

# HIV-1 and hepatitis B co-infections in the state of Tennessee

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## Background

### Hepatitis B

- Hepatitis B virus (HBV) affects the liver and its severity is dependent on the body's immune response (1).
- It is spread by the exchange of bodily fluids, semen, or blood most often through sexual contact or sharing of needles or syringes. It is also possible for a mother to transmit the virus to her baby at birth (1).
- HBV presents either as a mild acute illness that the body resolves or a chronic illness that lasts lifelong (1).
- Chronic infection is more likely for young children, 90% of infants exposed and 50% of young children between ages 1-5 years who are exposed develop chronic infections (2).
- Only 5-10% of healthy adults exposed will develop chronic infection, while the other 90-95% will develop a mild acute infection (2).
- Due to the rise in Human Immunodeficiency Virus (HIV) infections, and their resulting weakened immune system, HBV co-infections are increasing (2).

### HIV and HBV co-infection

- Around the world the co-infection rate can reach 20% in Southeast Asia, while in North America and Europe it is 5% (2).
- In the United States (US), HBV infection is the leading cause of hospital admission and death of HIV patients (2).
- HIV patients exposed to HBV are 3-6 times more likely to develop chronic HBV than non-HIV patients (3,4).
- The morbidity and mortality of those co-infected with HIV and HBV is far greater than that caused by either infection alone (5).
- In 2009 a national survey revealed that 51.4% of high-risk individuals were unvaccinated for HBV, and 50% had a missed opportunity to receive vaccination (6).

## Objective

To determine the incidence of HIV and HBV co-infection in Tennessee

## Methods

### Study setting and design

Chronic HBV positive serum specimens and HIV-1 positive specimens were acquired from residual diagnostic specimens across the state of Tennessee (TN). Specimens were de-identified and banked. For the study, specimens were chosen from each geographic region or metropolitan county in proportion to 2010 census data. 196 HBV positive specimens were tested for HIV-1 using the Bio-Rad EIA (Enzyme Immunoassay) HIV-1/2 test system and confirmed using the Multispot Rapid Test by Bio-Rad. 118 HIV-1 positive specimens were tested for HBV core total antibody and HBV surface antigen. 5 of these specimens were tested for HBV core IgM antibody.

### EVOLIS automated EIA

The Bio-Rad GS HIV-1/HIV-2 Plus O antigen and GS HBV surface antigen EIAs were both performed on the Bio-Rad EVOLIS automated EIA instrument following the protocols in the package inserts (7, 8).

### Manual EIA

The Bio-Rad HBV core total antibody test and HBV core IgM antibody test were both performed manually following the protocols in the package inserts (9, 10).

### Multispot HIV-1 / HIV-2 Rapid Test

The Bio-Rad Multispot HIV-1 / HIV-2 Rapid test was performed manually following the protocol in the package insert (11).

### Statistical methods

Figures and calculations for descriptive statistics were calculated using Microsoft Excel (2010).

## Results

### Specimen collection

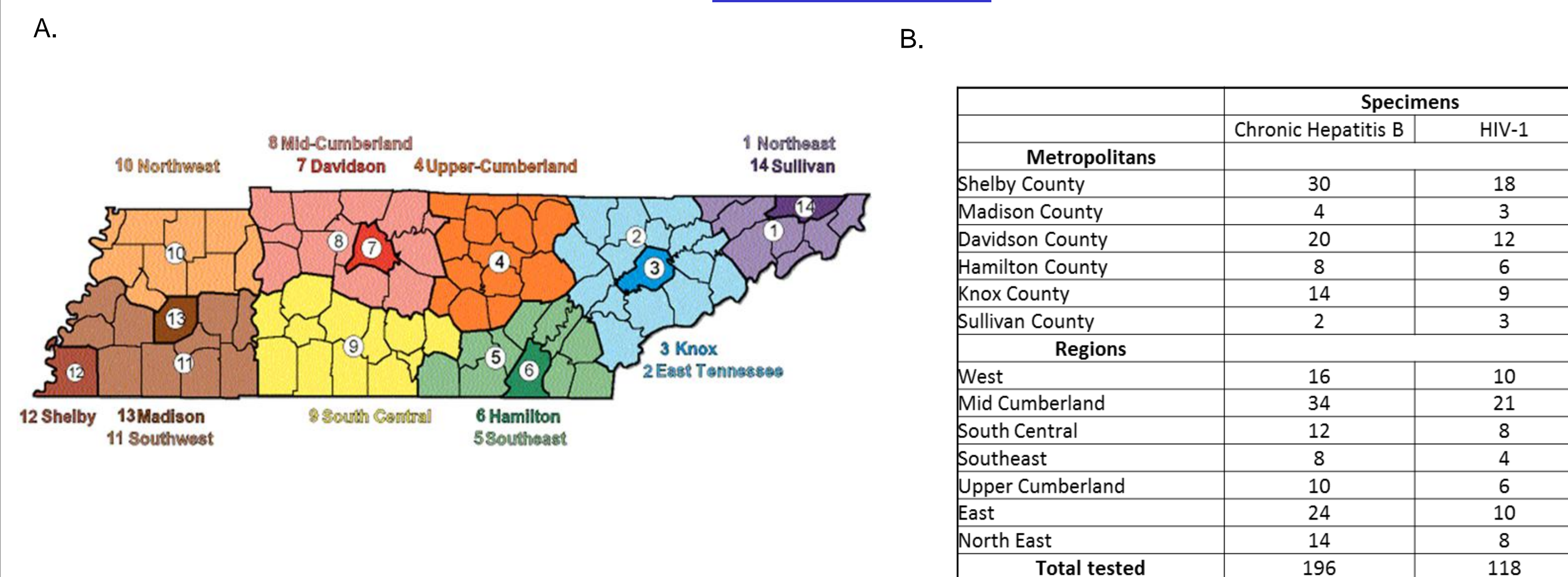


Figure 1. (A) The state of TN regions and metropolitan counties. (B) The number of specimens tested in each group by region or metropolitan county.

### Chronic HBV specimens reactive for HIV-1

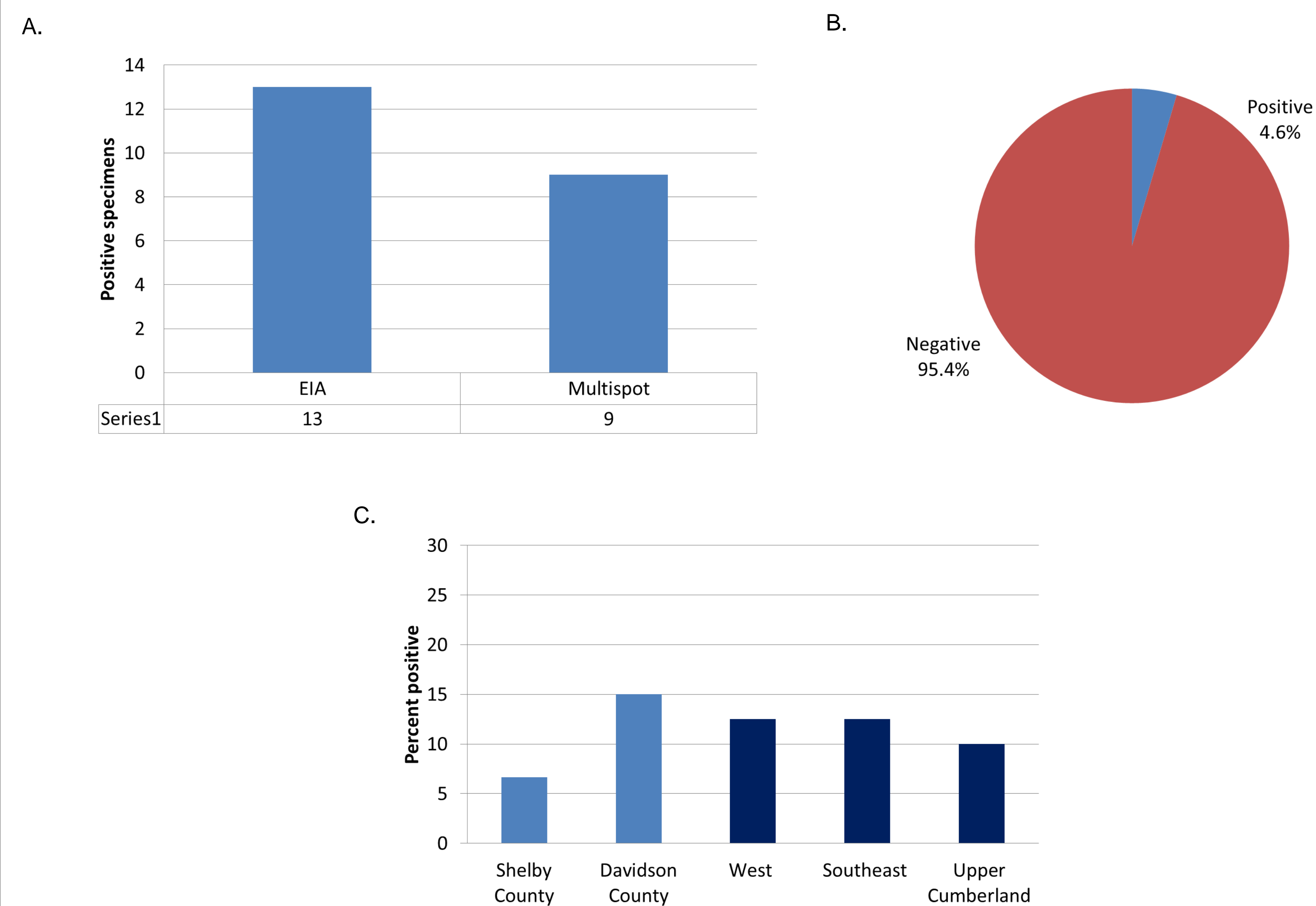


Figure 2. (A) The number of previously positive chronic HBV specimens reactive for HIV-1 by EIA or Multispot. (B) The percentage of chronic HBV specimens positive or negative for HIV-1. (C) The percentage of previously positive chronic HBV specimens co-infected with HIV in each metropolitan or region.

## Results

### HIV-1 specimens reactive for HBV

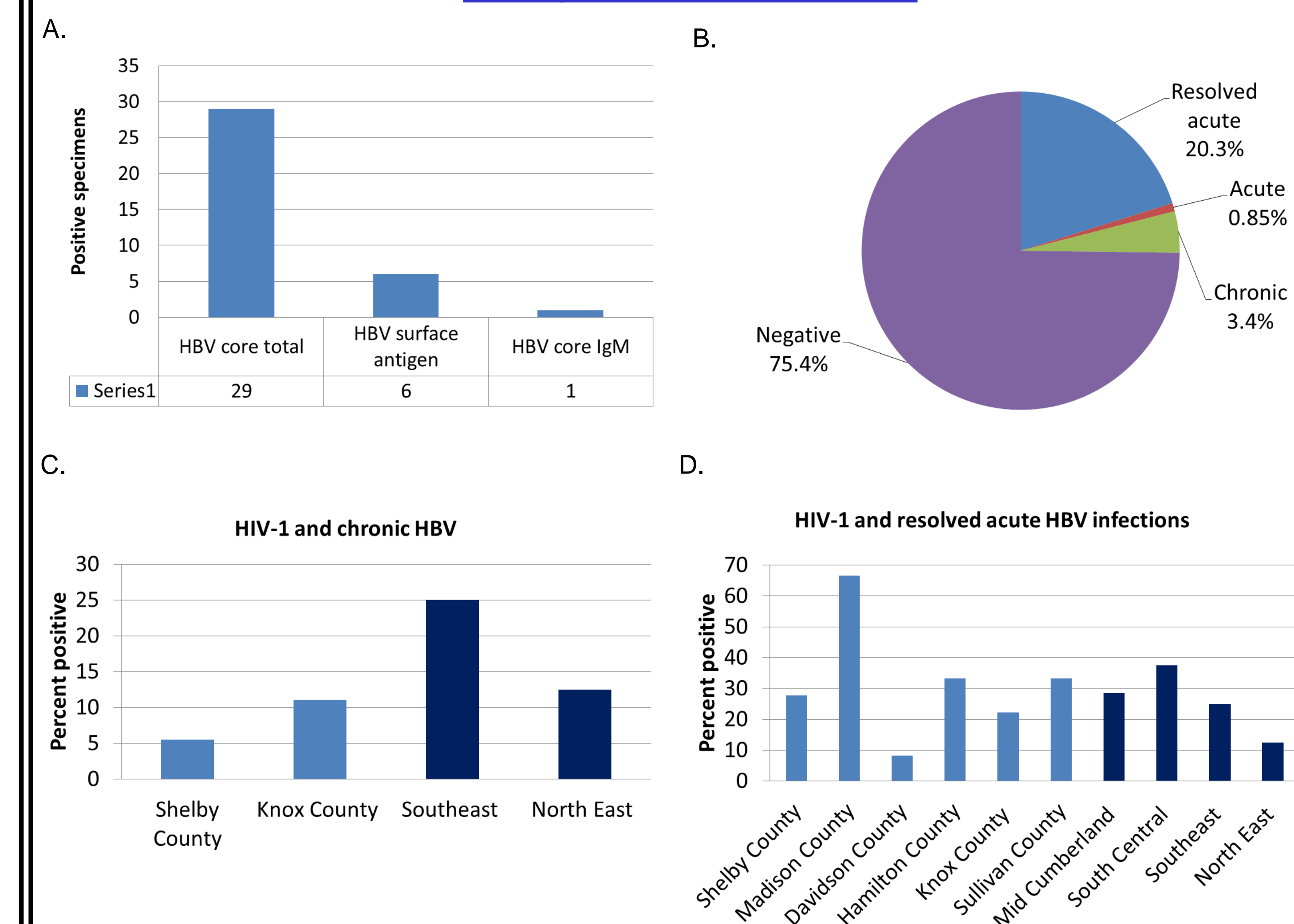


Figure 3. (A) The number of previously positive HIV-1 specimens reactive for each type of HBV test. (B) The percentage of positive HIV-1 specimens positive or negative for HBV. (C) The percentage of previously positive HIV specimens co-infected with chronic HBV in each metropolitan county and region. (D) The percentage of previously positive HIV-1 specimens co-infected with resolved acute HBV in each metropolitan county and region.

## Conclusions

- In the previously positive chronic HBV patients tested for HIV, we found a 4.6% co-infection rate
- In the previously positive HIV-1 patients tested for chronic HBV we found a 3.4% co-infection rate
- 20.3% of the total population of HIV infected patients tested were at one time exposed and developed acute HBV
- 20% of the active HBV infections in the HIV-1 positive population were newly acquired
- HIV and chronic HBV co-infections are present in the three largest population metropolitan counties in TN: Shelby, Davidson, and Knox.
- Two of the largest population regions (Mid Cumberland and East) were not represented
- Of the positive regions and metropolitans, Shelby County had the lowest percentage of HIV-1 and chronic HBV co-infection

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We thank the CDC and APHL Emerging Infectious Diseases Research Fellowship Program.