Geographic Epidemiology of Hepatocellular Carcinoma and Viral Hepatitis in New York City

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Background: HCC in NYC

- Hepatocellular carcinoma (HCC) incidence and mortality rates are increasing in the U.S. and in New York City (NYC).
- NYC is one of the most heavily impacted areas in the country in regard to HCC risk factors (chronic hepatitis B and hepatitis C, type 2 diabetes mellitus, and heavy alcohol use).
- We assessed the geographic pattern of HCC in NYC and geospatial associations between HCC incidence and risk factors prevalence.

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Methods: Spatial Analysis of HCC Incidence

- Data from NY State Cancer Registry, NYC Department of Health and Mental Hygiene Hepatitis Surveillance Registry, NYC Community Health Survey, 2008-2012.
- Age-adjusted HCC incidence 2009-2011 spatially mapped by NYC United Hospital Fund (UHF) neighborhood.
- Geographic clustering in age-adjusted HCC incidence using local Moran's I statistic (LISA) in GeoDA.
- Examined spatial associations between HCC and viral hepatitis, heavy drinking, diabetes, and poverty. Linear regression (OLS) and geographically-weighted regression (GWR) used to test for significance of association and local variations in relationships using SAS and GWR4.
- After initial analysis, NY State Cancer Registry data from 1/1/2001- 12/31/2012 was matched to DOHMH hepatitis surveillance database from the same time period.
- New dataset geocoded to zip code tabulation area (ZCTA).
- Hotspot analysis performed using LISA Moran's I statistics by total HCC cases, HCC + HBV, HCC + HCV, and HCC with no viral hepatitis infection reported.

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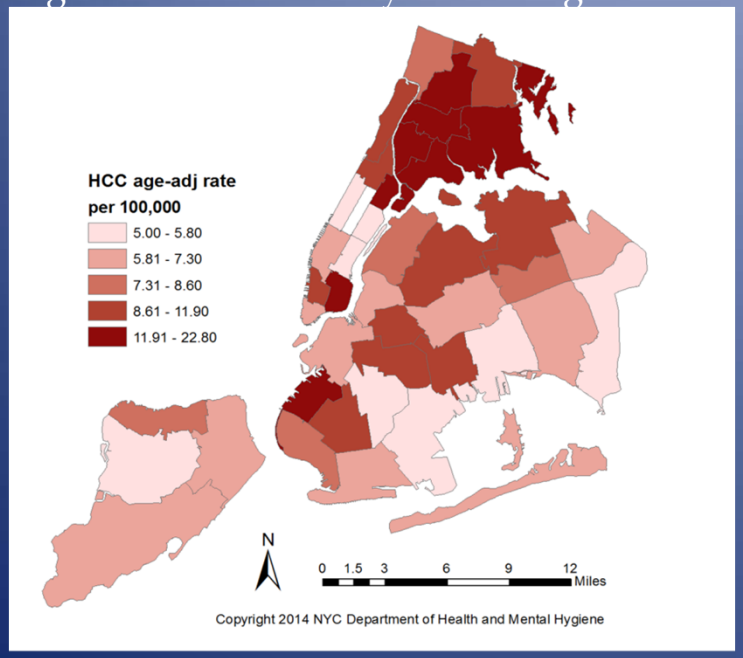
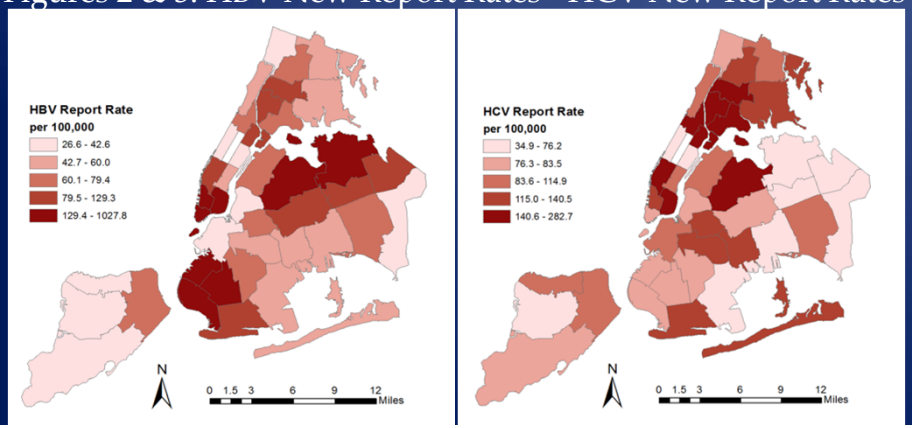
HCC Age-Adjusted Incidence Rates by NYC neighborhood, 2009-2011

Figure 1: HCC Rates by NYC Neighborhood



Figures 2 & 3: HBV New Report Rates - HCV New Report Rates



- During 2009-2011, 2,382 HCC cases were reported in NYC, with age-adjusted HCC rates by neighborhood ranging from 5.0 to 22.8 per 100,000 (*Figure 1*).
- In separate OLS models each controlling for age, HCC was significantly associated ($p<.05$) with viral hepatitis, and poverty across NYC.
- In separate GWR models controlling for age and spatial autocorrelation, the variation in HCC incidence by neighborhoods was best explained by HBV and poverty ($R^2=0.7$ in both models).

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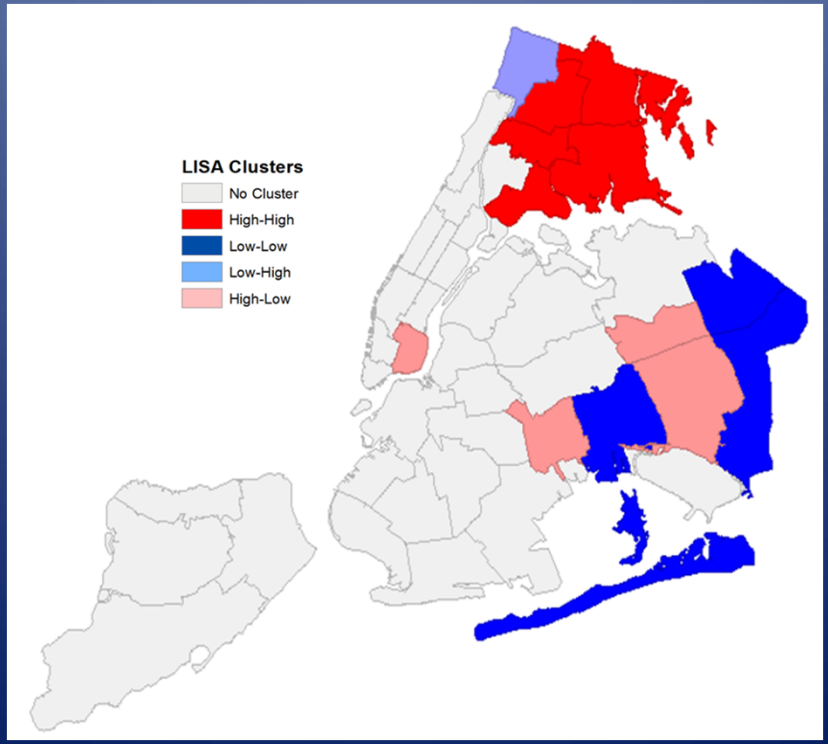
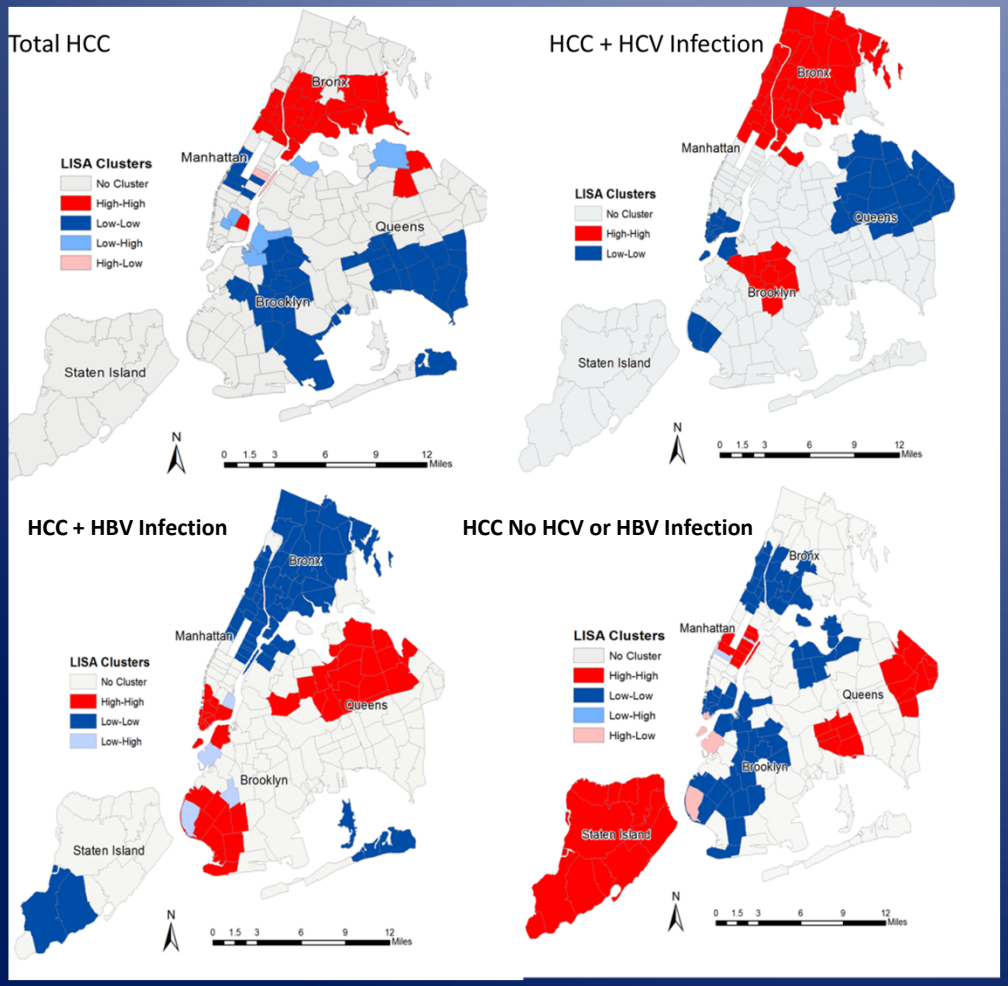
HCC Age-Adjusted Incidence Rates by NYC neighborhood, 2009-2011

- HCC rates were not distributed randomly (Moran's I=0.1, p<.01) with the most significant clustering detected in the South Bronx.



HCC Local Indicators of Spatial Autocorrelation in NYC by Zip Code and by Viral Hepatitis Infection Status, 2001-2012



- Between 2001 – 2012, 8,955 HCC cases were reported in NYC.
- LISA cluster detection identified 21 ZCTAs with high rates of HCC clustering.
- Once disaggregated by viral hepatitis infection, HCC incidence rates with HCV, HBV, and no HCV/HBV infection became distinct to different ZCTAs in NYC.

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Conclusions

- HCC is distributed inequitably across NYC, with stark geographic differences seen by viral hepatitis infection.
- Geographic clustering was observed in the distribution of HCC in NYC.
- HCC disproportionally affects neighborhoods with high rates of viral hepatitis and poverty.

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