Vulnerability Index Assessment

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Scott County, IN HIV Outbreak

Scott County, IN

- Rural county in SE Indiana
- Population: ~24,000
  - Compares in size to Otsego, Manistee, Roscommon, and Antrim Counties
  - Ranked 92 of 92 in health indicators
  - Austin, IN: ~4,200
- Less than 5 HIV cases/yr
- 95% Caucasian
- 9% without health insurance
- 33% with public health insurance
- 15% did not graduate HS
- 5.6% unemployed
- Median earnings: ~$35,000

Scott County HIV Outbreak

Late 2014: 3 new HIV cases identified

Identified two that had shared needles, which initiated contact tracing

8 more new infections were found and traced them to Austin, IN (which saw only 5 infections from 2009-2013)

Discovered that all cases reported injection of analgesic oxymorphone (Opana ER)

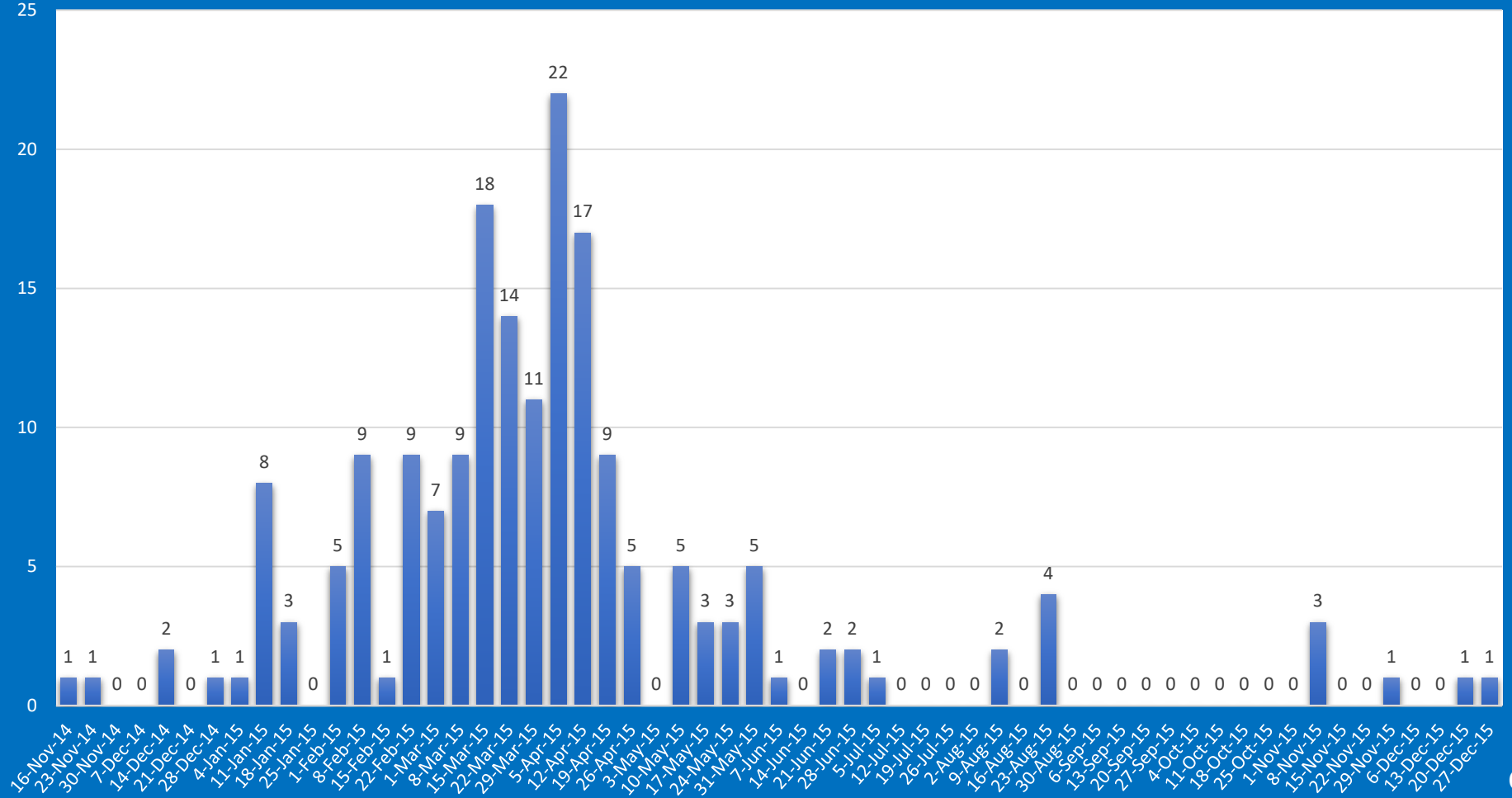
Discovered multigenerational sharing of injection works, with 4-15 injections per day and 1-6 partners per event

By April 21, 2015: 135 HIV cases

In total: 237 HIV cases

Rural injection of oral opioid = largest HIV outbreak of its kind in the US

HIV Epidemic Curve Nov 16, 2014-Dec 27, 2015



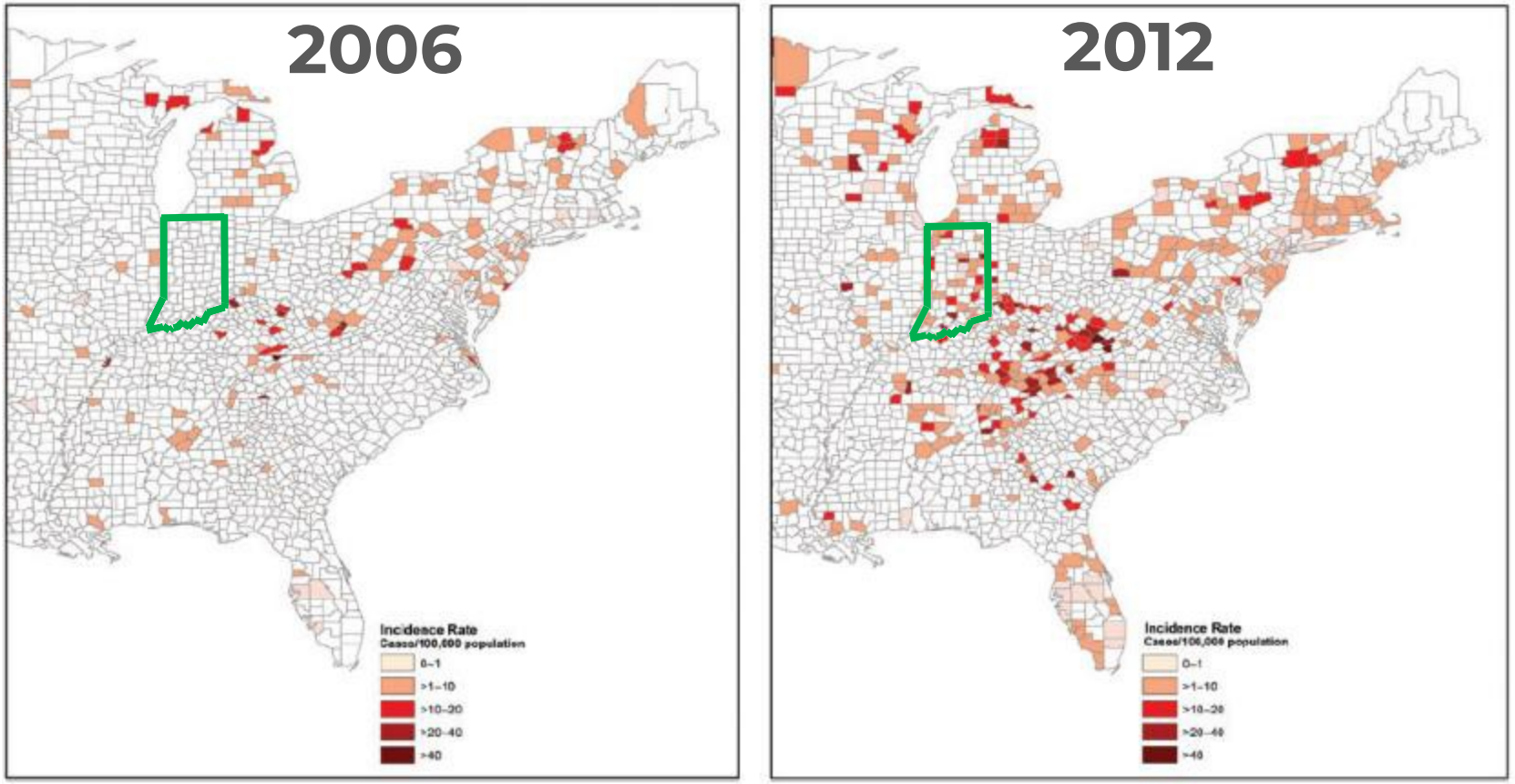
Outbreak demographics

- Median age: 34 yrs (18-60)
- 59% male
- 99% white non-Hispanic
- 93% admitted injecting drugs (oxymorphone, meth, heroin)
- 11% admitted exchanging sex for drugs or money
- 19% living in poverty
- 8.9% unemployed
- 21.3% did not complete HS
- High proportion without health insurance and medical care access

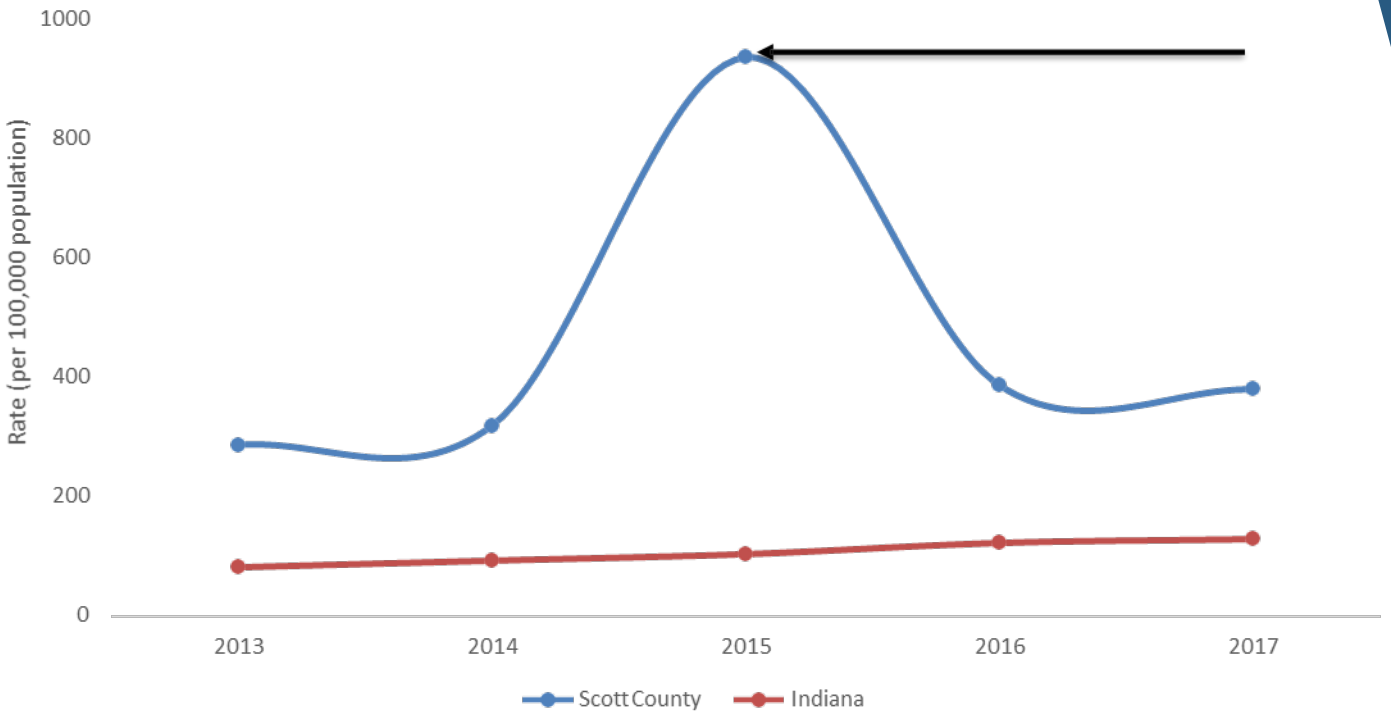
Outbreak Info

- 94% out HIV cases were co-infected with Hepatitis C (HCV)
  - 96% of HIV specimens map to one cluster, acquired within 6 months prior to sample
  - HCV specimens included multiple strains and clusters (it had been repeatedly introduced for years)
  - Seems to indicate presence IVDU network for years with recent introduction of person with infectious HIV

Expanding epidemic of injection drug use heralded by dramatic increase in acute HCV infections



Acute and Chronic Hepatitis C Rates Scott County and Indiana, 2013-2017

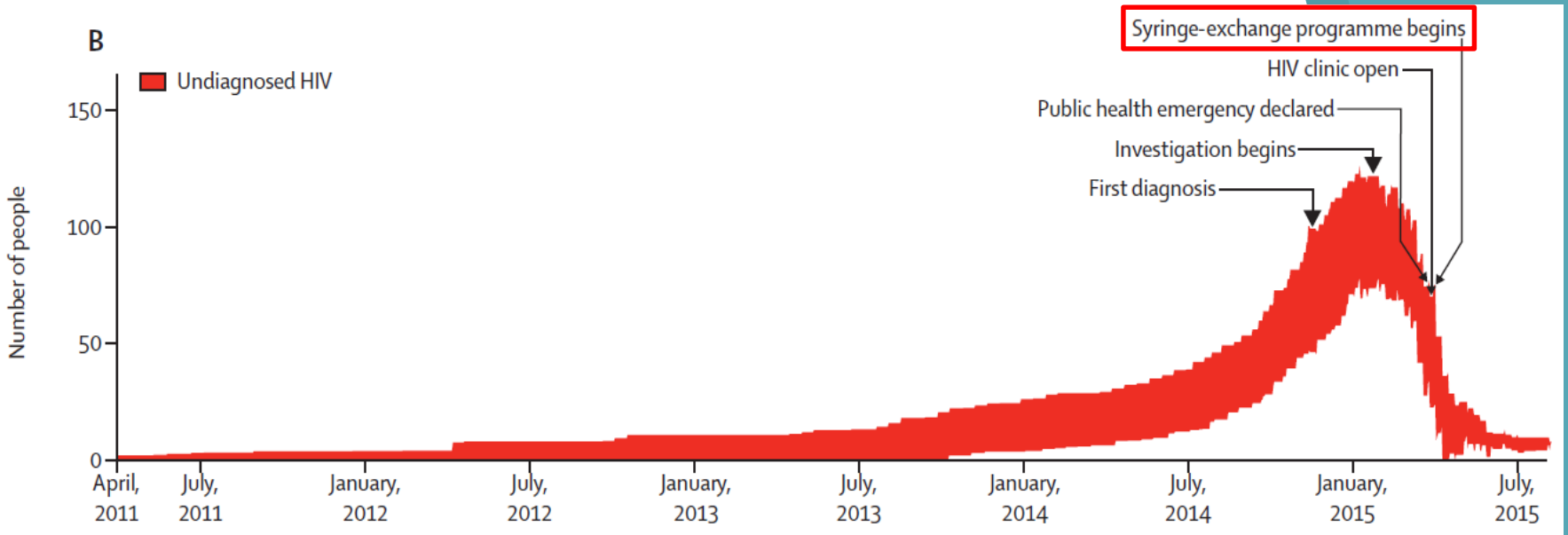


What did we learn?

- **Key term: Rapid dissemination**
- Rural settings can pose unique challenges
- Familiarity with localized data is key to timely recognition of outbreak circumstances
- Encourage providers to test for HCV and HIV, especially in high risk communities
- Preparation
  - Public health intervention was essential

Interventions

- Reconstructed model illustrates continuous infection until interventions were implemented
- Dramatic decrease in undiagnosed HIV immediately after SSP opens



SSP's by the [hypothetical] numbers

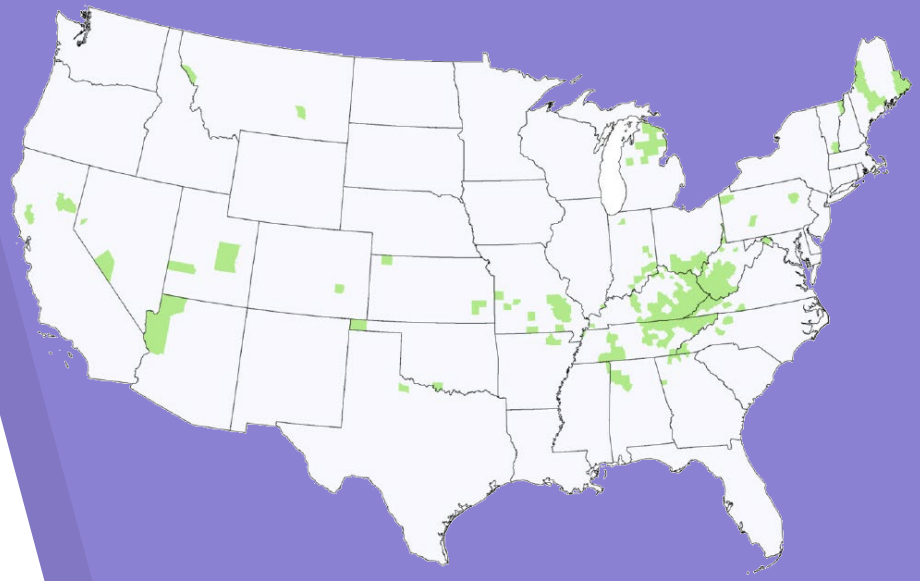
- Gonsalves & Crawford (2018)
  - "an earlier public health response could have substantially reduced the total number of HIV infections"
  - Response on Jan 1, 2013: reduce outbreak by 127 cases
  - Response on Apr 1, 2011: reduce "outbreak" by 173 cases
- Goedel et al. (2019) – 1,000 mathematical simulations
  - Over a 5 year period…
  - Without SSP: 133 cases
  - SSP introduced after 10 cases: 57 cases
  - SSP introduced proactively: 27 cases
- **How do we identify jurisdictions at highest risk?**

Gonsalves, G. S., & Crawford, F. W. (2018). Dynamics of the HIV outbreak and response in Scott County, IN, USA, 2011–15: A modelling study. The Lancet HIV, 5(10). doi:10.1016/s2352-3018(18)30176-0

Goedel, W. (2019). Can emergency implementation of syringe services programs prevent rapid HIV transmission among people who inject drugs in rural counties in the United States?: A modeling study.

2.

CDC County-Level Vulnerability Assessment



Background

- Study conducted in response to the Scott County outbreak
- Utilized acute HCV infections as a proxy measure of IVDU
- Nationwide, county-level
- Goals:
  - Identify risk factors/demographic data points most related to IVDU indicator (acute HCV infections)
  - Identify counties prevalent in those associated risk factors to focus prevention strategies

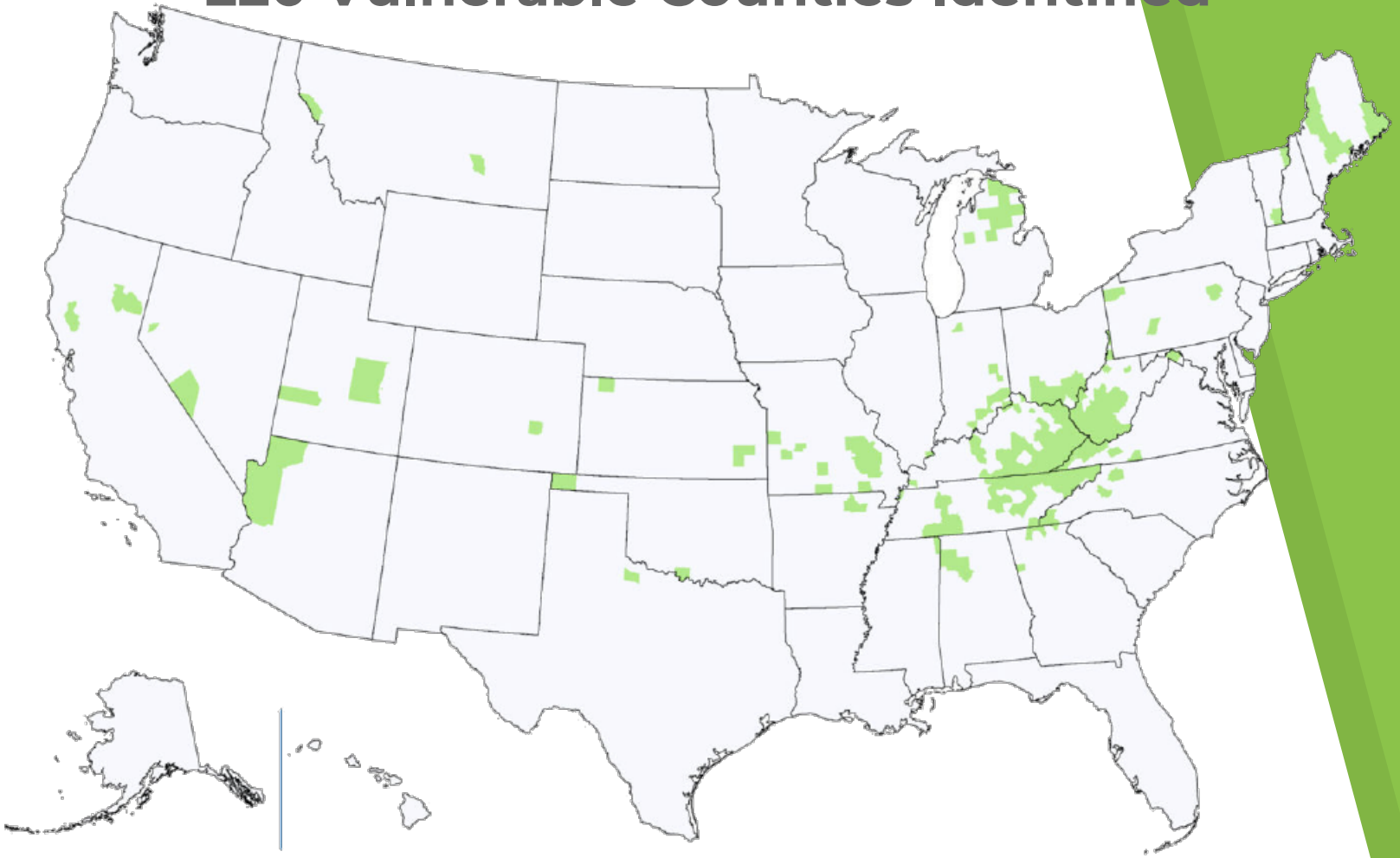
Data and Analysis

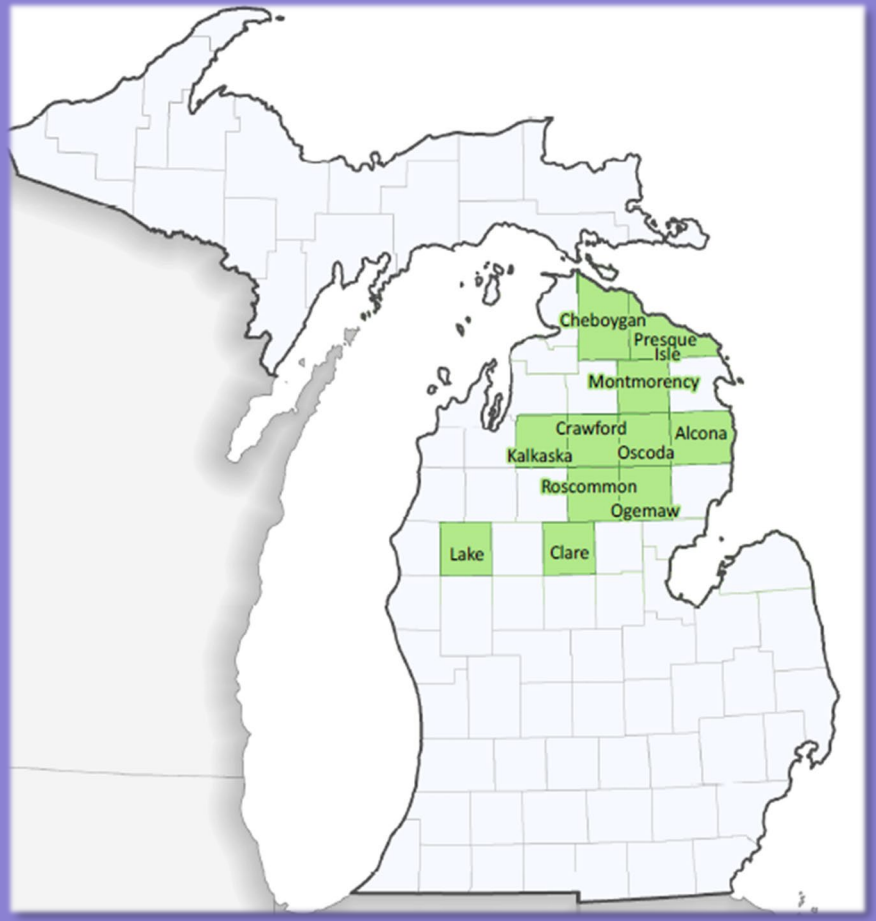
- County level variables known or plausibly associated with IVDU
- Identified 48 variable, 15 met inclusion criteria
  - Had to be available at county level, nationwide, reported annually, recent, and complete
- Multivariable Poisson regression model
- Used regression coefficients to generate vulnerability scores for each county
- "Vulnerable" = upper 90% CI exceeded the 95th percentile of scores

Predictor Variables

- Drug OD deaths per 100,000
- Prescription opioid sales per 10,000
- Median per capita income (-)
- Proportion of white, non-Hispanic population
- Percent unemployed (population 16+ yrs old)
- Buprenorphine prescribing potential per 10,000

220 Vulnerable Counties Identified





MI Vulnerable Counties:

- Ogemaw (3058)
- Clare (3057)
- Oscoda (3056)
- Montmorency (3053)
- Lake (3007)
- Presque Isle (2970)
- Alcona (2960)
- Roscommon (2946)
- Crawford (2936)
- Kalkaska (2916)
- Cheboygan (2866)

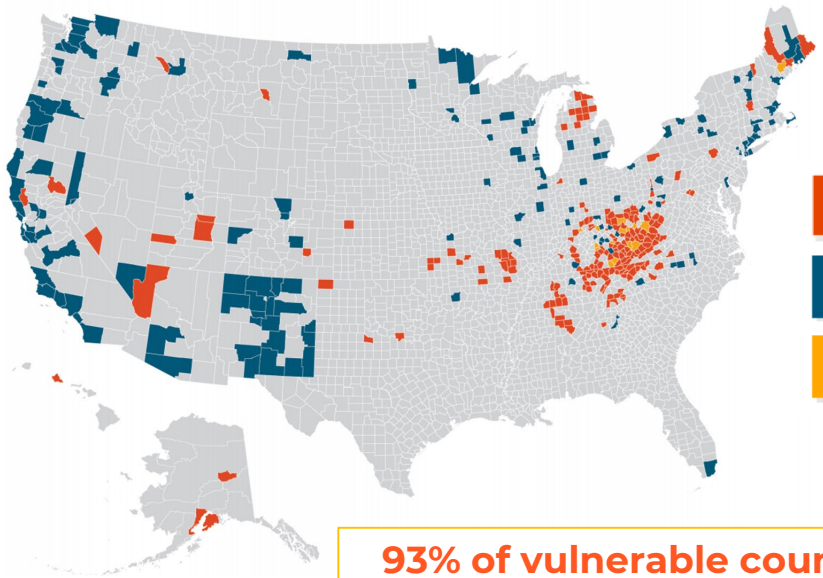
(CDC Rank; Higher = more vulnerable)

Limitations

- Very limited dataset due to availability of nationwide, county-level, data
- Proxy measure for IVDU only included acute HCV cases
  - Chronic HCV is not reported by all states
- Some data may have been outdated (3+ years old)
- **Needs more localized data**

Benefits

- Creates basis for this study to be emulated
- Replicable on a periodic basis to assess change in IVDU/HCV associated risks
- Rural, impoverished, predominantly Caucasian communities are most vulnerable



205 vulnerable counties have no SSP

Not a vulnerable county, has an SSP

15 vulnerable counties have SSPs

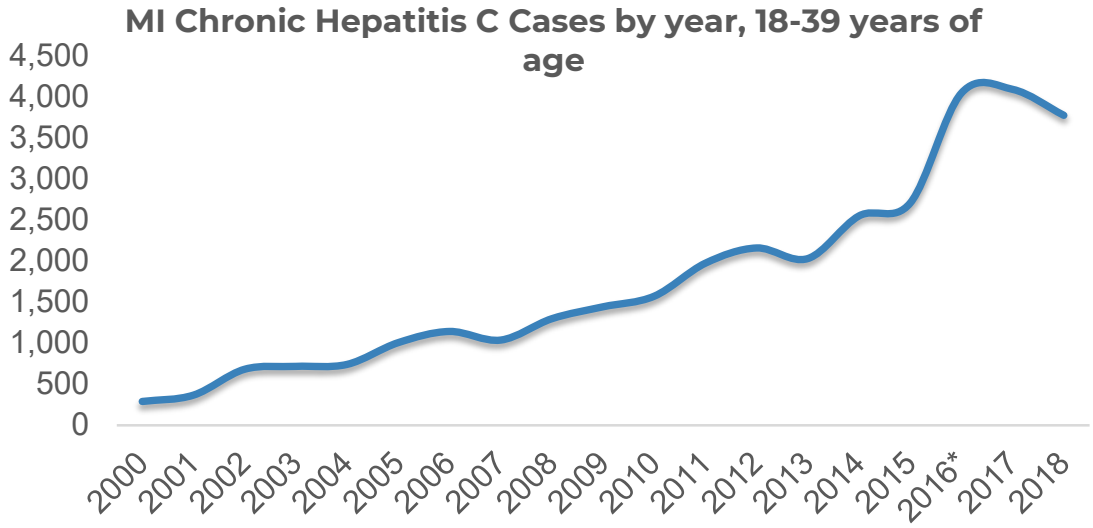
93% of vulnerable counties don't have a SSP.

4.

Michigan County-Level Vulnerability Assessment

Michigan Specific Data

- Dramatic increase in hepatitis C cases in recent years
- 8th most drug OD deaths in the nation in 2017 (2,694 deaths)



Age (n = 3,774)		
Median	30	
Mean	30.02	
Range	18 - 39	
Sex (n = 3,759)		**Rate per 100,000**
Female	1,776 (47.2%)	127.36
Male	1,983 (52.8%)	138.40
Race (n = 2,776)		**Rate per 100,000**
White	2,476 (89.2%)	112.79
Black	228 (8.2%)	48.07
American Indian	56 (2.0%)	191.07
Asian	16 (0.6%)	12.01
Hispanic Ethnicity (n = 2,270)		**Rate per 100,000**
Hispanic or Latino	97 (4.3%)	55.22
Not Hispanic or Latino	2,173 (95.7%)	81.80
Arab Ethnicity (n = 1,387)		**Rate per 100,000**
Arab Ethnicity	4 (0.3%)	Not Available
Non-Arab	1,383 (99.7%)	Not Available
History of IVDU (n = 1,580)		
Yes	1,294 (81.9%)	
No	286 (18.1%)	

Data and Analysis

- Modeled methodology after CDC and Tennessee's vulnerability assessments
- Use of Michigan specific data to associate with acute ***and*** chronic HCV cases
  - Outcome: HCV in 18-39 year olds
- Identified 93 variables for consideration
- Included 21 variables in model
- Negative binomial regression with backwards stepwise selection

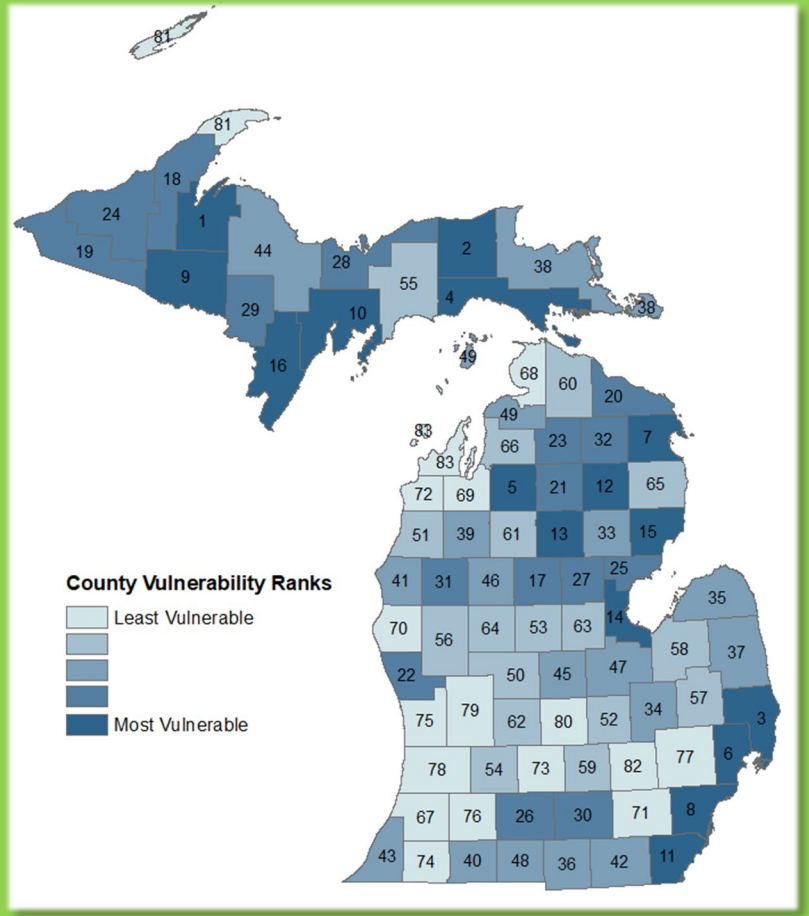

Private Insurance Coverage
Total Mme For All Drugs
Per Capita Income In Past
Aggregate Household Income
Adults Reporting Poor Fair Health
Years Of Potential Life Lost
Supplemental Security Income In Past
Median Property Value
Avg Household Size
Primary Care Providers
Race
Drug Trafficking Hot Zone
Acute Hcv Infections
Highway Access
Hiv Cases Related To IDU
Premature Deaths
Rate Of Std
Earnings
Substance Abuse Treatment Beds
Rate Of Injury Related Deaths
Primary Care Providers
Rate Of Hiv Incidence
Number Of Housing Units
Theft Crimes
Chronic Hcv Infections By Age
Poor Physical Health Days
Mental Health Services
Age
Marital Status
MME Rate For Analgesics
Vehicles Available
Opioid Related Deaths (Heroin Only)
Poverty Status
Hiv Cases Related To IDU
Nchs Rural Urban Classification
All Drugs
Sex
Mean Usual Hrs Worked
Rate Of Primary Care Providers
Neonatal Abstinence Syndrome Cases
Injury Related Deaths
Rate Of Hiv Prevalence
MME Rate For Mat Drugs
Household Income In Past
Public Insurance Coverage
Rate Of Syphillis
Acute Hcv Infections W
Social Security Income In Past
Geographic Mobility
Specialty Care Providers
Educational Attainment
Employment Status
Population
Certified Pain Management Clinics
Median Gross Rent
Drug Related Crimes
Urgent Care Facility
Rate Of Mental Health Services
Median Age Of Workers
Rate Of Specialty Care Providers
Specialty Care Providers
Drug Poisoning Deaths
Public Assistance Or Snap Income In Past
Substance Abuse Tx Admissions
Rate Of Buprenorphie Providers
Multiple Provider Episodes
Rate Of Hiv Incidence
Theft Crimes
Methadone Clinics
Rate Of Mental Health Services
Ratio Of Income To Poverty Level
Violent Crimes
Life Expectancy
Opioid Related Deaths (Heroin Only)
Rate Of Hiv Prevalence
Nativity
Rate Of Syphillis
Buprenorphine Providers
Weeks Worked In Past
Median Age
Mental Health Services
Avg Family Size
Percentage Of Adults Who Smoke
Median Household Income In Past
Behavioral Health Treatment Clinics
Rate Of Specialty Care Providers
Substance Abuse Treatment Beds Per Capita
Poor Mental Health Days
Median Earnings
Nchs Rural Urban Classification
Gini Index Of Income Inequlaity
Combo Of Above Acute
Urgent Care Facility
Employment Status
Rate Of Std
Rate Of Primary Care Providers
Housing Tenure
Insurance Status
Opioid Related Deaths
Public Assistance Income In Past

Predictor Variables

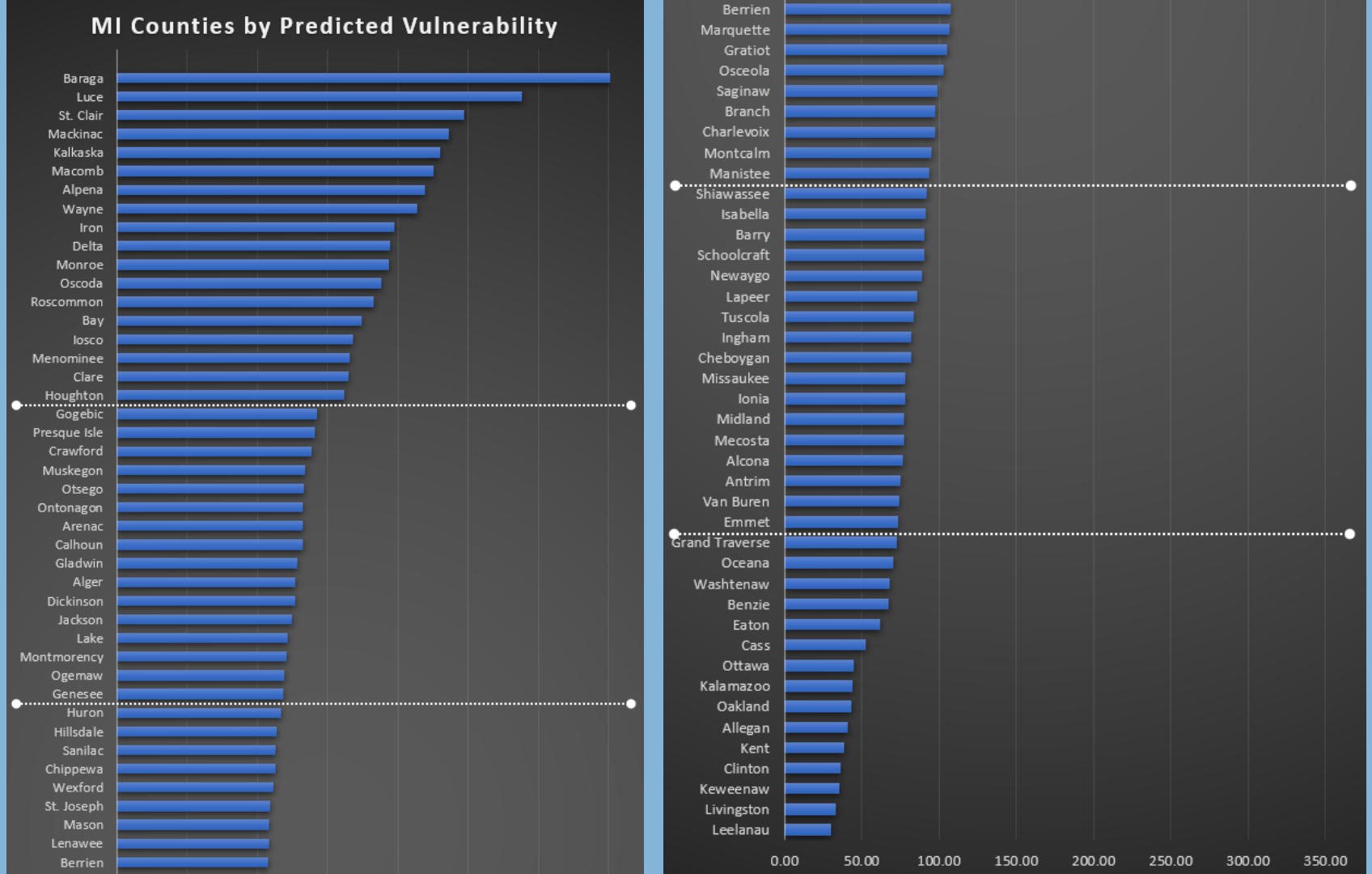
Variable	Coefficient	P-value
Proportion without a vehicle	0.1419	0.0012
Proportion without college education	0.0417	<0.001
Proportion of non-family households	0.0351	0.0230
Heroin treatment admissions per 100,000	0.0029	<0.0001
NAS cases per 100,000 births	0.0003	<.0001
STD's per 100,000	-0.0007	0.0389

- Used as a multiplier to predict rates of HCV, based on county specific values of each significant variable
- Useful in highlighting jurisdictions that may be prone to increased HCV incidence in the future

Michigan Assessment



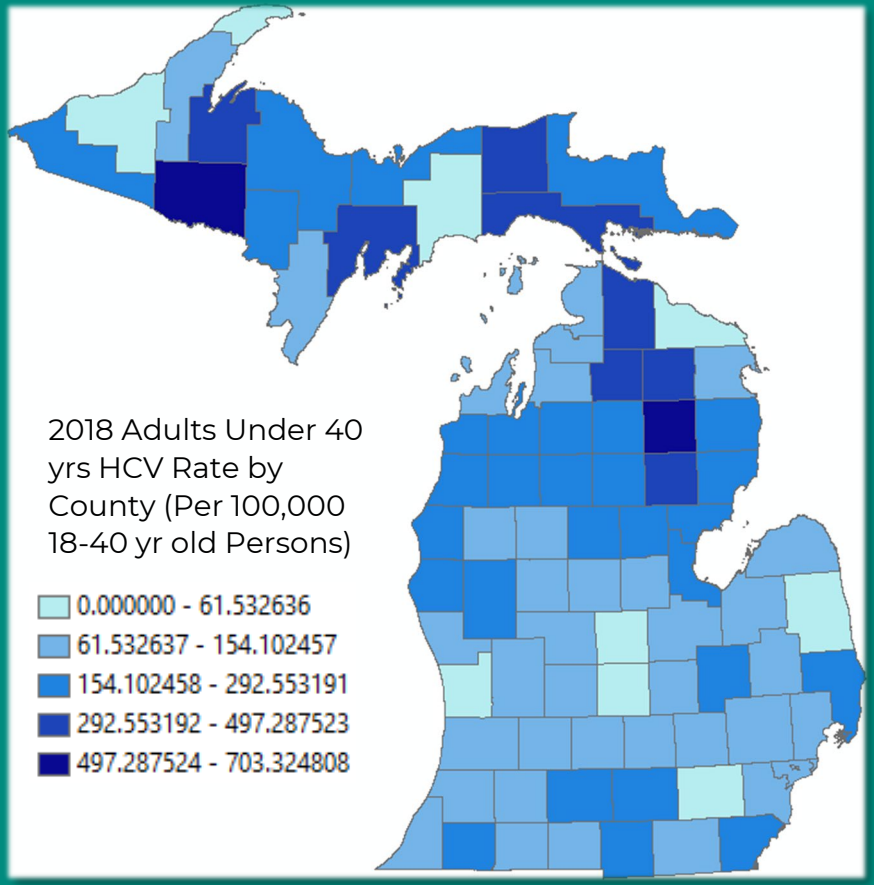
CDC Assessment

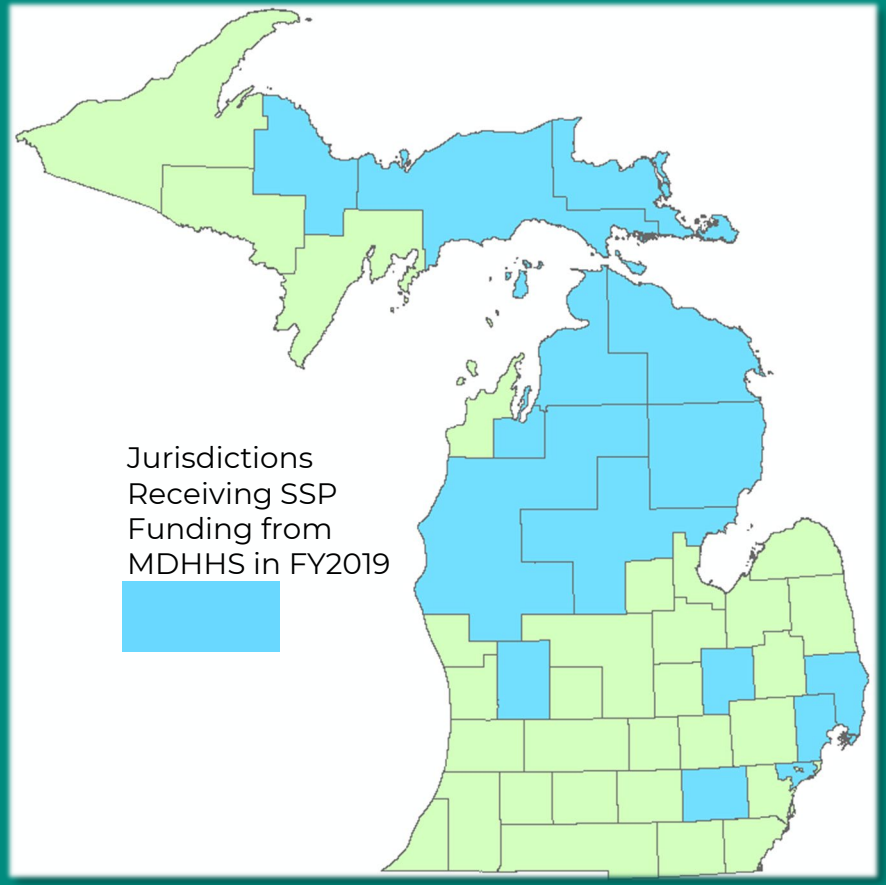

MI Counties by Predicted Vulnerability
Baraga
Luce
St. Clair
Mackinac
Kalkaska
Macomb
Alpena
Wayne
Iron
Delta
Monroe
Oscoda
Roscommon
Bay
Iosco
Menominee
Clare
Houghton
Gogebic
Presque Isle
Crawford
Muskegon
Otsego
Ontonagon
Arenac
Calhoun
Gladwin
Alger
Dickinson
Jackson
Lake
Montmorency
Ogemaw
Genesee
Huron
Hillsdale
Sanilac
Chippewa
Wexford
St. Joseph
Mason
Lenawee
Berrien
Berrien
Marquette
Gratiot
Osceola
Saginaw
Branch
Charlevoix
Montcalm
Manistee
Shiawassee
Isabella
Barry
Schoolcraft
Newaygo
Lapeer
Tuscola
Ingham
Cheboygan
Missaukee
Ionia
Midland
Mecosta
Alcona
Antrim
Van Buren
Emmet
Grand Traverse
Oceana
Washtenaw
Benzie
Eaton
Cass
Ottawa
Kalamazoo
Oakland
Allegan
Kent
Clinton
Keweenaw
Livingston
Leelanau
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00

Results

- Most “vulnerable” counties align with:
  - Highest rates of HCV under 40 yrs old
  - Highest rates of opioid prescription
  - Predominantly Caucasian, rural counties with less healthcare access (but some urban counties, as well)
  - Counties without long standing harm reduction services
- Provides a tool to aid in informing focus of limited resources

Expansion of SSP in Michigan





Conclusion

- These data reflect a point-in-time estimate
  - Easily duplicated and/or adjust to account for trends over time
  - Will be replicated with drug poisonings as model outcome
- Data include community specific factors, providing a more granular, tailored model
- Results can be used, in part, to inform administrative decisions pertaining to SSP's
- Prepares us to be proactive in efforts to avoid a major outbreak