4th International HIV/Viral Hepatitis Co-Infection Meeting

The Rocky Road to Viral Hepatitis Elimination:
Assuring access to antiviral therapy for ALL co-infected patients from low to high income settings

Saturday - Sunday, 22-23 July 2017
Paris, France
Emerging epidemics: will they derail progress? Rural HIV-HCV related epidemics in the US

John T. Brooks MD
Division of HIV/AIDS Prevention, CDC
Saturday July 22, 2017

Disclaimer: The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the U.S. Department of Health and Human Services.
Dr. Brooks has no relevant financial affiliations to disclose

Reported cases per 100,000 population

Year

0-19 yrs
20-29 yrs
30-39 yrs
40-49 yrs
50-59 yrs
≥ 60 yrs

CDC National Viral Hepatitis Surveillance System data

### Shift towards younger persons

| Year | Incidence of Acute Hepatitis C
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>0-19 yrs</td>
<td>20-29 yrs</td>
</tr>
<tr>
<td>2000</td>
<td>2.5</td>
</tr>
<tr>
<td>2010</td>
<td>0.5</td>
</tr>
<tr>
<td>2015</td>
<td>0.0</td>
</tr>
</tbody>
</table>

- **Ages 30-49 years** → **Ages 20-39 years**

Estimated ≥70 % of infections since 2006 due to injection drug use\textsuperscript{1-3}

Hepatitis C Leading Infectious Cause of Death in U.S.

Ly et al., Clin Infect Dis, 2016;62(10):1287-8
Number of HIV Infections Diagnosed among Adults and Adolescents, by Transmission Category, 2005–2014 - United States and 6 Dependent Areas

- Male-to-male sexual contact: 63% decline over 10 years
- Heterosexual contact: 6% of all HIV infections in 2014
- Injection drug use: 6,408 in 2014, 2,364 in 2014

CDC National HIV Surveillance System data
Single strain of HIV spread rapidly within a dense network of persons who inject drugs (PWID) who were using the prescription opioid oxymorphone

215 HIV Infections diagnosed as of March 2, 2017

Scott County ranked 92nd in many health and social indicators among Indiana’s 92 counties

- Lowest life expectancy
- 9% unemployment
- 19% poverty
- 21% no high school
- Many uninsured

Single strain of HIV spread rapidly within a dense network of persons who inject drugs (PWID) who were using the prescription opioid oxymorphone 215.

215 HIV Infections diagnosed as of March 2, 2017

Scott County ranked 92nd in many health and social indicators among Indiana’s 92 counties.

**Adult prevalence as of February 1, 2016 (n=188)**

- Scott County (18,264*): 1.0 %
- Austin, if home for 80% of cases (3,143*): 4.6 %

Why is Unsafe Injection of Drugs Increasing?
They’re the most powerful painkillers ever invented. And they’re creating the worst addiction crisis America has ever seen.

by Massimo Caldera
Rates of motor vehicle traffic and drug overdose deaths, United States 1980-2010

Source: DHHS, Addressing Prescription Drug Abuse in the United States Current Activities and Future Opportunities, September 2013
Rates of motor vehicle traffic and drug overdose deaths, United States 1980-2010

1999: Opioids involved: 30% of drug overdoses

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1999: Opioids involved: 30% of drug overdoses

Rates of motor vehicle traffic and drug overdose deaths, United States 1980-2010

Increasing opioid use → Increasing injection of drugs

Source: DHHS, Addressing Prescription Drug Abuse in the United States: Current Activities and Future Opportunities, September 2013
Opioid Epidemic is Generating Steady Increase in New Injectors
But Where is Unsafe Injection Drug Use Occurring?

• Difficult to assess in the absence of robust surveillance
• Injection drug use is a stigmatized and often criminalized behavior
• However, incidence of acute HCV infection can serve as the “footprints” for unsafe injecting behavior
  o HCV is highly transmissible through and associated with non-sterile injection of drugs
  o The acute phase HCV infection is closely linked in time/space to non-sterile injection (i.e., it’s a marker of unsafe injection)
Rapid expansion of injection drug use heralded by epidemic of new HCV infections in areas with historically low rates of HIV infection
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Suryaprasad, 2014 Clin Infect Dis; 59(10):1411-1419
Rapid expansion of injection drug use heralded by epidemic of new HCV infections in areas with historically low rates of HIV infection

Kentucky, Tennessee, Virginia, West Virginia

Incidence nonurban more than twice urban, and increasing faster

Zibbell J, 2015 MMWR, 64(17): 444-448
Where Could an Event like Scott County Happen Next?

Which counties have highest vulnerability to HCV/HIV outbreak?

• Composite Index Score – “Vulnerability Score”
  → added weighted values of predictor variables
    for each county to create a sum vulnerability score
  → rank ordered high-to-low by vulnerability score

Which variables best predict injection drug use?

• Poisson Regression Model – parsimonious set of predictors
  → used acute HCV infection as proxy outcome for IDU
  → factors known or plausibly associated with IDU
  → had to be national-level data, recent, complete
# Results: Which variables best predicted acute HCV infection?

<table>
<thead>
<tr>
<th>Variables</th>
<th>Final Model</th>
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<tbody>
<tr>
<td></td>
<td>Standardized</td>
</tr>
<tr>
<td></td>
<td>Relative Risk</td>
</tr>
<tr>
<td>Percent White, Non-Hispanic Population(^1)</td>
<td>1.68</td>
</tr>
<tr>
<td>Drug Overdose Deaths per 100K Persons</td>
<td>1.21</td>
</tr>
<tr>
<td>Per Capita Income(^2)</td>
<td>0.81</td>
</tr>
<tr>
<td>Percent Unemployed Population(^3)</td>
<td>1.14</td>
</tr>
<tr>
<td>Prescription Opioid Sales per 10K persons(^4)</td>
<td>1.09</td>
</tr>
<tr>
<td>Buprenorphine Prescribing Potential by Waiver per 10K Persons(^5)</td>
<td>1.08</td>
</tr>
</tbody>
</table>

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
5. Evidence of need for addiction services

van Handel, 2016, JAIDS, 73(3): 323-31
Counties Highly Vulnerable to New HIV or Viral Hepatitis Infections Due to Unsafe Injection Drug Use

van Handel, 2016, JAIDS, 73(3): 323-31

40% and higher prevalence may be reached within 1-2 years

Effective Treatment Prevents HIV Transmission

**HPTN 052** → 1,763 infected HIV-infected adults and negative sex partners:
- 10,381 person-years, **no genetically linked infections among suppressed**

**PARTNERS** → 1,166 serodifferent couples:
- ~55,000 condomless sex acts, **no genetically linked infections**

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**HPTN 052**

- **Linked Partner Infections**
  - Cumulative Probability
  - No. at Risk:
    - Early ART: 903, 808, 746, 697, 641, 612, 536, 269, 99, 21, 19, 2
    - Delayed ART: 890, 792, 715, 663, 611, 536, 269, 99, 28, 26, 1

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**PARTNERS**

<table>
<thead>
<tr>
<th>HIV-Negative Members of Eligible Couples Reporting Specific Sex Act, No./Total (%)</th>
<th>Couple-Years of Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td></td>
</tr>
<tr>
<td>Any sex</td>
<td>863/866 (99.7)</td>
</tr>
<tr>
<td>Vaginal sex</td>
<td>532/878 (60.6)</td>
</tr>
<tr>
<td>Anal sex</td>
<td>449/849 (52.9)</td>
</tr>
<tr>
<td>Insertive anal sex</td>
<td>363/862 (42.1)</td>
</tr>
<tr>
<td>Receptive anal sex with ejaculation</td>
<td>185/864 (21.4)</td>
</tr>
</tbody>
</table>

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Rodger et al., *JAMA* 2016, 316(2):171-181
Opioid Substitution Therapy Reduces HIV Transmission

64% reduction in risk of HIV infection

<table>
<thead>
<tr>
<th>Study</th>
<th>Effect estimate (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All pooled studies</td>
<td></td>
</tr>
<tr>
<td>Williams 1992</td>
<td>0.16 (0.02 to 1.30)</td>
</tr>
<tr>
<td>Metzger 1993</td>
<td>0.13 (0.03 to 0.50)</td>
</tr>
<tr>
<td>Chitwood 1995</td>
<td>0.29 (0.09 to 0.94)</td>
</tr>
<tr>
<td>Nelson 2002</td>
<td>0.56 (0.34 to 0.92)</td>
</tr>
<tr>
<td>Kerr 2006</td>
<td>0.67 (0.42 to 1.10)</td>
</tr>
<tr>
<td>Van den Berg 2007</td>
<td>0.35 (0.23 to 0.54)</td>
</tr>
<tr>
<td>Suntharasamal 2009</td>
<td>0.78 (0.58 to 1.05)</td>
</tr>
<tr>
<td>Judd 2012 (unpublished)</td>
<td>0.79 (0.20 to 3.15)</td>
</tr>
<tr>
<td>Bruneau 2012 (unpublished)</td>
<td>0.17 (0.04 to 0.71)</td>
</tr>
<tr>
<td>Overall: $I^2=60%$, $P=0.010$</td>
<td>0.46 (0.32 to 0.67)</td>
</tr>
</tbody>
</table>

MacArthur G J et al., BMJ 2012, Courtesy of Richard Needle
Needle and Syringe Programs Reduce HIV Incidence

56% reduction in risk of HIV infection

Aspinall E J et al., Int J Epidemiol 2014, Courtesy of Richard Needle
Counties Highly Vulnerable to New HIV or Viral Hepatitis Infections Due to Unsafe Injection Drug Use

What do most of these counties share in common?

Predominately RURAL
Key challenging characteristics in rural areas (among others...)

1. Limited access to services
   - Large distances
   - Few transportation options
   - Uninsured

2. Distrust between PWID and law and community leaders

3. Limited infrastructure
   - HIV and viral hepatitis testing
   - Clinical HIV/HCV care services
   - Medication-assisted therapy
   - Syringe service programs
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   o Medication-assisted therapy
   o Syringe service programs *may also be illegal*
Indiana Emergency Declaration and New Law Permitted Syringe Exchange in Response to Outbreak

After Temporary Emergency Actions, Indiana Passes Law to Allow Syringe Exchange Programs

*From AIDS United

Indiana Governor Mike Pence has signed a bill approved by the state legislature this week giving local officials across the state the ability to create syringe exchange programs if they are experiencing a disease outbreak tied to injection drug use. The signed bill, Senate Enrolled Bill 461, is part of a broader response to the recent outbreak of HIV infections in the southeastern part of the state, which was initially caught surprised and ill-equipped for HIV prevention or response.
Arnold showed members of Delaware County Council in their meeting Tuesday morning a bag of supplies distributed in neighboring Madison County. Contents of the needle exchange kit included hundreds of fresh needles, condoms, saline for use in injections, small heroin "cookers" with twist-tie handles and a bio-hazard container for used needles, which Arnold said was the only positive item in the bags.

"This is enabling," Arnold told council members about the kits. "There are only two things missing: heroin and a lighter."
Impact of Syringe Exchange in Scott County

- Reductions in sharing syringes and injection equipment (n=148)

Patel et al. IDWeek 2015, abstract: *Open Forum Infect Dis* (Fall 2015) 2 (supplement 1): S69-S70
Summary: Could Progress Be Derailed?

• The U.S. is in the midst of an expanding opioid and heroin epidemic.

• Generating a new population of PWID not traditionally considered vulnerable to HIV/HCV infections
  • Predominately rural often with very limited resources
  • Threatens to erode our substantial collective success controlling PWID-associated HIV infections and further increase PWID-associated HCV infections

• Numerous interventions have proven successful at reducing the risk of infection from unsafe injection of drugs (e.g., syringe service programs, medication-assisted therapy, TasP)
  • Models lacking how to operationalize these interventions in rural settings
  • The odds are in our favor if we use science to guide us in making the right choices
U.S. Innovation in Sterile Injection Services, 2017

Vending Machines

Supervised Injection Sites
HIV Rates by Population

3.5% - Ahtahkakoop

3.76% - Austin, Indiana

Source: Public Health Agency of Canada
Centers for Disease Control and Prevention (CDC)
Thank you

John T. Brooks: zud4@cdc.gov