Sensitivity of Death Certificates For Hepatitis B & C Related Mortality, Philadelphia

Eman Addish, MPH
Viral Hepatitis Senior Epidemiologist
Viral Hepatitis (VH) Elimination

• Goals:
  - World Health Organization (2016): 65% reduction in global mortality due to hepatitis B virus (HBV) & hepatitis C virus (HCV) by 2030
  - Centers for Disease Control & Prevention (CDC) (2017): ≥20% reduction in national mortality due to HBV & HCV by 2025

• Need data source to quantify deaths due to VH:
  - Death certificate data is a readily available

Methods- Study Goals

Determine the utility of using death certificates as a data source for measuring critical elimination goal progress

1. Measure sensitivity/completeness of HBV, HCV, or viral hepatitis listed as a COD/contributing COD

2. Identify deaths related to VH where VH is *not* listed as COD
   • Consider potential proxy for a VH-related death
Methods - Data

• Vitals data: Death of Philadelphia residents via electronic death certificate (DC)
  • 1/1/2015 – 10/31/2021

• Viral Hepatitis data: HBV & HCV cases reported to Philadelphia Department of Public Health’s Viral Hepatitis Registry
  • Past or present infection at death
  • 1/1/2015 – 12/31/2020
Methods - Analysis

• Matched DC and Viral Hepatitis Registries on name & DOB

• Sensitivity measured for:
  1. DC indicated VH as a COD/contributing COD
  2. CODs likely caused by viral hepatitis (i.e. liver disease (non-alcoholic) & hepatocellular carcinoma (HCC))

• Created new VH death estimate

• Assessed associations with various factors on DC (including Demographic & social factors, time from viral hepatitis event to death, & DC signee)
  • Chi-Square, Fisher’s exact, & t-test analysis used, where appropriate
  • Logistic regression to account for significant covariate relationships

Results: Sensitivity of DCs to Identify VH-related Death

- 57,357 HCV & or HBV infections
- 103,592 deaths in Philadelphia
- 10,216 (18%) matches
  - 1,458 (14%) COD/contributing COD VH or proxy
  - 452 (31%) COD/contributing COD VH
  - 1,006 (69%) COD/contributing COD proxy

Sensitivity: \[
\frac{452}{452 + 1,006} \times 100 = 31\%
\]

Note: VH= hepatitis B, hepatitis C, or viral hepatitis
proxy= non-alcoholic liver disease or HCC

8.1 years (SD=5.4) VH report to death
8 years (SD=5.3) VH report to death

8,758 (86%) COD/contributing COD overdose, kidney or cardiovascular disease, non-liver cancer, COVID-19, etc.
Results: Source & Mortality Estimate

DC COD: Liver Disease/HCC: 3,081
DC COD: Viral Hepatitis: 492

VH Registry: 55,899

1,006

% of deaths due to VH identified:

- DC COD is VH: 48%
- DC & VH Registry matched: 75%

Total VH related mortality: 1,950

65%³ of HCC caused by VH → 593 additional individuals may be attributable to VH as well

Results: Demographics of Decedents Who Had Hepatitis B/C

* Significant at a p-value of ≤0.05
Results: DC-Sourced Factors & Hepatitis B/C Status

- **Significant at a p-value of ≤0.05**

### Education Level
- Middle/High school but no high school diploma: 29% (VDH), 56% (VHB/C)
- High school diploma/GED: 29% (VDH), 56% (VHB/C)
- Some college/no diploma: 10% (VDH), 8% (VHB/C)
- College degree: 20% (VDH), 19% (VHB/C)

### Marriage Status at Death
- Divorced: 30% (VDH), 39% (VHB/C)
- Married: 30% (VDH), 38% (VHB/C)
- Never married: 11% (VDH), 13% (VHB/C)
- Widowed: 92% (VDH), 95% (VHB/C)

### Signee of Death Certificate
- Medical professional: 92% (VDH), 95% (VHB/C)
- Medical examiner: 8% (VDH), 5% (VHB/C)
- Other: <1%

*Significant at a p-value of ≤0.05*
## Results: aOR for COD/Contributing COD Listing Viral Hepatitis

<table>
<thead>
<tr>
<th>Age group at death (years)</th>
<th>aOR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-35</td>
<td>1.7</td>
<td>(0.28-10.45)</td>
</tr>
<tr>
<td>36-49</td>
<td>2.34</td>
<td>(1.32-4.15)</td>
</tr>
<tr>
<td>50-64</td>
<td>1.29</td>
<td>(1.01-1.64)</td>
</tr>
<tr>
<td>65+</td>
<td>ref</td>
<td>ref</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>aOR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>0.48</td>
<td>(0.18-1.27)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1.03</td>
<td>(0.69-1.54)</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>1.11</td>
<td>(0.86-1.44)</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td>Non-Hispanic Other</td>
<td>3.74</td>
<td>(1.30-10.81)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Death certificate signee</th>
<th>aOR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical professional</td>
<td>0.59</td>
<td>(0.37-0.95)</td>
</tr>
<tr>
<td>Medical examiner</td>
<td>ref</td>
<td>ref</td>
</tr>
<tr>
<td>Other</td>
<td>0.26</td>
<td>(0.03-2.38)</td>
</tr>
</tbody>
</table>

Having Viral hepatitis listed as a COD/ contributing COD:

- 2.34 increased odds among decedents aged 36-49 years
- 1.29 increased odds among decedents aged 50-64 years
- 41% decreased odds among records that had a medical professional as the signee
Limitations

• Not able to calculate PPV since decedents that were not in our VH Registry could not be used in this analysis

• Not everyone with Viral Hepatitis is diagnosed

• Further analysis will need to be done to validate the proxy of using non-alcoholic liver disease & HCC
Conclusions

• In Philadelphia, death certificates data is an incomplete source for viral hepatitis-related mortality due to low sensitivity of HBV & HCV reporting.

• Jurisdictions should validate any data sources used to assess metrics around death for elimination activities.

• Explore updating standardized protocols for medical professionals to improve reporting of viral hepatitis in cases of liver-related death.

• Use of a match with VH registries & a proxy for CODs such as liver cancer & liver disease should be considered to understand mortality impacts for viral hepatitis.
Thank you!

Acknowledgments:
Danica Kuncio, MPH
Kelly Gillespie, MPH

Contact the PDPH’s Viral Hepatitis Program
Viral Hepatitis Program Epidemiologist: Eman Addish | Eman.Addish@phila.gov