Community Viral Load (CVL): A Novel Marker to Measure Progress in HIV Prevention

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Objectives

• Define Community Viral Load (CVL) and approaches to measuring it

• Highlight challenges and limitations in the use of CVL

• Provide examples of how CVL can be used to identify health disparities and inform HIV treatment and prevention efforts
What is the Viral Load?

• The viral load is a measure of the amount of virus circulating in the blood of an HIV infected person
  – HIV RNA
  – Measured in copies/ml
• VL is routinely monitored by HIV care providers
• Goal is to get it to “undetectable” level which improves person’s health and reduces risk of transmission to almost zero
What is Community Viral Load?

• A population-based measure of the concentration of viral load in HIV-infected individuals
• Represents the level of viremia in a community in a geographic area
• Community viral load (CVL) is a potential biomarker for HIV transmission and quality of HIV care and treatment

Source: CDC CVL Guidance Document
What is the Importance of Community Viral Load?

• By measuring CVL, can assess progress in treatment and therefore reductions in a community's level of viremia

• Declining CVL should be associated with a reduction in new HIV infections (“incident cases”)

Source: CDC CVL Guidance Document
Evidence in Support of CVL

Viral load (HIV-1 RNA copies/ml) and HIV transmission

VL chief predictor of transmission (Quinn et al. NEJM 2000)

96% reduction in transmission if treat partner early in infection

Modeling of Test and Treat

Routine testing, linkage to care and ART initiation will result in 99% reduction in infectiousness (Granich et al, Lancet 2009)
Two Main CVL Measures

• Total CVL
  – Sum of all viral loads of people living with HIV in a particular community
  – Measures population’s potential infectiousness

• Mean or median CVL
  – Sum of all viral loads of people living with HIV in a particular community divided by the total number of people
  – Measure of average viral burden in the population
Things to Consider when Measuring CVL

- How define your “community”
  - Monitored
  - Population
  - In-care
- Which viral load measure to use
  - Most recent vs. average of all viral loads
  - Depends on time period looking at
- How to deal with missing data
  - Assume high VL among people with missing data
  - Ignore missing data
- Assume reflective of sexual behaviors or other HIV transmission risks in the community
Conceptual Framework for Measuring CVL

Source: CDC CVL Guidance Document
Examples of populations with the same HIV prevalence and CVL but different potential for ongoing HIV transmission
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Examples of Cities Using CVL

• Studies have supported CVL as a means of measuring HIV incidence:
  – Vancouver (Montaner) - direct relationship between viral RNA concentration and HIV incidence among IDUs
  – British Columbia (Wood) - increased ART coverage resulted in decreased VL and decrease in number of new HIV diagnoses
  – San Francisco (Das) - direct association between mean CVL and HIV incidence - 23,348 copies/ml
  – New York City (Laraque/Terzian) - variations between CVL and individual and neighborhood characteristics - 20,318 copies/ml
Measuring CVL in Washington, DC to Identify Health Disparities
Prevalence of HIV in Washington, DC, 2012

- 16,072 people living with HIV in DC
- 4,330 new HIV cases reported between 2008 and 2012
- 2.5% of the District’s population diagnosed with HIV
- ½ to 1/3 of people may be unaware of their HIV status

Source: DC Dept. of Health, 2014 Annual Epidemiology and Surveillance Report
Measuring CVL in Washington, DC

- Used public health surveillance data from 2004-2008
- Used current addresses of HIV+ persons
- Looked at completeness of VL data (indicator or not being in care)
- Measured the mean and total CVL
- Mapped the mean CVL along with selected indicators of SES by geopolitical designation (Ward) and census tract
## Results: Disparities in Mean CVL, Total CVL and Undetectable VL

<table>
<thead>
<tr>
<th></th>
<th>Missing VL</th>
<th>Mean CVL</th>
<th>Total CVL</th>
<th>Detectable VL (≥400 copies/ml)</th>
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</thead>
<tbody>
<tr>
<td><strong>Total (N=15,467)</strong></td>
<td>52%</td>
<td>33,847</td>
<td>158,541,289</td>
<td>43%</td>
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<tr>
<td><strong>Women</strong></td>
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<td><strong>Blacks</strong></td>
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<td><strong>Hispanics</strong></td>
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<td><strong>20-29 yr olds</strong></td>
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<td><strong>Heterosexuals</strong></td>
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<td><strong>IDUs</strong></td>
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<td><strong>Uninsured</strong></td>
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Decreases in mean CVL were not significantly associated with the number of newly diagnosed HIV/AIDS cases after controlling for time, late testers and ward. (p=0.11)
Areas with the higher mean and total CVLs appear to correspond to those areas with the worst SES indicators.
Other Examples of How is CVL Being Used Currently

• To monitor prevention activities
• To assess the impact of care and treatment programs
• To identify “hot spots” and populations at risk for HIV infection
• To identify disparities and target resources
• To measure progress in achieving the goals of the National HIV/AIDS Strategy
• To measure the impact of large community based HIV testing studies (e.g., Test and Treat and Testing and Linkage to Care Plus Study)
Summary

• Use of CVL as an proxy for the viral burden in a community has increased over time

• Useful marker for assessing trends, programmatic effects, and identifying disparities in HIV care, treatment, and access

• Geospatial and subgroup analyses may be useful for informing targeted interventions

• Based on initial CVL study findings need to focus on:
  • Universal HIV testing
  • Universal ART coverage
  • Programs to increase retention in care and adherence
  • Continued measurement of CVL over time
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