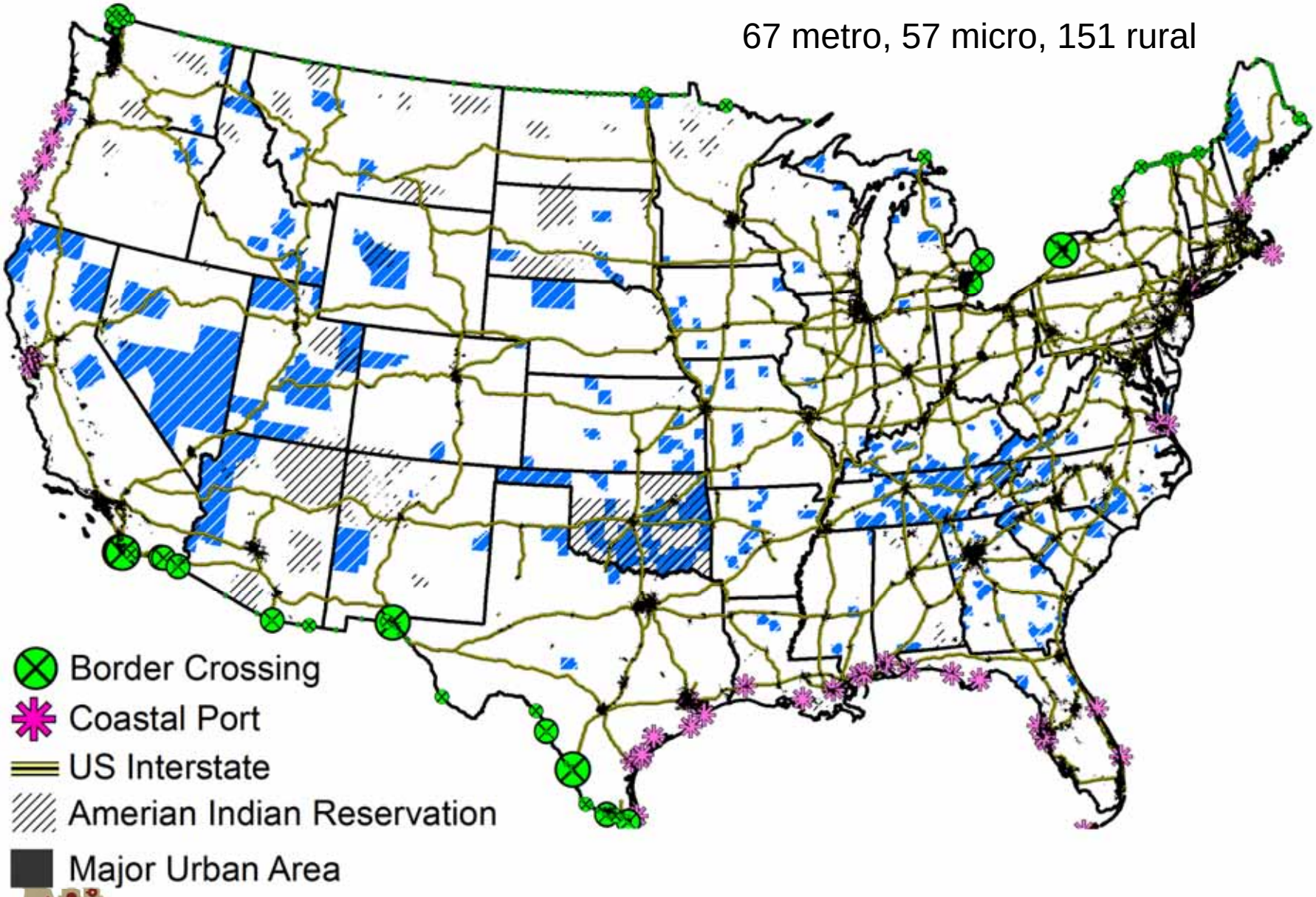
Economic restructuring for the worse …

- More yet fast declining goods-producing jobs
- Replaced by retail and leisure services jobs

Pharm country …

- 12.8 deaths/100k vs. 1.9 in low opioid
- Higher in rural places
- State regulation and Medicaid expansion seems to matter!

RX OPIOID PLACES



Counterfeit Pill Places

Metros …

- Synthetic alone (6.9 / 100k)
- Synthetic+Rx (3.0) & Synthetic+Heroin (2.3)
- Rx+Heroin (1.2) & Rx+Heroin+Synthetic (0.6)

Micropolitans …

- Rx alone (8.5 / 100k)
- Synthetic alone (5.7) & Synthetic+Rx (3.7)
- Rx+Heroin+Synthetic (0.6)

Rural …

- Synthetic+Rx (4.1 / 100k)
- Rx+Heroin (1.6)

Counterfeit Pill Places

Better-off cities with a Rx problem …

- Mostly white
- High prescribing rates and work disabilities
- Low social capital
- *Similar to High Heroin places, but core cities instead of suburbs*

Traded blue-collars for white …

- Economy dominated by services
- Large drop in goods-producing & TCPU jobs
- No problems with poverty
- *Similar to High Heroin places*

Large cities and micropolitans …

- 240,000 people. Midsize metro areas of 500-750k in MA, FL, IL, NY, OH, UT.
- Micropolitans of 40k adjacent to metros in KY, WV, GA, ME, MI, NC.

Counterfeit Pill Places

Metros influenced by urban proximity.

- Lots of synthetics, mixed with Rx and heroin
- Illicit opioids provided by existing drug trafficking orgs.
- Located near interstates and ports

In micros, a Rx problem gave rise to a synthetic problem.

- Mostly Rx mixes
- Expansion of DTOs into new markets?
- Some correlation with reservations

Does Rx regulation create a worse problem?

- Some evidence greater regulation drive synthetic mixes
- Regulation tends to be higher in more wealthy states

Syndemic Cities

Metros …

- Heroin alone (8.5 / 100k), Synthetic alone (7.1)
- Synthetic+Heroin (4.9)
- Rx+Synthetic (3.1), Rx+Heroin (1.2), Rx+Heroin+Synthetic (0.7)

Micropolitans …

- Heroin alone (9.7 / 100k), Synthetic alone (7.8)
- Synthetic+Heroin (3.6), Synthetic+Rx (3.0)
- Rx+Heroin (1.9), Rx+Heroin+Synthetic (0.7)

Rural …

- Heroin alone (9.4 / 100k), Rx alone (9.3)
- Synthetic alone (6.1), Synthetic+Heroin (4.9)
- Rx+Synthetic (3.1), Rx+Heroin (1.2), Rx+Heroin+Synthetic (0.7)

Syndemic Cities

Large cities in decline …

- Dense populations. Connect to interstates.
- White and aging population
- Higher home values, but slower appreciation

Better-off, but signs of decline …

- High HH incomes, but falling
- Low poverty, but growing
- Growing income inequality

Rx risk factors ….

- High prescribing rates
- More work disabled people

Syndemic Cities

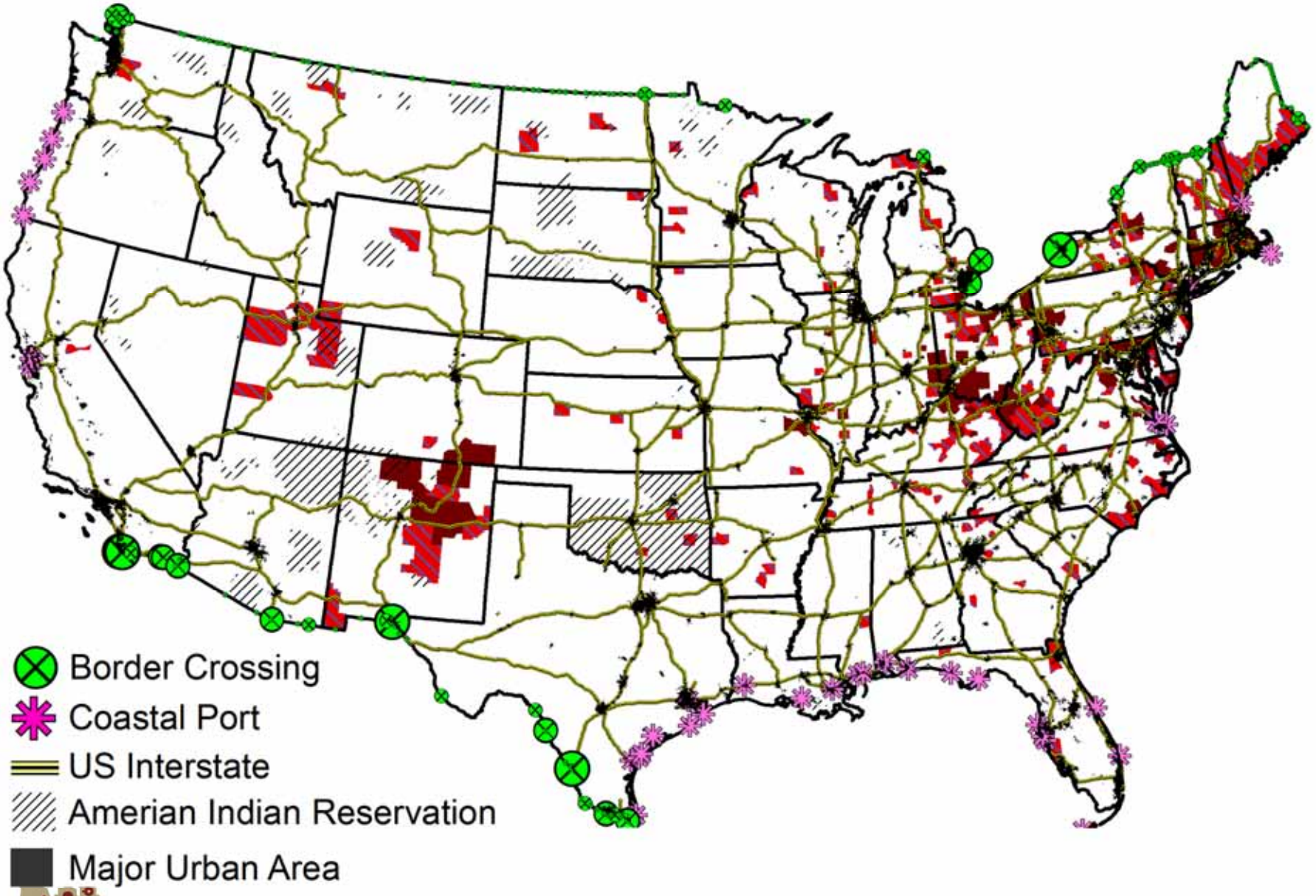
Services sector dominates …

- Many jobs in both high-skill and low-skill services
- Steep declines in blue-collar jobs (goods-producing & TCPU)

Includes some smaller cities and larger towns …

- Small number of micros (24) and rural places (23)
- Fewer services jobs, falling prescribing rates
- Persistent drug problem

OPIOID SYNTHETIC & SYNDEMIC PLACES



PULLING IT ALL TOGETHER

SUMMARY

Heroin and highways in suburbs past their peak

- Similar to low opioid places, except more connected & more property crime.
- *What sets them apart?*

Code of the Suburbs

- Mostly white with aging populations. Low violent and property crime.
- *Why the problem grew? Why it is hard to combat?*

At-risk for opioid abuse

- High non-opioid drug deaths → *drugs have always been a problem?*
- Lots of prescription opioids → *failure of state regulation?*
- Many work-disabled people → *start of the problem?*
- Loss of goods-producing jobs → *collapse of the white working class?*

Rural "deaths of despair"

- Poorest and most remote parts of the nation.
- *Opioids as a way to cope or way to make a living?*

IMPLICATIONS

Not a single "opioid epidemic"

- Three *epidemics* – prescriptions, heroin, synthetics+Rx
- One *syndemic* that includes all three
- Need to *place-based responses*, not a national response

Limits of state regulation of Rx opioids

- Illicit opioids used an alternative, will spike deaths

Importance of drug enforcement and ancillary activities

- Border security and customs
- Drug intelligence and interdiction, especially interstates
- How to stop synthetics that are cheap, accessible, compact, & potent?

Stop Rx problems from becoming heroin/synthetic ones

- Medication Assisted Treatment
- Medicaid reforms … tighter regulation, more treatment
- Stop flow of illicit drugs locally

IMPLICATIONS

Organized Crime will respond to changes in opioid regulation.

There is little reason to expect changes in distribution routes.

Loads will be better hidden and larger.

Street prices for pills will go up. Synthetics will become cheaper.

The pharmaceutical problem will continue to shrink, and be offset by increasing synthetics in many places in effects on overall death rates.

Some places with pharmaceutical problems will become heroin, synthetic, and syndemic places beginning with those geographically proximate to such places and to distribution hubs.

Organized Crime will respond to changes in opioid regulation.

New forms of opioids will continue to be developed and smuggled.

Easier technologies for heroin production eventually will spread.

There is a tremendous market for counterfeit opioid pharmaceuticals waiting to be filled as pharmaceuticals become increasingly scarce.

Some production will shift toward domestic finishing to assist smugglers. (ex: converting liquids to powders, as is already happening for methamphetamines).

The reason why synthetics are popular with DTOs …

Opioid	Cost to DTO per 1kg	Milled Yield	Street Price per 1kg	Revenue to DTO
Heroin (~60 pure)	$5,000 - $7,000	1 kg	$80,000	$80,000
Fentanyl (~90 pure)	$3,000 - $5,000	16-24 kg	$80,000	$1.28 mil to $1.92 mil

DISCUSSION

What are some successful opioid drug intelligence and counterdrug programs that can be used in communities?

If a rural county has an opioid problem, what intelligence strategies would you recommend to local law enforcement?

Are there different strategies for heroin/synthetics versus prescriptions?

In your expert opinion, what is the most important opioid counterdrug initiative or program?

Equipment, Resources, Intelligence.

Equipment, Resource, Intel
1. Officers carry naloxone/narcan for opioid overdoses in their cars or on their persons when on duty.
2. Officers carry naloxone/narcan for opioid overdoses in their cars or on their persons when off duty.
3. My department has confidential informants who inform on drug distribution and the drug economy that we use repeatedly.
4. My department has funds for confidential informants.
5. My department has money for buy/busts.
6. Emergency responders in my county carry naloxone/narcan.
7. Drug defendants are offered a break or plea deal in exchange for information or help building another drug case.
8. Officers carry drug tests kits when on patrol.
9. When a vehicle is suspected of containing drugs that are not in plain sight, we call a K-9 unit.
10. Has a tip-line available for those who want to provide drug intelligence.

Community.

Community
11. While in jail, my department suggests, refers or secures drug treatment for persons before drug treatment is mandated by courts.
12. Suggests, refers or secures drug treatment for persons before drug treatment is mandated by courts for known drug users.
13. Participates in local drug education efforts such as programs for schools and/or the community
14. Officers serve or work on drug task forces.
15. Officers participate in opioid task forces.

Response.

Response
16. When officers investigate or are made aware of an overdose, there is a follow-up investigation to gather drug intelligence or make an arrest.
17. A tip will be pursued if someone
18. If someone overdoses, we follow up with the victim or victim's family to talk about the problem or further investigate.
19. If someone overdoses and dies, how often do officers follow up with victim's family or return to victim's residence to follow up.
20. Assigns officers specifically to drug intelligence or narcotics investigations.
21. Assigns officers to drug surveillance.
22. Conducts road interventions (road blocks and similar procedures) aimed specifically at targeting the drug problem.
23. Formally identifies high rate, chronic drug dealers and users.
24. Records the source of seized "prescription" drugs.

Management & Information Sharing.

Management Information Sharing
25. Utilizes e-mail, phone calls or formal meetings to share drug intelligence with other agencies in our county.
26. Shares drug intelligence with federal agencies.
27. Shares drug intelligence with other local departments.
28. Shares drug intelligence with state police or task forces.
29. Stores drug intelligence data on a designated computer.
30. Analyzes drug intelligence from past cases or tips.
31. Works cases with state police or drug task forces.

Additional Multiple Choice.

4. In the last year, how many persons would you estimate have been arrested through simple buy bust operations?

5a. In the last year, has your department worked any drug investigation that lasted more than a
week?

5b. If yes, could you estimate how many?

6a. Does your department have a K-9 unit?

6b. If yes, are the dogs trained to detect drugs?

6c. If yes, are some of the dogs trained to detect?

a. Cocaine
b. Meth
c. Opioids/heroin

Additional Multiple Choice.

7. Is there a place, designated computer, or office in your department where drug intelligence is compiled, stored and analyzed?

8. Is there a formal means such as secure e-mail group, regular phone calls, or regular meetings to share drug intelligence between agencies in your county?

9. Is there an opioid task force that you are aware of in your county?

10. Does your department take efforts to identify high rate, chronic drug dealers in your area?

THANK YOU

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