

Refocusing Hepatitis C Prevention Through Geographic Viral Load Analyses

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Objective

To describe the use of Hepatitis C Virus (HCV) viral load (VL) results and geospatial analysis to guide prevention efforts.

Introduction

Approximately 2.7 million Americans live with chronic HCV, with roughly 30,000 new cases in 2013¹. Fortunately, recent clinical trials have shown great advances using interferon-free, oral direct-acting antivirals, with cure rates over 95%². But only a few people have been treated³, and most are unaware of the infection⁴. This presents an opportunity for public health to address unmet needs, but most jurisdictions have limited surveillance and prevention efforts. Leveraging HCV surveillance, this analysis presents a cost-effective method to improve situational awareness and guide prevention efforts in Houston.

Methods

The Houston Health Department (HHD) receives ELR and other reports for chronic and acute Hepatitis C, which include VL results. These are stored in Consilience Software's Maven 5.0. For this analysis, VL results were abstracted from Maven and managed in SAS v9.3. Geospatial analysis was performed using Esri's ArcGIS v10.1.

CDC HIV VL guidance⁵ was used and modified for HCV. Average VL for each patient each year was calculated for trend and geospatial analyses. Finally, principal component analysis and bidirectional stepwise linear regression were performed on average VL by ZIP, US Census data, and American Community Survey data using SAS v9.3.

Results

Since 2009, over 9,500 VL results were reported to HHD. This number increased annually, with over 2,700 reported from Jan-May 2015. The average HCV log value by ZIP code in 2015 ranged from 4.58 to 6.95 (Figure 1).

The final linear regression model is -

Average HCV log value (IU/mL) = 5.52577 + 0.00601*(% of Families in Poverty) + 0.0029*(% African American)

From several social and demographic variable risk factors, the model found that percent of families in poverty and percent African American were positively correlated with the average log value (Table 1).

Conclusions

VL analyses are a viable method of identifying areas of decreased level of HCV suppression and increased potential for HCV transmission. This is crucial, as complications from unsuppressed HCV include cirrhosis and hepatocellular carcinoma⁶. Additionally, Medicaid programs have limited access to the most effective HCV therapies by various eligibility criteria, though most are not based on clinical evidence⁷. The utilization of these methods to significantly improve outcomes of prevention and intervention activities needs to be evaluated.

Table 1. Stepwise coefficient for the linear model.

	Parameter Estimate	Standard Error	Type II SS	F Value	Pr > F
Intercept	5.5258	0.0741	488.7386	5560.04	< 0.0001
% of Families in Poverty	0.0060	0.0036	0.2501	2.85	0.0963
% African American	0.0029	0.0017	0.2683	3.05	0.0852

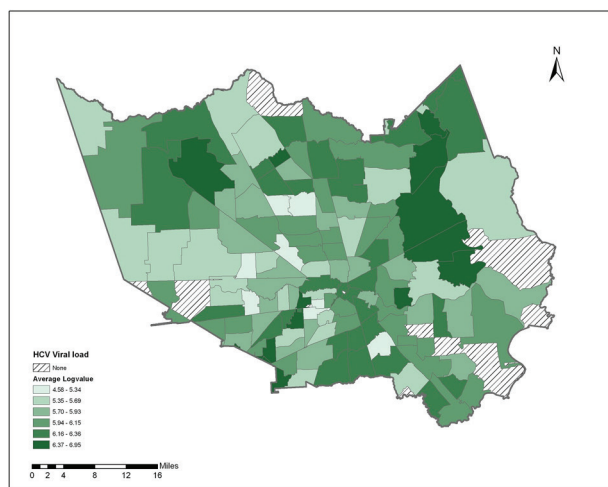


Figure 1. Average HCV viral load by ZIP, 2015.

Keywords

Hepatitis C; Linear Regression; Geospatial Analysis

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