Estimation of New York State Hepatitis C Prevalence, 2013 - 2016

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Eli Rosenberg, PhD, Associate Professor

Department of Epidemiology and Biostatistics
UAlbany School of Public Health, SUNY
Outline

• Background

• Overview of methodology

• Tailoring methods for New York State

• Results

• Limitations and strengths
Background on HCV Prevalence Estimation

• State-level burden of HCV infection informs policies, resource allocation, advocacy, and elimination efforts

• Prevalence of current infection nationally traditionally measured in representative **residential** survey
  ▫ National Health and Nutrition Examination Survey (NHANES)

• Statistical models allow combining national NHANES HCV prevalence with local information to yield state-level results
  • National Vital Statistics System (NVSS) mortality
  • American Community Survey (ACS) population sizes
Method builds on previous approaches
Shifting epidemiology of HCV to account for:

- Rapid rise in incidence in younger PWID due to opioid epidemic
- Mortality in high prevalence group: 1945-1965 birth cohort
- Scale-up of cure via DAAs
Overview of analytic approach
Overview of analytic approach

A. NHANES 1999-2016
HCV prevalence direct estimation, 2013-2016

B. NVSS 1999-2016
State-level HCV mortality
State-level narcotic overdose mortality

National Prevalence: 0.81%

Age/race/sex stratum and state-specific ratios for HCV mortality, 2013-2016
Age/race/sex stratum and state specific-ratios for Narcotic overdose mortality, 2013-2016
Overview of analytic approach

A. NHANES 1999-2016
   HCV prevalence direct estimation, 2013-2016

B. NVSS 1999-2016
   State-level HCV mortality
   State-level narcotic overdose mortality

C. Direct estimates modified by mortality ratios
   Weighted average of state ratios according to birth cohort-specific trends in HCV exposure

D. Adjusted HCV prevalence for NHANES-eligible population, 2013 - 2016

Age/race/sex stratum and state-specific ratios for HCV mortality, 2013-2016
Age/race/sex stratum and state specific-ratios for Narcotic overdose mortality, 2013-2016
Age/race/sex stratum and state specific state mortality ratios, 2013-2016
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A) NHANES 1999-2016
HCV prevalence direct estimation, 2013-2016

B) NVSS 1999-2016
State-level HCV mortality
State-level narcotic overdose mortality

C) Weighted average of state ratios according to birth cohort-specific trends in HCV exposure

D) Direct estimates modified by mortality ratios

E) Literature and analyses for additional populations not included in NHANES' sampling frame

Final HCV prevalence for total US adult population, 2013 - 2016
Populations not Included in NHANES

- Residents of nursing homes
- Unsheltered homeless
- Incarcerated

Approach
- State-level population size estimates for each population
- Estimate HCV prevalence in each population
  - Residents of nursing homes
    - Used on NHANES sex/age-specific prevalences
  - Unsheltered homeless
    - Review of articles published 1/1/2013 to 12/31/2017
  - Incarcerated
    - Analyses of specific data sources
Tailoring national work to New York

- Used HCV prevalence model for all states, 2013-2016

- Synthesized NYS and NYC HCV diagnosis data
  - Generate state-specific weights by sex
  - Better reflects HCV epidemiology in New York

- Used New York-specific testing and population size sources for incarcerated populations
Tailoring to NYS: Incarcerated Population

DOH Seroprevalence Study

DOCCS Under Custody Report

AI Rapid Testing (Upstate)

Lit Review (NYC)

Prison Ab+ Prevalence Estimate

Jail Ab+ Prevalence Estimate

Combined Ab+ Count (previous/current infection)

RNA Adjustment Method #1

RNA Adjustment Method #2

Combined RNA+ Count (current infection)
# HCV Prevalence in Prisons

## Illustration of approach

<table>
<thead>
<tr>
<th>Intake Date</th>
<th>Intake Prevalence</th>
<th># Incarcerated in 2016</th>
<th>HCV Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>9.8% (Male)</td>
<td>5,210 (Male)</td>
<td>512</td>
</tr>
<tr>
<td>2015</td>
<td>10.1% (Male)</td>
<td>8,459 (Male)</td>
<td>852</td>
</tr>
<tr>
<td>2014</td>
<td>17.8% (Female)</td>
<td>230 (Female)</td>
<td>41</td>
</tr>
<tr>
<td>2015</td>
<td>21.0% (Female)</td>
<td>475 (Female)</td>
<td>100</td>
</tr>
</tbody>
</table>

= 5,746 Ab+ persons (5,227 male, 519 female) as of Jan 2016
HCV Prevalence in Jails

• 20.6% Ab+ in NYC (Akiyama et al., 2016)
  ▫ x 9,599 inmates (NYS Division of Criminal Justice Services)

• 12.8% Ab+ in NYS (AIDS Institute HCV Rapid Testing Program)
  ▫ x 15,534 inmates (NYS Division of Criminal Justice Services)

= 3,966 Ab+ inmates in jails
Incarcerated HCV Prevalence: Current Infection

• Above estimates are Ab+, representing previous or current infection
  ▫ Prisons: 5,746
  ▫ Jails: 3,966
  Total: 9,712

• How many currently infected (RNA positive)?
  ▫ Reflects spontaneous clearance (~25%) and treatment
  ▫ Based on analysis of DOCCS testing data from AI:
    67.93% of Ab+ individuals RNA+

  \[= 9,712 \times 67.93\% = 6,597\] RNA positive
**Primary Results: Adult HCV prevalence, 2013-2016**

<table>
<thead>
<tr>
<th>Population Description</th>
<th>Population size</th>
<th>Persons with HCV</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHANES civilian, residential population</td>
<td>15,260,067</td>
<td>106,996</td>
<td>0.70</td>
</tr>
<tr>
<td>Incarcerated</td>
<td>80,063</td>
<td>6,597</td>
<td>8.24</td>
</tr>
<tr>
<td>Unsheltered homeless</td>
<td>3,528</td>
<td>318</td>
<td>9.01</td>
</tr>
<tr>
<td>Nursing home residents</td>
<td>110,448</td>
<td>446</td>
<td>0.40</td>
</tr>
<tr>
<td>Total Population</td>
<td>15,448,845</td>
<td>114,356</td>
<td>0.74</td>
</tr>
</tbody>
</table>
Final model-based estimate of 114,356 adults with current HCV infection, with finer age breakdown based on distribution of diagnoses in NYS and NYC
Estimation by poverty level

- Estimates by Federal Poverty Level (FPL) may aid HCV planning efforts
- Crude approach to allocate to FPL based on simpler stage of model
  - 42% of infections in 14% of population < FPL

<table>
<thead>
<tr>
<th>NHANES-based Poverty Level</th>
<th>% of Number infected</th>
<th>Total Number Infected</th>
<th>Total NYS Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below FPL</td>
<td>42%</td>
<td>48,003</td>
<td>2,128,092</td>
</tr>
<tr>
<td>1.0-1.9 times the FPL</td>
<td>18%</td>
<td>20,723</td>
<td>2,425,375</td>
</tr>
<tr>
<td>&gt;= 2.0 times the FPL</td>
<td>40%</td>
<td>45,239</td>
<td>10,895,378</td>
</tr>
</tbody>
</table>
Limitations & Strengths

• Limitations to consider
  ▫ NHANES representation of HCV increases among PWID
  ▫ HCV- & opioid- mortality incomplete proxies for underlying HCV infection
  ▫ Estimates represent average during 2013-2016
    • Period of rising incidence
    • Incidence continues to rise
  ▫ Use of NY probable/confirmed case surveillance
    • May not reflect current infections
    • Emphasizes screened populations

• Strengths of approach
  ▫ Synthesis of large national datasets, with local information
  ▫ Few model assumptions
  ▫ Allows apples-apples comparisons between states
Thank you!

Eli Rosenberg  
erosenberg2@albany.edu

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