

County-level Vulnerability to Rapid Dissemination of HIV/HCV Infection Among Persons who Inject Drugs

March 8, 2016

Collaborative Effort

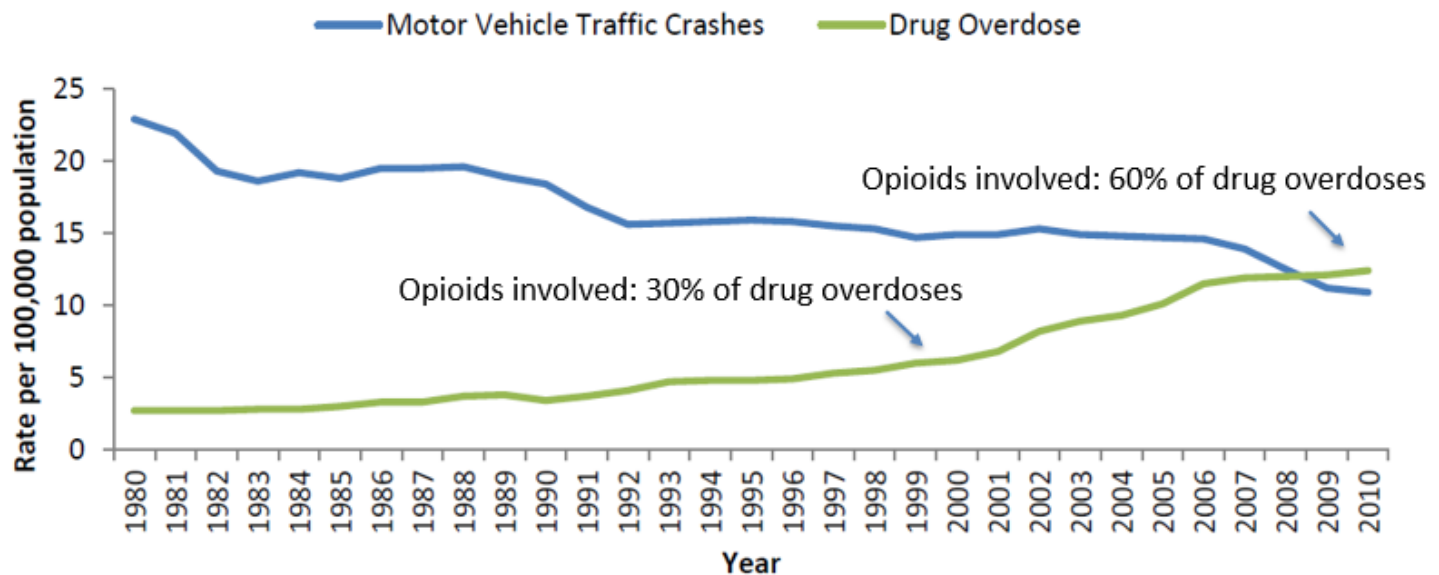
- NCHHSTP/
Division of HIV/AIDS Prevention
- NCHHSTP/
Division of Viral Hepatitis
- ATSDR/Geospatial
Research Analysis and
Services Program
- NCIPC
- FDA



Background

- Nationally, the epidemic of non-prescription opioid addiction has led to increased injection drug use and its infectious complications, most notably hepatitis C virus (HCV) infection

Rates of motor vehicle traffic and drug overdose deaths, United States

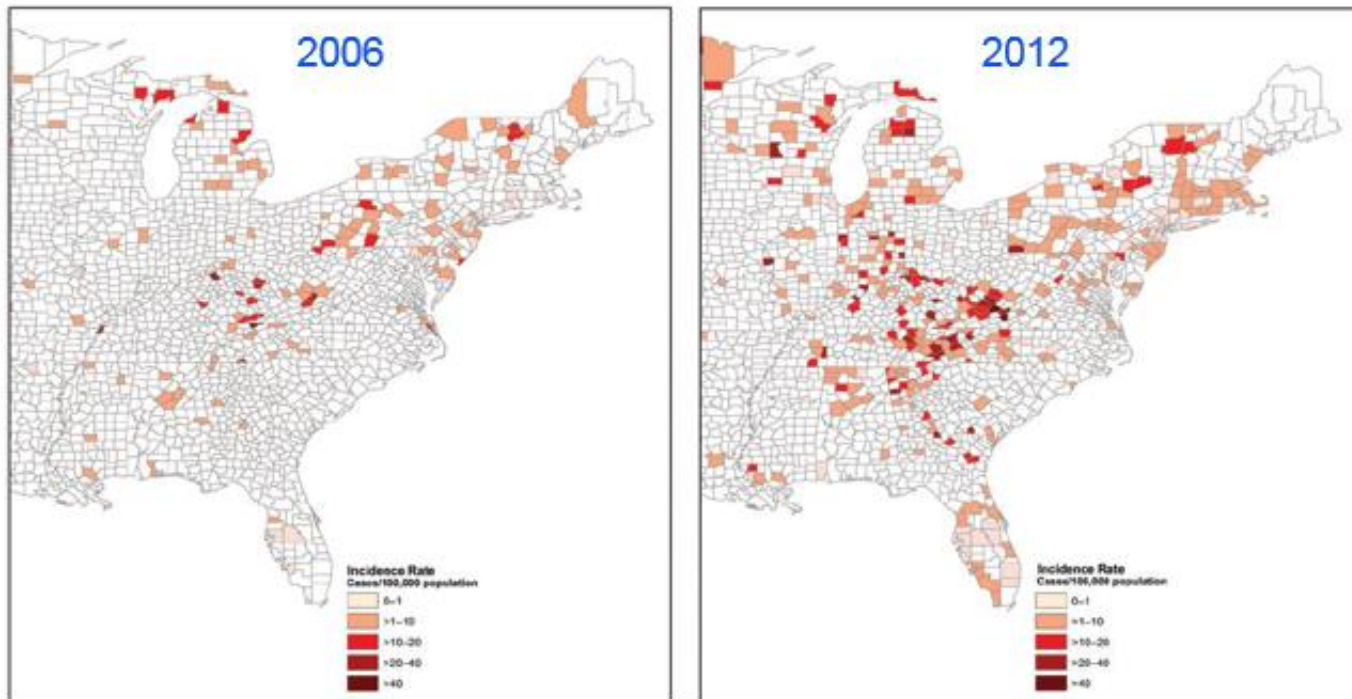


Source: DHHS, Addressing Prescription Drug Abuse in the United States Current Activities and Future Opportunities, September 2013

Background

- The communities affected are not typical of those affected historically by injection drug use

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



Background

- Beginning in late 2014, an outbreak of HIV infections spread rapidly among a network of persons who inject drug users in the small rural community of Austin in Scott County southeastern Indiana
- As of February 1, 2016, 188 HIV infections had been diagnosed
 - >90% coinfecting with HCV
- Rapid recognition of the outbreak and institution of intensive control efforts prevented new infections and limited geographic spread
- Other U.S. jurisdictions may be at risk for similar event

Purpose

- Identify counties in the United States potentially vulnerable to rapid dissemination of HIV/HCV infection among persons who inject drugs.

Methods: Multi-step Approach

Which variables predict acute HCV infection?

- Poisson Regression Model

Which counties have highest vulnerability to HIV/HCV outbreak?

- Composite Index Score – “Vulnerability Score”

Methods: Multi-step Approach – Step 1

Which variables
predict acute HCV
infection?

- **Poisson Regression Model**
 - Outcome: acute HCV infection, proxy for unsterile injection drug use.
 - Independent variables: most up-to-date national data available at the county-level

Methods: Multi-step Approach – Step 1

Which variables
predict acute HCV
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- **Poisson Regression Model**
 - Outcome: acute HCV infection, proxy for unsterile injection drug use.
 - Independent variables: most up-to-date national data available at the county-level

Why acute HCV infection as proxy outcome?

- **HCV is highly transmissible through injection drug use**
- **HCV and the injection event are linked closely in time and space**
- **Acute HCV infections are reportable to the National Notifiable Disease Surveillance System (NNDSS)**
 - **For this analysis, we excluded acute HCV infection data from 8 states and District of Columbia due to absent or unreliable reporting**

Methods: Multi-step Approach – Step 1

Which variables
predict acute HCV
infection?

- **Poisson Regression Model**
 - Outcome: acute HCV infection, proxy for unsterile injection drug use.
 - Independent variables: most up-to-date national data available at the county-level

Criteria for independent variables

- **Known or plausibly associated with injection drug use**
- **Available from national data sources at the county level**
- **Recent: 2012 or later**
- **Complete: >90% of U.S. counties with valid values**

Results:

Outcome and Variables (n=15) selected for analysis

Outcomes/Variables	Data Source, Year(s) reported
HCV incidence (outcome)	National Notifiable Disease Surveillance System (NNDSS), 2012-2013
Drug overdose deaths	National Center for Health Statistics (NCHS) / National Vital Statistics Systems (NVSS), 2012-2013
Prescription opioid sales	Drug Enforcement Administration - Automation of Reports and Consolidated Orders System, 2013
Mental health services	Center for Medicare and Medicaid Services (CMS), National Provider Identification, 2014
Urgent care facilities	Homeland Security Infrastructure Program Gold Database, 2012
Access to interstate	ESRI maps and data, 2014
Buprenorphine Prescribing Potential	SAMHSA DATA 2000 Program Information, 2014
Urban/Rural status	National Center for Health Statistics (NCHS), 2013
Insurance coverage	American Community Survey, 2012-2013 5-year estimates
Vehicle access	American Community Survey, 2012-2013 5-year estimates
Education	American Community Survey, 2012-2013 5-year estimates
Income	American Community Survey, 2012-2013 5-year estimates
Poverty	American Community Survey, 2012-2013 5-year estimates
Race/ethnicity	American Community Survey, 2012-2013 5-year estimates
Unemployment	American Community Survey, 2012-2013 5-year estimates
Population density	US Census, 2010

Results:

Which variables best predicted acute HCV infection?

Variables	Final Model	
	Standardized Relative Risk	p-value
Percent White, Non-Hispanic Population ¹	1.68	<0.0001
Drug Overdose Deaths per 100K Persons	1.21	<0.0001
Per Capita Income ²	0.81	<0.0001
Percent Unemployed Population ³	1.14	0.012
Prescription Opioid Sales per 10K persons ⁴	1.09	0.013
Buprenorphine Prescribing Potential by Waiver per 10K Persons	1.08	0.010

1. Percent of the county population of white, non-Hispanic race/ethnicity
2. Mean income computed for every person in the county; derived by dividing the total income of all people 15 years and older by the total population; modeled as log base 10
3. Percent of civilian persons aged 16 years and older unemployed and actively seeking work
4. Rate of morphine milligram equivalent kilograms sold of opioid pain relievers per 10,000 population

Methods: Multi-step Approach – Step 2

Which counties have highest vulnerability to HIV/HCV outbreak?

- **Composite Index Score – “Vulnerability Score”**
 - Calculate score using variables significantly associated with outcome (i.e., acute HCV infection as proxy for unsterile injection drug use).
 - Rank counties by score to identify those with greatest potential vulnerability.

Methods: Vulnerability Score Calculation

- Created a “scoring” dataset containing each county’s values for the six significant variables (indicators) from the parsimonious final Poisson regression model
 - Averaged data for the three indicators with two years of data
 - Imputed values for counties with missing data (i.e., 133 counties for drug overdose deaths)
- For each county, we calculated the composite index score as:

Composite Index Score_i =

$$\Sigma(\beta_1 * X_{1_i} + \beta_2 * X_{2_i} + \beta_3 * X_{3_i} + \beta_4 * X_{4_i} + \beta_5 * X_{5_i} + \beta_6 * X_{6_i})$$

Where:

i = county

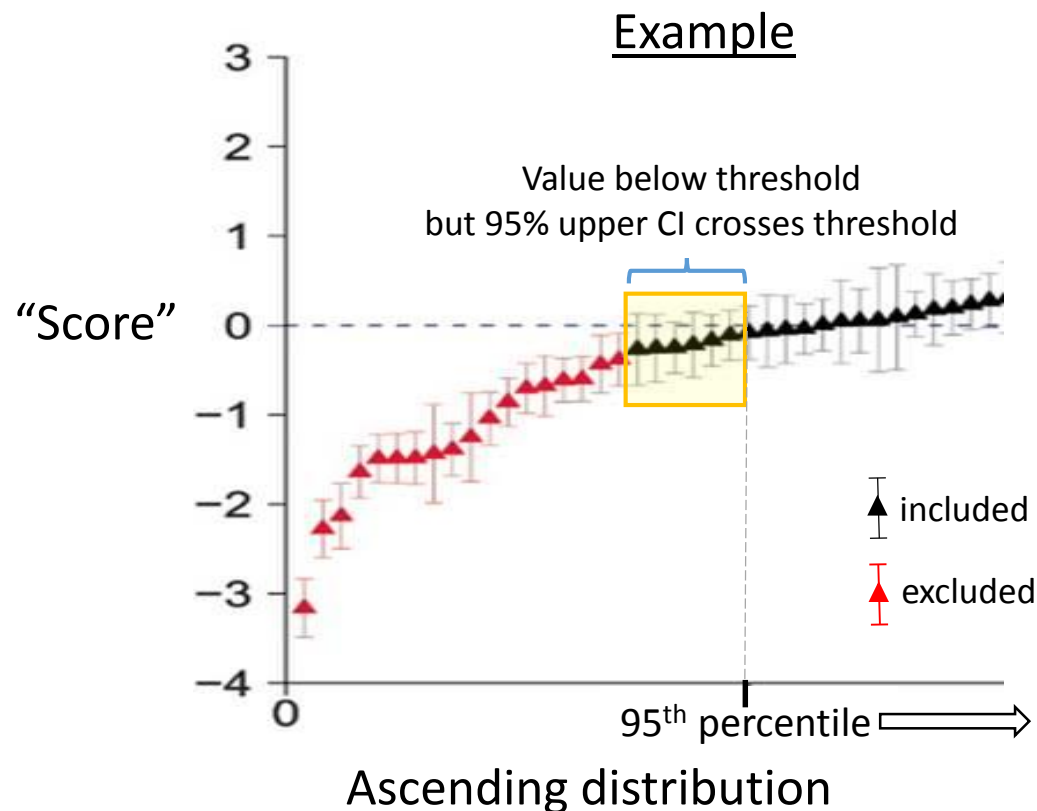
β = regression coefficient

X = observed value for county i

- Thus, for each county, the “vulnerability score” was the sum of the regression coefficients multiplied by the observed values for each indicator

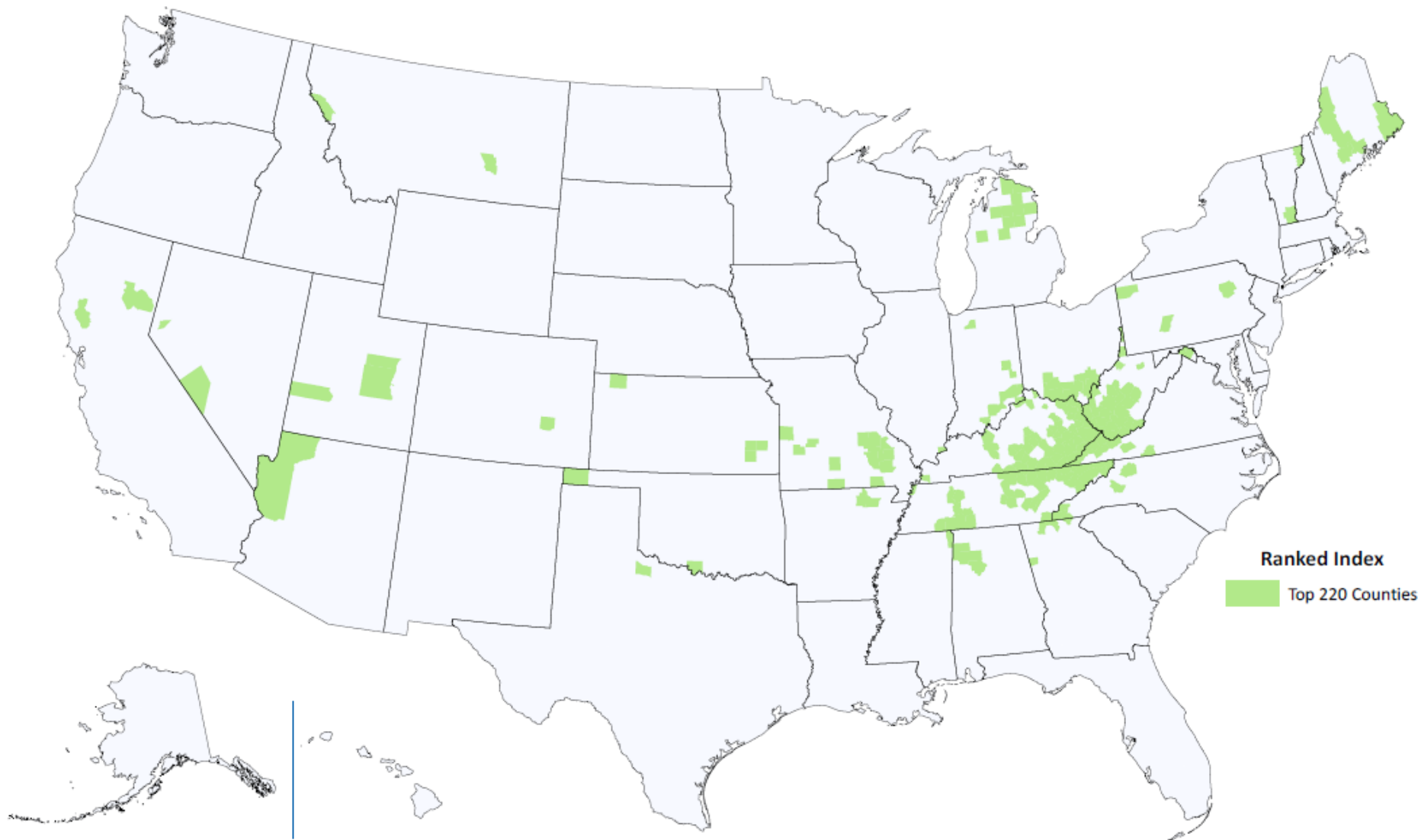
Methods: Vulnerability Score Ranking and Mapping

- For the 3,143 U.S. counties, we mapped those counties scoring in the 95% percentile (top 5%) most vulnerable
 - We included all counties whose upper 95% confidence interval limit crossed the 5% boundary (n=220)



Vulnerability to Rapid Dissemination of HIV/HCV Infections Among Persons Who Inject Drugs: Ranked index using regression model coefficients

26 States with 1 or more vulnerable counties



Results – Vulnerability to HIV/HCV Outbreak

- **56% of counties were located in the Appalachian core region (Kentucky, Tennessee, West Virginia)**
- **In four states, at least 15% of the state’s population resides in counties identified as vulnerable**
- **Residing in an area identified as vulnerable does not indicate risk of infection for all residents**
 - Purpose of analysis was to identify places where HIV/HCV, if introduced, might spread rapidly among PWID

Limitations

- **Inclusion criteria for indicators excluded some factors that may be associated with injection drug use, such as:**
 - EMS calls and ER visits for drug overdose
 - Prescription drug monitoring program (PDMP) data
- **Vulnerability to rapid dissemination of HIV or HCV dependent on prevalence in the region and injection drug use behaviors**
 - A region with low HIV prevalence may be at lower risk for rapid dissemination than a region with high HIV prevalence
 - The number of times people inject per day may increase their risk for acquisition of HIV or HCV

Summary

- **To prevent future outbreaks like that which occurred in Indiana, CDC conducted an analysis to identify other communities especially vulnerable to rapid spread of HIV/HCV among persons who inject drugs by**
 - Identifying variables highly associated with acute HCV infection, best proxy for injection drug use
 - Applying indicator data to identify areas at highest risk for rapid spread of HIV/HCV among persons who inject drugs
- **Local-level data can be used to better characterize risk profiles**
- **State, local, and federal authorities can work together to continue ongoing monitoring of the risk for an HIV/HCV outbreak and control it if detected**

Key Considerations

1. The epidemiology of injection drug use in the U.S. is changing

- The U.S. is experiencing an epidemic of prescription and non-prescription opioid use and expanding injection drug use in communities not previously considered at high risk for HIV infection
- All states should assess state-based data for evidence of areas where injection drug use may be occurring
- Data at the state level will likely provide a better local picture

2. This is a dynamic planning exercise and the findings will change

- This analysis can be updated as new and better information becomes available
- Having more complete and rapid reporting of acute HCV infections will help you and us better and more accurately assess communities at highest risk

Key Considerations

3. Associations don't represent causation

- The association of an indicator with the outcome does not mean it caused the outcome.
- For instance, the association with “buprenorphine prescribing potential by waiver per 10,000” reflects community awareness of and response to a need, namely the need for medication-assisted therapy to treat substance use disorder.
- It does not mean – and it would be incorrect to conclude – that use of buprenorphine is failing to control opioid abuse.

Recommendations

- 1. Determine if unsafe injection of drugs is occurring**
 - What data sources are available?
- 2. Enhance testing for HIV and HCV infections**
 - How can you improve detection of injection drug use and of a possible HIV outbreak?
- 3. Prepare an action plan for a potential HIV outbreak**
 - What steps can you take to prepare?

1. Determine if “unsafe” injection of drugs is occurring

Through *prompt reporting and review of disease surveillance* data and data for other medical outcomes

- Acute HCV infections
 - Be sensitive to any increases in acute HCV infections
 - Over 70% of recent acute HCV infections are due to injection drug use
 - Interviewing recently diagnosed persons can confirm this risk
- IDU-associated HIV infections
 - Be sensitive to any increases in IDU-associated HIV diagnoses
- Medical complications of unsafe injection drug use
 - Consider monitoring incidence of endocarditis or skin and soft tissue infections

1. Determine if “unsafe” injection of drugs is occurring

By *monitoring data sources* to assess for increases in ***outcomes that may be associated with unsafe injection drug use, for example***

- Drug overdose deaths (esp. opioid-related)
- Treatment for drug overdose or intoxication
- EMS calls for drug overdose or intoxication
- Poison center calls for drug overdose or intoxication
- Administration of naloxone
- Admissions to rehabilitation centers for substance use disorder
- Demand for medication-assisted therapy (e.g., methadone, buprenorphine, naltrexone)
- Arrests for drug possession or sales, or other drug-related crime
- Medical examiner and toxicology records

1. Determine if “unsafe” injection of drugs is occurring

Through *direct surveys* and other data systems

- Population surveys assessing prevalence of injection drug use
- State prescription drug monitoring plan (PDMP) data for “hot spots” of prescribed opioids

2. Enhance testing for HIV and HCV infection

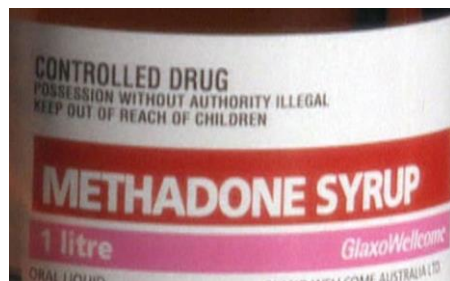
At locations where at-risk persons are likely encountered and can provide an early signal of a problem

- Providers of services for persons with substance use disorder
- Jails and prisons
- Emergency departments and in-patient settings

2. Enhance testing for HIV and HCV infection

At locations where at-risk persons are likely encountered and can provide an early signal of a problem

- **Providers of services for persons with substance use disorder** who inject drugs including but not limited to:
 - Opioid substitution therapy programs (e.g., methadone)
 - Providers who prescribe buprenorphine
 - Drug rehabilitation or detoxification programs
 - Mental health service providers for substance use disorder
 - Syringe services programs



Detox Programs

Manage the **symptoms** of withdrawal.

depression	suicide
tremors	nausea
seizures	weakness
anxiety	diarrhea
vomiting	irritability
headaches	cravings
insomnia	muscle aches
sweating	bone aches
chills	sweating
paranoia	delirium

CoMeth
Marijuana pills
Heroin
Alcohol
Pain killers
Heroin

COMPLETED under the supervision of a DOCTOR



2. Enhance testing for HIV and HCV infections

At locations where at-risk persons are likely encountered and can provide an early signal of a problem

- **Jails and prisons** including but not limited to persons incarcerated or undergoing incarceration for:
 - Drug possession, sales, or distribution
 - Syringe or other paraphernalia possession, sales, or distribution

County jail expands HIV testing

Lockups seen as crucial area to stem spread of the disease

By NAOMI NIX
Tribune reporter

Every day about 200 people pass through the doorways of the Cook County Jail to have their clothes inspected, their pictures taken and their backgrounds checked. Now the incarcerated face one more examination: an HIV test.

The Cook County Jail is testing everyone who goes through the intake process for HIV, unless they refuse, hoping to put a dent in the number of people who have the virus but don't know it.

The approach, called opt-out HIV testing, has been in place for female inmates since April 2011, but the jail system expanded the program to include male inmates in late June.

Meanwhile, health officials plan to adopt a similar program for state prisons in the coming months.

Experts say correctional facilities have become a key battleground in the fight against HIV.

"It's a window of opportunity for reaching them for education purposes," said Cajetan Luna, executive director of the Center for Health Justice. "Once people get out in the community, it's much harder to do that work."

Each year, 1 in 7 people living with HIV pass through a correctional facility ... the number of them was a fraction of what we really wanted to be tested," said Dr. Chad Zawitz, di-

Blood samples from those who take the test are sent to Stroger Hospital, where they are tested over-

doctor" Zawitz said. "I try to give them plausible reasons on why they are seeing me other than they got it."

Compared with the previous year, the number of HIV tests taken since opt out began for female inmates has about tripled, Zawitz said.

The Cook County Health and Hospitals System is paying about \$275,000 a year for the increased testing at the jail.

The state prison system hopes to adopt a similar approach. Currently inmates are offered a test at their parent facility. But in the fall, inmates will be told only of their option to refuse a test when they enter a reception and classification center.

"It's certainly a significant change," said agency medical director Louis Shicker. "We're hoping that we will catch more people and possibly pick up more positives."

The initiative will be paid for by part of a \$7 million grant awarded two years ago to researchers at the University of Illinois at Chicago.

The group also is experimenting with using inmate social networks to find and diagnose more HIV-posit-



TERRENCE ANTONIO JAMES/TRIBUNE PHOTO

A Cook County Jail inmate gives blood while going through the intake process last week. In June the facility began regular HIV testing for men. Testing of women began last year.

"It's a window of opportunity for reaching them for education purposes."

— Cajetan Luna, executive director of the Center for Health Justice

2. Enhance testing for HIV and HCV infections

At locations where at-risk persons are likely encountered and can provide an early signal of a problem

- **Emergency departments and in-patient settings** including but not limited to persons with medical problems related to unsafe injection practices:
 - Drug overdose or intoxication
 - Endocarditis
 - Skin and soft tissue infections (e.g., abscess, cellulitis)

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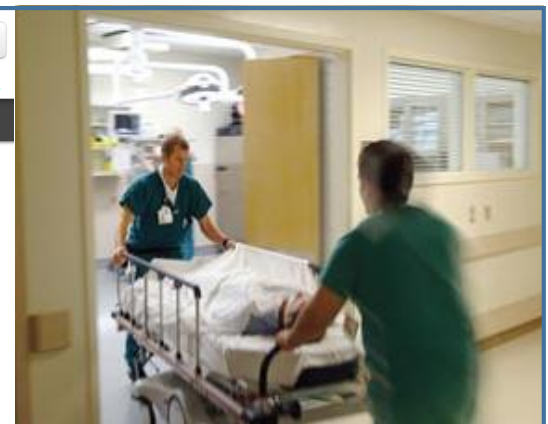
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Focus on Patient Care

First year of HIV testing in UAB ED helps reduce the spread of virus

by Bob Shepard

August 07, 2012 | Print | Email



3. Prepare an action plan for a potential HIV outbreak

Identify state preparedness partner and develop a response plan

- Catalogue resources needed for a response at the county or other sub-regional unit level. These resources include:
 - Intensive contact tracing and HIV testing
 - HIV treatment
 - Syringe services programs
 - Medication-assisted treatment
 - HIV pre-exposure prophylaxis (sexual and needle-sharing partners)
 - Condoms and safer sex education
- Create an activation plan
 - Establish an incident command structure, communications plan, data management plan

Recommendations – “Take-Home”

1. Determine if unsafe injection of drugs is occurring

- Monitor data sources that may indicate injection drug use
- Improve surveillance for acute HCV infection

2. Enhance testing for HIV and HCV infections

- Providers of services for persons with substance use disorder
- Jails and prisons
- Emergency departments and in-patient settings

3. Prepare an action plan for a potential HIV outbreak

- Know your HIV (and HCV) treatment landscapes

Thank you

For more information please contact: or John T. Brooks, MD (zud4@cdc.gov)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.