State of the State: Viral Hepatitis in Tennessee
Drugs, Brains, and HIV Conference
March 20, 2017
Learning Objectives

• Review the definition and epidemiology of viral hepatitis
• Recognize co-morbidities related to Tennessee’s HCV epidemic
• Review the HCV Continuum of Cure
• Identify key factors in developing a statewide response to the prevention and control of HCV
Tennessee Public Health Regions and Metros

- Metros
- Mid-Cumberland
- East
- West
- Upper Cumberland
- Southeast
- South Central
- Northeast
HIV/STD/Viral Hepatitis

Communicable & Environmental Diseases and Emergency Preparedness
Director and State Epidemiologist
TIM JONES, MD

HIV/STD Programs - Medical Director
Carolyn Wester, MD, MPH

HIV/STD Director
Dr. Shanell McGoy

- HIV Prevention Director
  Melissa Morrison
- STD Prevention Director
  Brad Beasley
- HIV/STD Epi Director
- Ryan White Pt B Director
  Tonya King
- HOPWA Director
  Trang Wadsworth
- VH Hep Director
  Lindsey Sizemore
For Healthcare Providers

The diseases, events, and conditions reportable to Tennessee Department of Health (TDH) by healthcare providers are listed below for 2017. Laboratories in healthcare facilities should refer to Page 2 of this document. The reporting form (PH-1600) and associated documentation may be faxed directly to the local or regional health office (see [http://tn.gov/health/topic/localdepartments](http://tn.gov/health/topic/localdepartments)) or the Division of Communicable and Environmental Diseases and Emergency Preparedness (CEDEP) at (615) 741-3857. The PH-1600 also is available for completion online at [https://is.gd/TNReportableDiseases](https://is.gd/TNReportableDiseases). More information about reporting, is available at the Reportable Diseases website at [https://apps.health.tn.gov/ReportableDiseases](https://apps.health.tn.gov/ReportableDiseases). For questions, contact CEDEP at (615) 741-7247 or (800) 404-3006.

Disease Outbreaks (e.g., foodborne, healthcare-associated, waterborne)
- Anaplasmosis
- Anthrax!
- Babesiosis
- Birth Defects
- Botulism: Foodborne !, Wound !
- Botulism: Infant
- Brucellosis
- California/LaCrosse Serogroup Virus Infection
- Campylobacteriosis
- Candida auris
- Carbapenem-Resistant Enterobacteriaeae: Enterobacter species, Escherichia coli, Klebsiella species
- Carbon Monoxide Poisoning
- Hansen's Disease (Leprosy)
- Healthcare Associated Infections: *
  - Catheter-Associated Urinary Tract Infections
  - Central Line Associated Bloodstream Infections
  - *Clostridium difficile*
  - Dialysis Events
- Healthcare Personnel Influenza Vaccination
- Methicillin-Resistant *Staphylococcus aureus*
- Surgical Site Infections
- Ventilator Associated Events

Hemolytic Uremic Syndrome

Hepatitis, Viral- Type A 💯
- Hepatitis, Viral- Type B: Acute
- Hepatitis, Viral- Type B: Perinatal (age ≤24 months), Pregnant Female (each pregnancy)
- Hepatitis, Viral- Type C: Acute

Q Fever 🍂
- Rabies: Animal, Human 🐶
- Ricin Poisoning 🎯
- Rubella 🍀
- St. Louis Encephalitis Virus Infection 🦇
- Salmonellosis: Typhoid Fever 🍳
- Salmonellosis: All other species 🍳
- Shiga toxin-producing *Escherichia coli* 🍳
- Shigellosis 🍳
- Smallpox 🕷
- Spotted Fever Rickettsiosis 🦇
- *Staphylococcus aureus*: Methicillin-Resistant Invasive Disease 💯

Regular Reporting:
- PH-1600 only in 1 week (all diseases for Regular Reporting)
- Phone immediately + PH-1600 in 1 week 📞
- Phone next business day to + PH-1600 in 1 week 📞
- Complete the PH-1600 online or fax to HAI Emerging Infections Program at (615) 741-3857 within 30 days. These conditions are reportable only for residents of Davidson County. For questions, email HAI.Health@tn.gov.
## Viral Hepatitis Overview

<table>
<thead>
<tr>
<th></th>
<th>Hepatitis A</th>
<th>Hepatitis B</th>
<th>Hepatitis C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U.S. Statistics (2014)</strong></td>
<td>2,500 new</td>
<td>19,200 new</td>
<td>30,500 new</td>
</tr>
<tr>
<td></td>
<td></td>
<td>~1.2 million chronic</td>
<td>~3.5 million chronic</td>
</tr>
<tr>
<td><strong>Transmission</strong></td>
<td>Fecal-oral</td>
<td>Blood / other body fluids</td>
<td>Blood / other body fluids</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Perinatal</td>
<td>• Needles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sexual</td>
<td>Less commonly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Needles</td>
<td>• Perinatal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Sexual</td>
</tr>
<tr>
<td><strong>Vaccine Preventable</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Chronic Infection</strong></td>
<td>No</td>
<td>Infants: &gt;90%</td>
<td>75–85%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-5 yo: 25-50%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;5 yo: 5-10%</td>
<td></td>
</tr>
<tr>
<td><strong>Severity</strong></td>
<td>Most recover w/o damage</td>
<td>If chronic, 15%–25% develop liver disease</td>
<td>If chronic, ~20% develop cirrhosis, 1%–5% will die from liver disease</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td>Supportive</td>
<td>Acute: Supportive</td>
<td>Acute: Supportive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chronic: Monitor +/- Antivirals (treat)</td>
<td>Chronic: Monitor +/- Antivirals (cure)</td>
</tr>
<tr>
<td><strong>Screening Recs</strong></td>
<td>N/A</td>
<td>-Pregnant women</td>
<td>-Birth cohort (1945-1965)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Exposed infants</td>
<td>-IDUs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Other HR individuals (known exposure, endemic areas, MSM, IDUs, HIV+, hemodialysis)</td>
<td>-Other HR individuals (known exposure, HIV+, MSM, hemodialysis, transfusion/transplant prior to 1992)</td>
</tr>
<tr>
<td><strong>In Brief</strong></td>
<td>Vaccinate</td>
<td>Screen Vaccinate (HAV)</td>
<td>Screen Vaccinate (HAV, HBV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitor or Treat</td>
<td>Evaluate for Treatment (cure)</td>
</tr>
</tbody>
</table>

[https://www.cdc.gov/hepatitis/resources/professionals/pdfs/abctable.pdf](https://www.cdc.gov/hepatitis/resources/professionals/pdfs/abctable.pdf)
# Reported Cases of Acute HBV in Tennessee

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>US</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>case rate*</td>
<td>1.1</td>
<td>0.9</td>
<td>0.9</td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td>cases</td>
<td>3,350</td>
<td>2,903</td>
<td>2,895</td>
<td>3,050</td>
<td>2,953</td>
</tr>
<tr>
<td><strong>TN</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>case rate*</td>
<td>2.4</td>
<td>3.0</td>
<td>3.7</td>
<td>4.0</td>
<td>3.5</td>
</tr>
<tr>
<td>cases</td>
<td>150</td>
<td>192</td>
<td>240</td>
<td>262</td>
<td>232</td>
</tr>
<tr>
<td>rank</td>
<td>4th</td>
<td>3rd</td>
<td>3rd</td>
<td>3rd</td>
<td>3rd</td>
</tr>
</tbody>
</table>

* per 100,000 population

# Hepatitis B, Acute

| Clinical Criteria | 1) S/sx’s ... plus...  
|                  | a) jaundice, or b) ALT > 100  
|                  | Note: S/sx's = fever, h/a, malaise, anorexia, n/v, diarrhea, abd pain  
|                  | 2) Alternatively, a negative HBsAg followed ≤ 6 mos by a positive HBeAg or HBV DNA (qual, quant, geno), regardless of clinical criteria  
| Lab Criteria     | HBsAg positive and HBc IgM positive  
| Hep B, Acute --  | Seroconversion, or  
| Confirmed        | Clinical and lab criteria (and not known to have chronic HBV)  

# Hepatitis B, Chronic

(Case Definition for Acute HBV not met...)

<table>
<thead>
<tr>
<th>Lab Criteria</th>
<th>HBc IgM negative, ... plus ... a positive HBsAg or HBeAg or HBV DNA</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Hep B, Chronic -- Confirmed</th>
<th>1) Chronic HBV lab criteria, or</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2) Alternatively, any combo of the following tests positive &gt; 2 times &gt; 6 mos apart: HBsAg or HBeAg or HBV DNA</td>
</tr>
</tbody>
</table>

| Hep B Chronic -- Probable | Single HBsAg or HBeAg or HBV DNA |

## Hepatitis B, Perinatal

<table>
<thead>
<tr>
<th>Clinical Criteria</th>
<th>Infant &gt;1-24 months born to an HBsAg-positive mother</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Criteria</td>
<td>HBsAg positive</td>
</tr>
<tr>
<td>Hep B, Perinatal -- Confirmed</td>
<td>HBsAg positivity in any infant aged &gt;1-24 months who was born in the United States or in U.S. territories to an HBsAg-positive mother</td>
</tr>
</tbody>
</table>
HBV Ag/Ab Detectable in Blood Following **Acute** Infection
HBV Ag/Ab Detectable in Blood Following Chronic Infection
<table>
<thead>
<tr>
<th>Condition</th>
<th>HBsAg</th>
<th>HBsAb</th>
<th>HBcAb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susceptible</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Chronic Infection</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td>Recovered from Past Infection and Immune</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Vaccinated</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Note: Active Infection (IgM anti-HBc can distinguish between acute and chronic)
### HBV Quick Reference Table

#### Hepatitis B

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ Symptomatic</td>
<td>□ Jaundice and/or ALT &gt;100</td>
<td>□ HBsAg (+)</td>
<td>□ IgM anti-HBc (+)</td>
</tr>
</tbody>
</table>

- **Acute, Confirmed:**
  - Seroconversion: (-) HBsAg within 6mos prior to a (+) HBsAg, HBeAg/HBV NAT; OR
  - All Boxes checked (I, II, III, and IV) OR
  - Boxes I, II, and III checked with unknown IgM anti-HBc

- **Acute, Probable:**
  - [Box I, and/or Box II], plus Box III checked with unknown IgM anti-HBc*; OR
  - Boxes III and IV checked

- **Chronic, Confirmed:**
  - (-) IgM anti-HBc and one (+) of the following: HBsAg, HBeAg, or HBV NAT; OR
  - (+) HBsAg, HBeAg, HBV NAT two times ≥ 6 months apart (any combo)

- **Chronic, Probable:**
  - One (+) of the following: HBsAg, HBeAg, or HBV NAT

*While a (-) IgM anti-HBc would make this “Chronic, Confirmed”, an absent IgM anti-HBc is not the same as a (-) IgM anti-HBc.*
HCV: Burden of Disease

- 3.5 Million Infected
  - **Seroprevalence**
    - Birth cohort represents ~75% cases (b: 1945-1965)
  - **New Infections**
    - Driven primarily by IDUs (<30 years old, white, male and female, non-urban)

![Graph showing rising number of new acute HCV cases related to injection drug use and HCV seroprevalence by year of birth. The graph indicates that seroprevalence is highest in the 1945-1965 cohort, with a 6X prevalence (3.4%) compared to others. 81% of HCV+ adults and 73% of deaths are in this cohort. There is a health disparity for blacks, AI/AN.](image-url)
Cirrhosis may take >20 years to develop but can be faster in the presence of immunodeficiency or alcohol use.

These statistics do not apply to HIV/HCV or HBV/HCV co-infected patients.

www.cdc.gov/hepatitis/HCV
# Reported Cases of Acute HCV in Tennessee

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>case rate</td>
<td>0.3</td>
<td>0.4</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>cases</td>
<td>850</td>
<td>1,229</td>
<td>1,778</td>
<td>2,138</td>
</tr>
<tr>
<td>TN</td>
<td>case rate</td>
<td>0.7</td>
<td>1.3</td>
<td>2.0</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>cases</td>
<td>46</td>
<td>83</td>
<td>129</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td>rank</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

* per 100,000 population


[Map of Tennessee with reported cases]
Modes of Transmission

- **Injection Drug Use**
  - ~ 50% people living with HCV in U.S. are associated w/ IDU

- **Healthcare-Associated**
  - 239 outbreak-associated cases reported to CDC 2008-2015

- **Perinatal**
  - HCV mono-infected mother: ~6% transmission risk

- **Sexual**
  - Low risk among discordant heterosexual couples
  - HIV (+) MSM 8x higher risk than HIV (-) MSM

- **Other**
  - Non-injection drug use, unregulated tattoos
Who Is At Risk For HCV?

• Hepatitis C is usually spread when blood from a person infected with HCV enters the body of someone who is not infected
  – It is 10 times more infectious than HIV
  – It can live outside of the body for up to 30 days

• HCV can be transmitted by:
  – contact with objects that have even small amounts of infected blood on them (syringes, snorting straws, medical equipment, personal items),
  – unsanitary piercing or tattooing equipment,
  – unprotected sex,
  – mother-to-child transmission
  – blood transfusion or organ transplant prior to 1992
  – hemodialysis
  – occupational exposure
Symptoms of early (or acute) viral hepatitis include:
- Fever, headache, malaise, anorexia, nausea, vomiting, diarrhea, and abdominal pain

Signs of early (or acute) viral hepatitis include:
- Yellowing of skin or eyes (jaundice) and/or,
- Elevated liver enzymes (ALT > 200)

Note: HCV has an incubation period of up to 6 months and >70% of acutely infected persons are asymptomatic
For persons who might have been exposed to HCV within the past 6 months, testing for HCV RNA or follow-up testing for HCV antibody is recommended. For persons who are immunocompromised, testing for HCV RNA may be considered.

To differentiate past, resolved HCV infection from biologic false positive for HCV Ab, testing with another HCV Ab assay may be considered. Repeat HCV RNA testing if the person testing is suspected to have had HCV exposure within the past 6 months or has clinical evidence of HCV disease, or if there is concern regarding the handling or storage of the test specimen.

Source: CDC. MMWR 2013;62(18)
## Hepatitis C, Acute

<table>
<thead>
<tr>
<th>Clinical Criteria</th>
<th>1) S/sx's ... plus... a) jaundice, or b) ALT &gt; 200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Note: S/sx's = fever, h/a, malaise, anorexia, n/v, diarrhea, abd pain</td>
</tr>
<tr>
<td>Lab Criteria</td>
<td>HCV Ab</td>
</tr>
<tr>
<td></td>
<td>HCV RNA (qual, quant, genotype)</td>
</tr>
<tr>
<td></td>
<td>HCV Ag</td>
</tr>
<tr>
<td>Hep C, Acute -- Confirmed</td>
<td>1) Clinical plus positive HCV RNA or HCV Ag, or</td>
</tr>
<tr>
<td></td>
<td>2) Documented negative HCV Ab, RNA, or Ag test followed by a positive (of any of these) ≤ 12 mos</td>
</tr>
<tr>
<td>Hep C, Acute -- Probable</td>
<td>Clinical criteria, plus positive HCV Ab (and absent or negative other HCV tests)</td>
</tr>
</tbody>
</table>

# Hepatitis C, Chronic

(Case Definition for Acute HCV not met...)

<table>
<thead>
<tr>
<th>Hep C, Chronic -- Confirmed</th>
<th>Positive HCV RNA or HCV Ag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hep C, Chronic -- Probable</td>
<td>Positive HCV Ab (and absent or negative other HCV tests)</td>
</tr>
</tbody>
</table>

## Hepatitis C Quick Reference Table

### Hepatitis C

<table>
<thead>
<tr>
<th>Symptom(s) plus either a) jaundice or b) ALT &gt;200 IU/L</th>
<th>No or unknown</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCV Ab(+) only</td>
<td>Chronic, Probable</td>
<td>Acute, Probable</td>
</tr>
<tr>
<td>HCV NAT(+) or HCV Ag(+)</td>
<td>Chronic, Confirmed</td>
<td>Acute, Confirmed</td>
</tr>
</tbody>
</table>

**Acute, Confirmed:**
- Seroconversion: (-) HCV Ab, HCV Ag, or HCV NAT followed by a (+) of any of these within 12 months
Intersection of Epidemics

Opioid Abuse

Hepatitis C  HIV
The Syndemic of HCV and Opioid Abuse
(≤ 30 year olds in 4 Appalachia States, MMWR, May 8, 2015)

FIGURE 1. Incidence of acute hepatitis C among persons aged ≤30 years, by urbanicity and year — Kentucky, Tennessee, Virginia, and West Virginia, 2006–2012

FIGURE 2. Percentage of all admissions to substance abuse treatment centers by persons aged 12–29 years (N = 217,789) attributed to the use of opioids, prescription opioids, and heroin, by year — Kentucky, Tennessee, Virginia, and West Virginia, 2006–2012

* Any opioids include heroin and prescription opioids.
HIV and HCV Coinfection

• According to the CDC, about 25% of HIV-infected persons in the US are also infected with HCV

• Among IDUs, the co-infection rate is estimated to be anywhere from 50-90%

• HIV/HCV co-infection causes liver damage to progress more rapidly in infected persons

http://www.cdc.gov/hepatitis/populations/hiv.htm
Scott County, Indiana
HIV/HCV Outbreak (NEJM, 2016)

Outbreak Detection & Response
1/16/15: 6 HIV cases in 6 days
1/22 – 2/10/15: AIDS Dir & State Epi informed
2/11/15: Emergency meeting
3/23/15: Epi AID team arrives
3/26/15: Exec Order, PH Emergency Declared (Governor)
4/4/15: SEP started
Establishment of Care Coordination Centers

Results (11/18/14 – 11/1/15))
181 HIV +
92% co-infected HCV
88% IDU
536 contacts
94% Care Coordination
74% Insurance
69% Engaged in Care
↓Wait time for inpatient detox (12 d)
Scott County: Lessons Learned

• The affected population demonstrated:
  – High levels if unemployment, poverty, IDU, and,
  – Low levels of education and medial insurance coverage

• Per CDC, the three approaches that turned around the HIV/HCV epidemic in Scott County were increased access to:
  – HIV and HCV testing,
  – HIV and HCV treatment, and
  – Syringe service programs
Vulnerability to Rapid Dissemination of HIV/HCV Infections Among Persons Who Inject Drugs: Ranked index using regression model coefficients

Newly Diagnosed HIV Cases

Acute HCV Cases

Note: County Data Unavailable for n=19 HCV Cases

Tennessee NBS, accessed February 10, 2017

Tennessee eHARS, internal source

Natural Breaks/Manual, 5 Classes
Strengthening Prevention & Treatment Along the Spectrum of TN’s HCV Continuum of “Cure”

U.S. HCV "Continuum of Cure"
(Holmberg et al, NEJM, 2013)

Engagement in HCV Care & Treatment

- Infected (3.2 mill)
- Detected (1.6 mill)
- Confirmed (750 K)
- Treated (360 K)
- Cured (200 K)

Surveillance & Education

Prevention

Testing

Navigation

Case Management

Prevention
Tennessee’s Next Steps: Building an HCV Continuum of “Cure”

• **Prevention**
  – Community and Provider Education (Screening, Evaluation, Treatment)
  – HBV Vaccination Program
  – Syringe Exchange, Opioid Substitution Therapy, PrEP

• **Surveillance/Outbreak Investigation**
  – Build Capacity – Planning, Detection, Response
  – Augment HCV Reporting (All HCV labs – acute and chronic)
  – Build HCV “Continuum of Cure” and “Data-to-Care” models

• **Testing**
  – TDH Lab Capacity: HCV Testing and Lab-Based Surveillance (GHOST)
  – Community Partners: Education Regarding HCV Testing Recommendations

• **Linkage to Care**
  – Prevention and Treatment Services

• **Partnerships/Pilots**
  – MHSA, PDO, Corrections, Law Enforcement, Community and Academic Partners
  – HCV Treatment, Medication Assisted Therapy, SSPs
HBV Vaccination Program

- 19 Jails in eastern TN (NER, ETR, UCR, Knox)
- Viral Hepatitis education and HBV vaccination
- September 2012-May 2016
  - 15,493 doses administered
    - 1\textsuperscript{st} dose (56%), 2\textsuperscript{nd} dose (27%), 3\textsuperscript{rd} dose (17%)
    - Recipients
      - Male (71%), ≥ 25 years old (86%), Non-Hispanic White (90%)
- From 2012-2015, rates of acute HBV rose more slowly in the participating regions (7%) then rest of the state (29%)
- Need more vaccine to provide to all persons at increased risk of HBV
Increasing HCV Surveillance

- Simplify and streamline existing efforts
- Continue field investigations of all suspected acute HCV by regional staff
- Establish reporting for chronic HCV labs by Central Office
  - Associate “orphan” laboratory reports (ELR) with cases in NBS
  - Data entry of paper laboratory reports
    - Notify regional staff of any cases suspected of acute HCV
## Surveillance for Chronic HCV, Tennessee

<table>
<thead>
<tr>
<th>Case Classification</th>
<th>2013</th>
<th>2014</th>
<th>2015*</th>
<th>2016**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirmed</td>
<td>1,782</td>
<td>3,385</td>
<td>7,394</td>
<td>10,442</td>
</tr>
<tr>
<td></td>
<td>(44%)</td>
<td>(50%)</td>
<td>(59%)</td>
<td>(50%)</td>
</tr>
<tr>
<td>Probable</td>
<td>2,234</td>
<td>3,421</td>
<td>5,244</td>
<td>10,496</td>
</tr>
<tr>
<td>Total (C + P)</td>
<td>4,016</td>
<td>6,806</td>
<td>12,638</td>
<td>20,938</td>
</tr>
</tbody>
</table>

*Central office chronic HCV surveillance efforts augmented beginning 7/1/15
**Provisional Data
Outbreak Planning, Detection, and Response

- Shift our thinking to outbreak detection
- Plan, prepare, and have early detection since we are vulnerable
- Increase surveillance and testing activities (including groups with currently low rates of HIV)
Outbreak Planning – Tools

- Outbreak Response Plan
- Questionnaire
- Just in Time Training
- Research Electronic Data Capture (REDCap Database)
HCV Testing

• Rapid testing (antibody only, finger stick, 20 minutes)
  – Community-based organizations
  – Coupled with HIV testing

• Blood-based (antibody reflex to RNA, venipuncture, 1-2 weeks)
  – Health Department Pilot (June-October 2016)

• Health Department Roll-Out (April 1, 2017)
  – Statewide
  – Record Risk Factor(s) – PTBMIS supplemental screen
  – Clinics – Primary Care, STD, FP, others...
HCV Community Based Organizations (CBO) Testing Project

- Rapid antibody test kits are provided to those CBO’s serving at-risk populations
  - History of IDU or intranasal drugs
  - Known to be HIV (+)
  - Born 1945-1965
  - Sexual partner known to be HCV (+)
  - History of non-regulated tattoo or piercing
  - Any other risk factors

- Reporting Requirements
  - Monthly report (all tests conducted)
  - Line-item report (HCV Ab + individuals only)
HCV Community Based Organizations (CBO) Testing Project

• CBO’s currently partnering with TDH to perform rapid testing:
  – Children Family Services
  – Columbia Cares
  – Free Medical Clinic
  – Hope for Tennessee
  – Positively Living
  – Samaritan Ministry

• Expansion is being considered to include other facilities serving at-risk clients (jails, MAT providers, SA treatment centers, recovery courts)

• HCV Rapid Testing Coordinator: Shannon.Depont@tn.gov
CBO HCV Testing: Monthly Report (All Tests Conducted)

<table>
<thead>
<tr>
<th></th>
<th>Total # of Tests Done</th>
<th># POSITIVE</th>
<th>Seropositivity Rate</th>
<th># Male</th>
<th># Female</th>
<th># Transpdrag</th>
<th># Hispanic</th>
<th># Non-Hispanic</th>
<th># Black</th>
<th># White</th>
<th># American</th>
<th># Native</th>
<th># AHA Indian</th>
<th># Other</th>
<th># Unknown</th>
<th># Born 1945-1965</th>
<th># Hx of Injection drug</th>
<th># Hx of Intranasal drug</th>
<th># Hx of Injections in arm</th>
<th># Incarcerated &gt;24 hrs</th>
<th>HIV (+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-17</td>
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<td>Mar-17</td>
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</tr>
</tbody>
</table>
CBO HCV Ab Testing Form
Tennessee Department of Health

INSTRUCTIONS: Fax for Positives Only:
This form is to be completed by Community Based Organization’s (CBO’s) for all individuals tested using TDH-supplied rapid HCV test kits. For individuals testing positive: Completed forms must be submitted within one week of test date via secure fax or email to Shannon De Pont in the Viral Hepatitis Program. Shannon De Pont, phone: 615-532-8518, fax: 615-741-3091, email: shannon.depont@tn.gov

AGENCY INFORMATION:
Agency Name: ____________________________
Agency Phone Number: (___)________________________
Name of Person Conducting Testing: ____________________________

PATIENT INFORMATION:
HCV Antibody collection date (MM/DD/YY): ___/___/____
Patient Name: ____________________________________________
Patient Address: ____________________________________________
City: ___________________ Zip code: _______ Phone: (___)_______
State: _______DOB (MM/DD/YY): ___/___/___
Gender: □ Female □ Male □ Other: ____________________________
Ethnicity: □ Hispanic □ Non-Hispanic □ Other/Unknown
Race: □ Black/African American □ American Indian/Alaska Native □ Asian □ Native Hawaiian/Pacific Islander □ White
Has the patient been previously tested for HCV? □ Yes □ No
□ IF YES, what was the result? □ Positive □ Negative □ Unknown
Has the patient been vaccinated for HAV? □ Yes □ No
□ IF YES, did they complete the 2-dose series? □ Yes □ No
Has the patient been vaccinated for HBV? □ Yes □ No
□ IF YES, did they complete the 3-dose series? □ Yes □ No

HCV TESTING SETTING:
Facility Name: ____________________________________________
Type of Facility: (Check all that apply)
□ Correctional Facility □ Substance Abuse Treatment Facility □ Agency Walk-In □ Other, specify: ____________________________

REASON FOR TESTING: (Check all that apply)
□ Born from 1945 through 1965 □ History of incarceration > 24 hours □ Other, specify: ____________________________
□ History of injection drug use (ever) □ HIV positive
□ History of illicit intranasal drug use (ever) □ History of STD or multiple sex partners
□ History of tattoo or body piercing □ Sexual contact with HCV positive individual □ No Identified Risks

HCV TESTING RESULTS / LINKAGE TO CARE:
HCV Ab test result: □ Positive □ Negative
Patient informed of HCV Ab result? □ Yes □ No
# HCV Community Based Organizations (CBO) Testing Project

<table>
<thead>
<tr>
<th>Hepatitis C (HCV) Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agency Information:</strong></td>
</tr>
<tr>
<td>Agency Name:</td>
</tr>
<tr>
<td>Agency Phone Number:</td>
</tr>
<tr>
<td>Today's Date (MM/DD/YY):</td>
</tr>
<tr>
<td>Form Completed By:</td>
</tr>
</tbody>
</table>

| **Patient Demographics:**     |
| Last Name:                    |
| First Name:                   |
| DOB (MM/DD/YYYY):             |

- **Hepatitis C Antibody Negative:**
  - Today's HCV Antibody test indicates that you most likely have not been infected with the Hepatitis C Virus
  - Today's test may not have detected an infection if you have been exposed to HCV within the last 6 months
  - If you have been exposed in the past 6 months, we recommend you retest in at least 6 months

- **Hepatitis C Antibody Positive:**
  - Today's HCV Antibody test indicates that you have been exposed to HCV in the past and that you may be currently infected
  - Assume you can infect others until you have additional tests
  - It is important that you see a doctor to conduct additional testing to determine if you are currently infected with HCV
  - If you are currently infected with HCV, it is important that you see a doctor to:
    - Learn how to protect your liver from further damage
    - Learn how you can prevent spreading HCV to others
    - Obtain advice regarding HCV treatment
    - Obtain additional testing including the state of liver disease

<table>
<thead>
<tr>
<th><strong>Hepatitis C Prevention Tips:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not share equipment used to prepare, inject, or snort drugs including syringes, needles, water, cotton, and straws</td>
</tr>
<tr>
<td>Do not share personal hygiene items such as razors, toothbrushes, nail clippers, or piercing jewelry</td>
</tr>
<tr>
<td>Make sure tattoo and piercing is conducted by a licensed artist/shop</td>
</tr>
<tr>
<td>Use condoms consistently</td>
</tr>
<tr>
<td>Use contraception to reduce the risk of unintended pregnancy and/or mother-to-child transmission</td>
</tr>
<tr>
<td>Seek additional services as needed (drug treatment, HIV treatment, HCV treatment, STD screening, Hepatitis A and B vaccinations, family planning)</td>
</tr>
</tbody>
</table>
## CBO Testing: Results (TDH, 2016)

<table>
<thead>
<tr>
<th>Site (HIV Prevention Partners)</th>
<th>Tests Conducted</th>
<th>Antibody Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>East TN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 CBOs</td>
<td>958</td>
<td>350 (36.5%)</td>
</tr>
<tr>
<td>Middle TN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 CBO</td>
<td>773</td>
<td>310 (40.1%)</td>
</tr>
<tr>
<td>West TN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 CBOs</td>
<td>429</td>
<td>63 (14.7%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2,160</td>
<td>723 (33.5%)</td>
</tr>
</tbody>
</table>
During June 1–October 31, 2016:

- 4,753 Patients were tested for HCV
HCV Testing: HD Pilot Results

- 4,753 persons tested for HCV
  - 8.4% Ab positive
    - 74.1% RNA positive

- Risk Factors among population tested
  - ~10% IDU
  - ~20% intranasal drug user
  - ~25% incarceration

- Females 11-50 yo represented 58% of persons tested
  - 6.3% Ab (+)
    - 5 were pregnant at the time of testing
HCV Testing: TDH Recommendations

One time test for all patients that are:

• Born from 1945 to 1965
• Identified as high risk
• Seeking evaluation and/or treatment for STIs
• Requesting HCV testing or counseling

Persons with ongoing risk for HCV infection may have repeat screening at intervals of ≥ 12 months, including:

• Injection drug use (even once)
• Illicit intranasal drug use (even once)
• History of incarceration over 24 hours
• Receipt of an unregulated tattoos
• High-risk sexual behaviors (multiple sex partners, unprotected sex or sex with an HCV-infected person or an injection drug user)
HCV Testing: TDH Resources

• Protocols/Training Manuals
  – HCV Testing Nursing Protocol
    • Specimen Collection, Transport, Results
  – HCV Testing Training Manual
  – Viral Hepatitis Navigator Training Manual
## HCV Testing: Interpreting Results

<table>
<thead>
<tr>
<th>Test Outcome</th>
<th>Interpretation</th>
<th>Further Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflex testing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCV Ab negative</td>
<td>No HCV antibody detected; client likely not infected with HCV.</td>
<td>If recent exposure suspected, consider testing for HCV RNA or repeating HCV Ab testing after 12 months; counsel regarding risk reduction measures.</td>
</tr>
<tr>
<td>HCV Ab positive, HCV RNA not detected</td>
<td>Results are consistent with past HCV infection; there is no evidence of current HCV infection.</td>
<td>Provide counseling, including prevention measures to avoid re-infection.</td>
</tr>
<tr>
<td>HCV Ab positive, HCV RNA detected</td>
<td>Results consistent with current HCV infection.</td>
<td>Provide counseling and link to care and treatment.</td>
</tr>
</tbody>
</table>

### Antibody-only testing (rapid testing)

<table>
<thead>
<tr>
<th>Test Outcome</th>
<th>Interpretation</th>
<th>Further Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCV Ab negative</td>
<td>No HCV antibody detected; client likely not infected with HCV.</td>
<td>If recent exposure suspected, consider testing for HCV RNA or repeating HCV Ab testing after 6-12 months; counsel regarding risk reduction measures.</td>
</tr>
<tr>
<td>HCV Ab positive</td>
<td>Presumptive HCV infection; a reactive result is consistent with current or past HCV infection</td>
<td>Test for HCV RNA to confirm current versus past infection.</td>
</tr>
</tbody>
</table>
• Risk Reduction Messaging (shared with all clients while having specimen drawn)

  – Do not share any needles or other equipment to inject or snort drugs

  – Do not share any other items that may come in contact with another person’s blood (medical equipment, razors, toothbrushes, or other personal items)

  – Use condoms consistently during all sexual activity

  – Avoid unregulated tattoos
**Post-Test Counseling: Ab -**

- If HCV Ab negative, the client is most likely not currently infected with HCV
  
  - Assess for ongoing risk and provide risk reduction counseling
  
  - For persons who might have been exposed to HCV within the past 6 months, testing for HCV RNA or follow-up testing for HCV antibody is recommended
    
    - HCV infection can be detected by HCV Ab screening tests 4-10 weeks after infection
    - HCV Ab can be detected in >97% of persons by 6 months of exposure
    - TDH recommends screening no more than every 12 months
Post-Test Counseling: Ab +, RNA -

- If HCV Ab positive and RNA negative, the client has evidence of past HCV infection
  - The client has cleared the infection (either naturally or via treatment) and is not currently infected
    - Once exposed to the virus a person will always have a positive result for HCV Ab
    - Having HCV Ab do NOT protect individuals from reinfection
  - Assess for ongoing risk and provide risk reduction counseling to prevent transmission
Post-Test Counseling: Ab +, RNA Unknown

- If HCV Ab positive and RNA results not available, the client has either past or present HCV infection
  - The client needs a confirmatory test (HCV RNA)
  - If tested through local health department, TDH state lab will automatically reflex to RNA test
  - If tested outside of health department and referred to health department, HCV Ab will be conducted first (and, if positive, reflexed to RNA)
Post-Test Counseling: Ab +, RNA +

- If HCV Ab positive and RNA positive, the client has evidence of current HCV infection
  - The client has the virus in the blood and needs HCV evaluation and treatment
  - Counsel regarding meaning of test results, prevention, transmission, natural disease, progression, and importance of follow-up care (cure > 90% with treatment)
  - Report all HCV-confirmed cases to VH Case Navigator for linkage to care
Risk Reduction Counseling for HCV Confirmed Individuals (RNA +)

• Transmission Prevention
  – Reiterate Pre-test counseling and,
  – Preconception counseling and/or contraception to reduce the risk of unintended pregnancy and/or mother-to-child transmission

• Health Education/Liver Health
  – Discuss disease progression
  – Assess for, and if needed, recommend HAV and HBV vaccinations
  – Avoid alcohol
  – See a doctor regularly and consult a health professional before taking any prescription or over-the-counter medications
  – Join a support group to learn more about the disease and how to best take care of yourself
  – Refrain from donating blood, organs, tissues, or semen
Regional responsibilities re: Viral Hepatitis

- ALL regions
  - Field investigation and contact investigation for:
    - Perinatal HBV
    - Acute HAV, acute HBV, acute HCV

- Additionally, for regions with VH Navigators
  - Provide referral to care for HCV (+) individuals identified via
    - HD testing
    - Acute HCV Case investigations
    - PWID, regardless of HCV test result
  - Develop tools/skills to promote referral (and linkage to care)
    - Regional Provider Directories (HCV, HIV, SA, MH, HIV)
    - Database to track referrals
  - Implementation models may vary from region to region
    - 4/11/17: Brainstorm session to determine region-specific models
HCV Treatment: Key Terms

- Acute HCV Infection
  - Early Infection (first 12 months)
  - Chronic HCV Infection
    - Long-term infection (75-85% of acutely infected individuals develop)
- Fibrosis
  - Scarring of the liver (F0-F4)
- Cirrhosis
  - Advanced scarring of the liver (20% chronically infected individuals) = F4
    - Compensated vs. decompensated
- Hepatocellular Carcinoma
  - Liver cancer developed by ~20% of individuals with cirrhosis = F4
- Genotype (1-6)
  - US = 70% (GT 1a and 1b), 15% (GT 2), 10% (GT 3)
- Sustained Virologic Response (SVR)
  - Undetectable HCV viral load 12 weeks after completing treatment
- American Association for the Study of Liver Disease (AASLD)
  - Guidelines for treatment of HCV (updated regularly)
Global Distribution and Prevalence of HCV Genotypes

HCV genotype proportion

- 1
- 2
- 3
- 4
- 5
- 6

GBD region
- North Africa and Middle East
- Western sub-Saharan Africa
- Eastern sub-Saharan Africa
- Central sub-Saharan Africa
- Southern sub-Saharan Africa
- Southern Latin America
- Andean Latin America
- Tropical Latin America
- Central Latin America
- Caribbean
- Central Asia
- South Asia
- East Asia
- Southeast Asia
- High-income Asia Pacific
- Oceania
- Australasia
- High-income North America
- Western Europe
- Central Europe
- Eastern Europe

- 55.5 million
- 14 million
- 3.9 million
- 1.7 million
- 486,000
HCV Treatment

• Why?

• Why Now/When?

• How?
HCV in the US

Estimates range from **3.2-5.2 million cases in the USA**
Why Should We Treat HCV Monoinfection?

- All-cause mortality
  - Without SVR
  - With SVR
  - Time, y
  - No. at risk
    - Without SVR: 192, 181, 168, 162, 155, 144, 125, 88, 56, 40, 28
    - With SVR: 192, 181, 168, 162, 155, 144, 125, 88, 56, 40, 28
  - P < 0.001

- Liver-related mortality or liver transplantation
  - Without SVR
  - With SVR
  - Time, y
  - No. at risk
    - With SVR: 392, 380, 358, 334, 305, 277, 229, 187, 146, 119
  - P < 0.001

- Hepatocellular carcinoma
  - Without SVR
  - With SVR
  - Time, y
  - No. at risk
    - Without SVR: 405, 390, 375, 349, 326, 294, 269, 229, 191, 151, 122
    - With SVR: 384, 361, 337, 314, 288, 259, 216, 184, 143, 113
  - P < 0.001

- Liver failure
  - Without SVR
  - With SVR
  - Time, y
  - No. at risk
    - Without SVR: 405, 384, 361, 337, 314, 288, 259, 216, 184, 143, 113
    - With SVR: 192, 180, 166, 160, 152, 141, 123, 88, 56, 40, 28
  - P < 0.001

Van der Meer AJ et al. JAMA 2012.
Slide Credit: Dr. Cody Chastain
Why?

Why Now/When?

How?
Rising Mortality Associated with HCV in the US
Ly et al, CID 2016
A Short History of HCV Therapy


- HCV Discovered (Chiron)
- HCV Antibody Testing
- Ribavirin added
- PEG interferon + RBV trials
- Genotype–specific RGT
- Telaprevir Boceprevir Approval
- Simeprevir Sofosbuvir Approval

SVR:
- 1989: 6%
- 1992: 12%
- 1996: 20%
- 2000: 40%
- 2005: 54%
- 2011: 70%
- 2014: 90%

%
New Fixed Dose Sofosbuvir and Velpatasvir
(June 28, 2016)

Sofosbuvir and Velpatasvir for HCV Genotype 1, 2, 4, 5, and 6 Infection

J.J. Feld, I.M. Jacobson, C. Hézode, T. Asselah, P.J. Ruane, N. Gruener, A. Abergel,
A. Mangia, C.-L. Lai, H.L.Y. Chan, F. Mazzotta, C. Moreno, E. Yoshida,
S.D. Shafran, W.J. Towner, T.T. Tran, J. McNally, A. Osinusi, E. Svarovskaia,
Y. Zhu, D.M. Brainard, J.G. McHutchison, K. Agarwal, and S. Zeuzem,
for the ASTRAL-1 Investigators*

Sofosbuvir and Velpatasvir for HCV Genotype 2 and 3 Infection

G.R. Foster, N. Afzhal, S.K. Roberts, N. Bräu, E.J. Gane, S. Pianko, E. Lawitz,
A. Thompson, M.L. Shiffman, C. Cooper, W.J. Towner, B. Conway, P. Ruane,
M. Bourlière, T. Asselah, T. Berg, S. Zeuzem, W. Rosenberg, K. Agarwal,
C.A.M. Stedman, H. Mo, H. Dvory-Sobol, L. Han, J. Wang, J. McNally, A. Osinusi,
D.M. Brainard, J.G. McHutchison, F. Mazzotta, T.T. Tran, S.C. Gordon, K. Patel,
N. Reau, A. Mangia, and M. Sulkowski, for the ASTRAL-2 and ASTRAL-3 Investigators*
Simple and Well-Tolerated

- Minimal Side Effects
- High-Efficacy (>90% cure rates)
- Oral Only Regimens
- 12 Weeks (8-24)
Only just the beginning of the end of hepatitis C

...heralding an era where all patients can be cured, even debating whether eradication is possible.

The main drawback ... is the huge price tag, which will make treatment out of reach for people in the developed and developing world...
HCV Treatment

• Why?

• Why Now/When?

• How?
Training Resources for HCV Treaters

- **Full Day HCV Provider Trainings**
  - Middle TN (Nashville, MCRO): 02/23/17
  - West TN (Memphis, St. Jude): 02/24/17
  - East TN (Knoxville, KCHD): 03/02/17

- **Toolkits**
  - Provider (visit-by-visit)
  - Medication Access (PAPs, PAs, Appeals)

- **Pre-Treatment Algorithms** (including associated costs)
  - Insured, under-insured, un-insured

- **Online Resources**
  - AASLD/IDSA HCV Recommendations
    - [http://www.hcvguidelines.org](http://www.hcvguidelines.org)
  - Hepatitis C Online
    - [http://www.hepatitisc.uw.edu/](http://www.hepatitisc.uw.edu/)

- **Coming...**
  - HCV Providers Case Conferences
  - On-Site Mentoring (Provider and Case Management)
HCV is a widespread, serious, curable communicable disease

70% of acute infections are associated with IDU

Rates of acute HCV are on the rise, predominately among young (<30 years of age), white, men and women living in rural areas

Tennessee has 41 counties at high risk for an HIV/HCV outbreak

HCV testing is indicated for baby boomers and anyone with risk factors

Highly effective HCV treatment is available (most regimens are oral only 12-week regimens with minimal side effects)

HCV treatment is prohibitively expensive

A pan-genotypic HCV treatment regimen (sofosbuvir/velpatasvir) has been available since June 2016 (with more coming down the pipeline)
Viral Hepatitis: TDH Contacts

Programmatic
• Carolyn Wester
  – Carolyn.wester@tn.gov, 615-532-8516
• Lindsey Sizemore
  – Lindsey.sizemore@tn.gov, 615-770-6928

Prevention
• Cathy Goff
  – Catherine.goff@tn.gov, 865-549-5290

Clinical Services
• Kim Gill
  – Kimberly.gill@tn.gov, 615-253-7304

Non-Perinatal Hepatitis B, Hepatitis C, Hepatitis D, and Hepatitis E
• Michael Rickles
  – Michael.rickles@tn.gov, 615-253-0679
• Shannon DePont
  – Shannon.depont@tn.gov, 615-532-8518

Perinatal Hepatitis B, HBV Positive Pregnant Females
• Janice Johnson
  – M.janice.johnson@tn.gov, 615-253-1359

Hepatitis A
• Robb Garman
  – Robb.garman@tn.gov, 615-532-8507
Acknowledgements/Resources

- TDH Viral Hepatitis Team
- TDH HIV Surveillance
- Dr. Cody Chastain, Vanderbilt University
- http://www.hcvonline.org
- http://www.clinicaloptions.com
- http://hcvguidelines.org