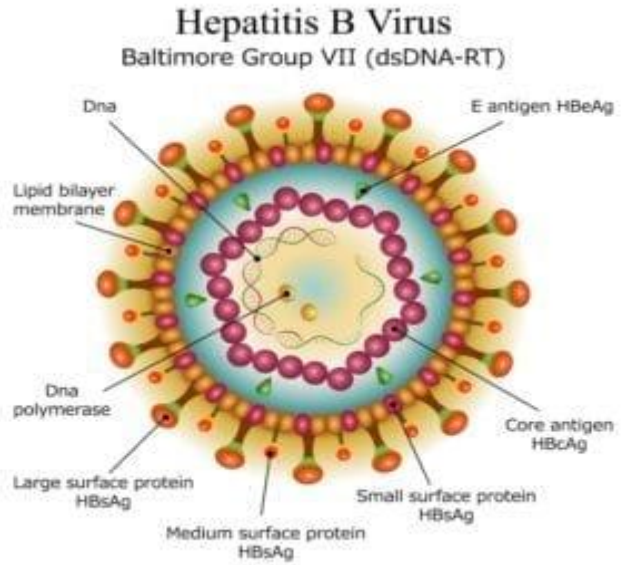
Availability of Health Facilities and Interventions to Prevent Perinatal Hepatitis B Virus (HBV) Transmission in Nigeria: A Geo-spatial Analysis



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Background

- Chronic HBV infection is a global public health problem and a major cause of chronic liver diseases.
- Length of chronicity is a predisposing factor for hepatic damage.
- There is an inverse relationship btw the age at infection and chronic hepatitis.
- About 90% of infants with perinatal infection, 30% of children infected under the age of 5, and 5% of those infected as adults develop chronic infections.
- Besides, evidence shows that more than half of infections globally are acquired perinatally or during childhood.
- Serial HBV vaccination has proven effective in transmission interruption especially among infants.
- WHO recommends birth dose within 24 hours of birth; then 2nd dose in 1-2 mths and 3rd dose in 4-6 mths after birth dose.

Background...

- Nigeria is a highly endemic country for HBV infection
  - with prevalence above 8% in the general population.
- Transmission is mediated through complex biological, socio-economic and geographic factors responsible for poor infection control.
- Existing studies do not assess the geographic factors and
  - often do not contain granular data enough to determine hot spots and cold spots
- Exploration of the role of availability of health facilities in implementing programs to reduce perinatal HBV transmission is important for decision-making, intervention mapping, program planning and resource allocation.
- We examined the spatial autocorrelations between availability of health facilities and interventions associated with perinatal transmission of HBV in Nigeria.

Methods

- The study is a geo-spatial analysis
- Combination of data sources –
  - NDHS 2018, NAIIS 2018 and FMoH (Geo-coded/tagged health facilities list)
- Used ArcGis® and GeoDa® for spatial relationship between availability of health facilities (Clinic density) and:
  - HBsAg status of WRA (NAIIS 2018)
  - HBV birth dose vaccination across states in Nigeria (NDHS 2018).
- Initial data exploration and calculation of proportions with STATA release 16
- Global and local univariate Moran's I tests for spatial auto-correlations across all regions and states.

- **Research Questions:**
  - Are there significant hotspots/cold spots for:
    - HBV infection among WRA and
    - Coverage of birth dose of HBV vaccine among newborns across states?
  - Are there state/regional spatial autocorrelations between availability of health centers (clinic densities) and receiving the birth dose of HBV vaccine?

Test Statistics: Moran's I

Local and Global auto-correlations are approaches to Exploratory Spatial Data Analysis (ESDA)

Measures spatial auto-correlation of a specific variable to a location, considering the same variable (or another variable) in a neighboring location.

Local auto-correlation uses Local Indicators of Spatial Association (LISA) to determine the influence of individual locations (here: states) on magnitude of effect derived from the global Moran's- I statistics.

Moran's I statistic is designed to reject the null hypothesis of spatial randomness in favor of an alternative of *clustering*.

The Moran scatter plot provides a classification of spatial association into four categories, corresponding to the location of the points in the four quadrants of the plot.

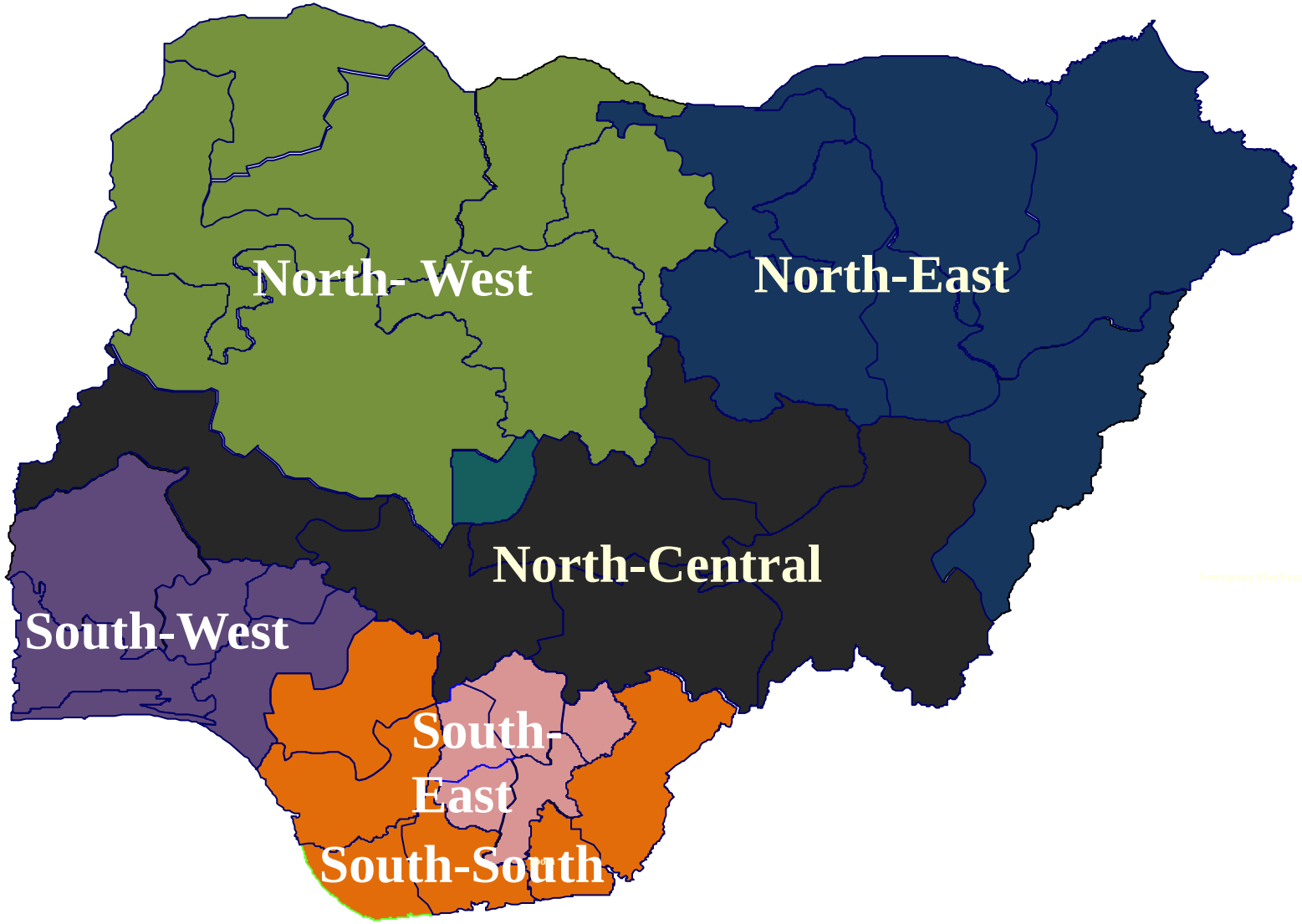
These categories are referred to as High-High, Low-Low, Low-High & High-Low.

Identifies local clusters & local spatial outliers

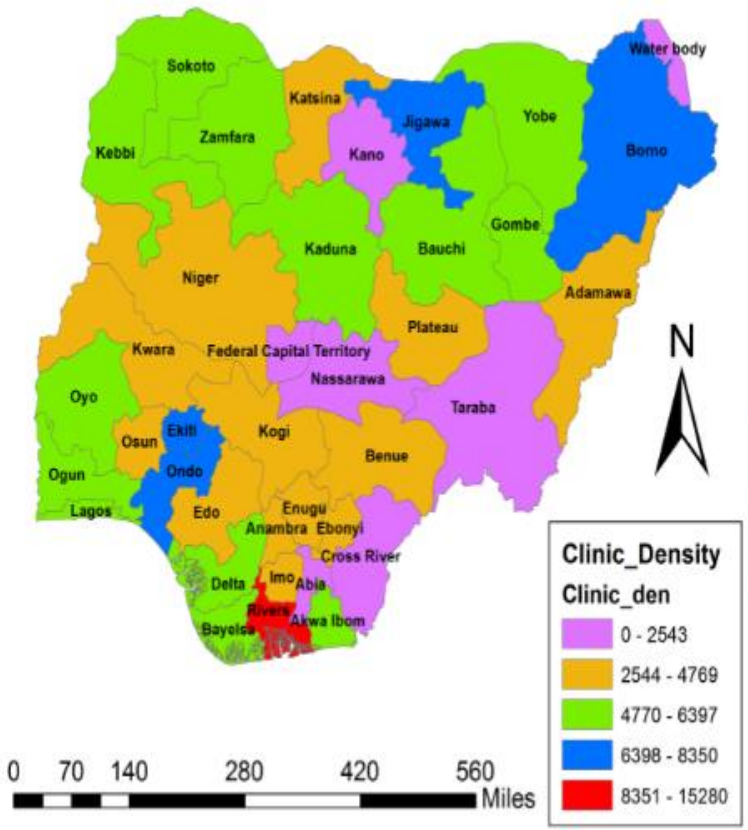
Outliers means that an average for the neighbors are much smaller or bigger than would have been expected under spatial randomness.

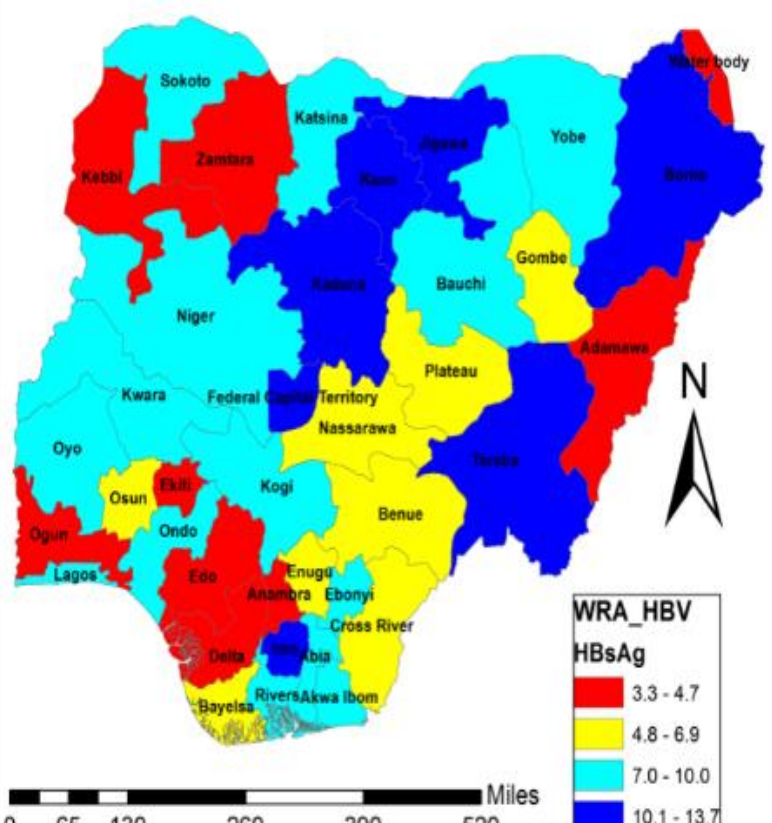

Results

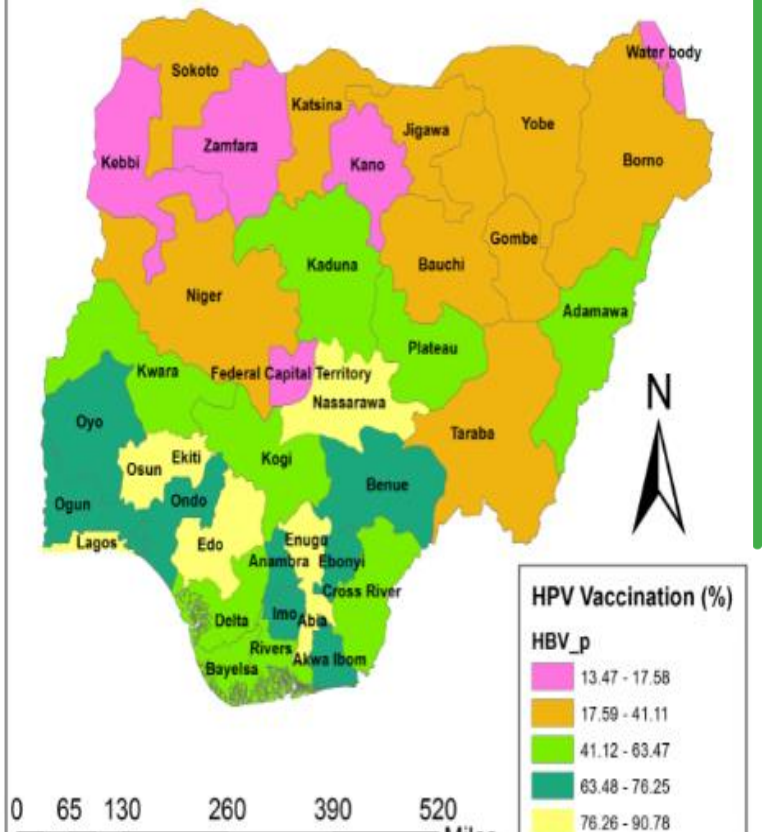
Map of Nigeria



Variations in Clinic Density, HBV+ Status-WRA & Infant HBV BD Vaccination







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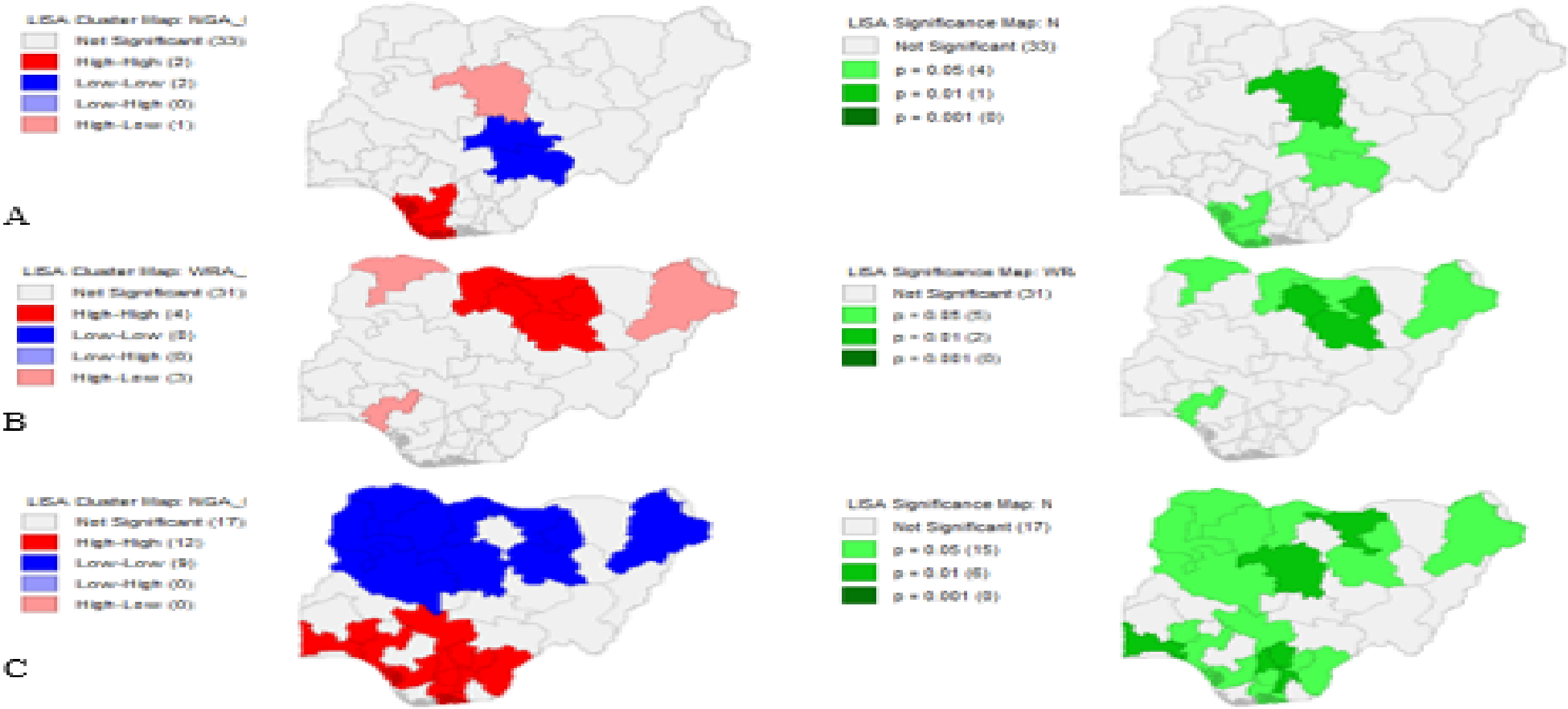
LISA Clusters and significance levels for spatial autocorrelation of HBV prevention interventions.

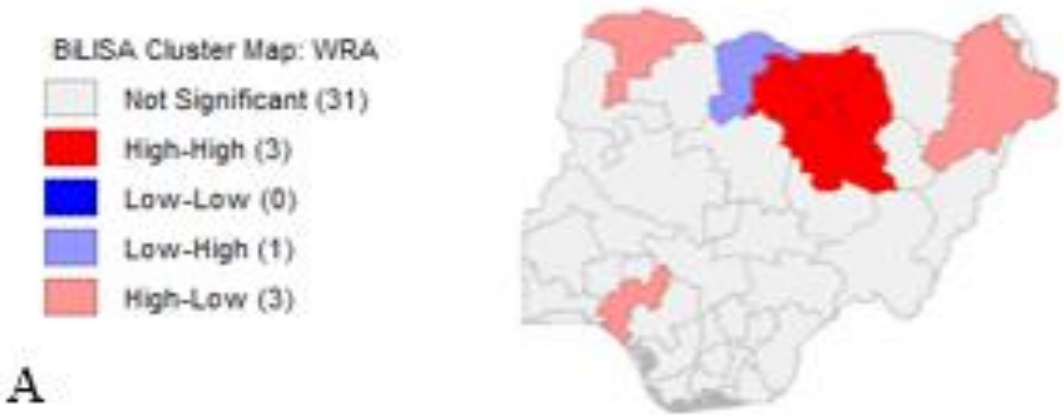


(A) Univariate Local Moran's I estimation for Clinic Densities

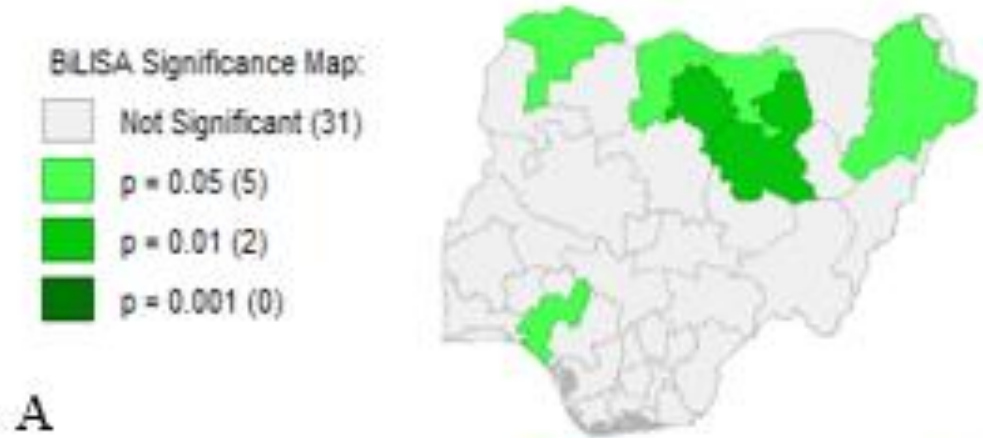
(B) Univariate Local Moran's I estimation for HBsAg status of women of reproductive age (WRA).

(C) Univariate Local Moran's I estimation for coverage of Birth Dose of Hepatitis B Vaccination

BiLISA Clusters and significance levels for spatial autocorrelation of HBV prevention interventions.



A



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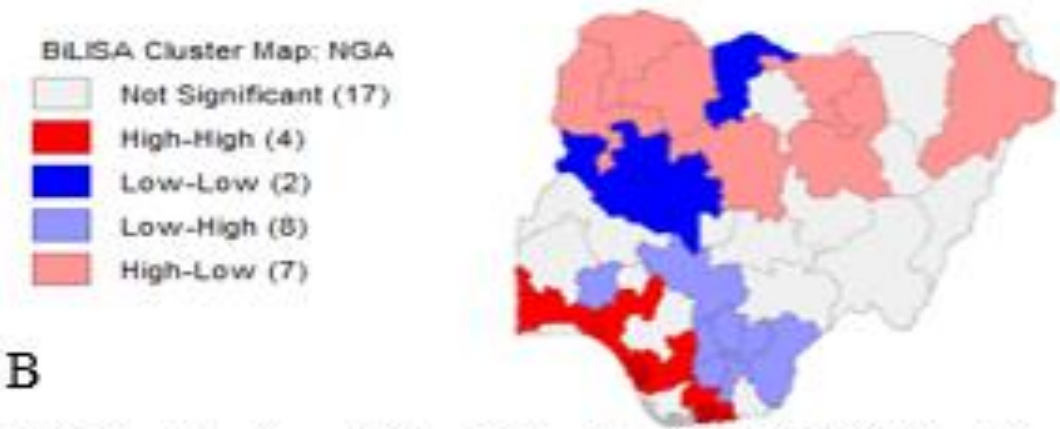

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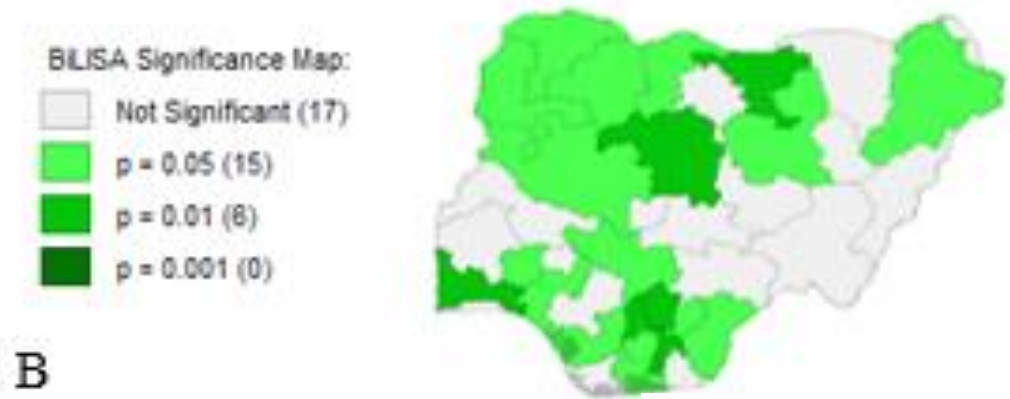

B

(A) Bivariate Local Moran's I estimation for HBsAg status of WRA.
(B) Bivariate Local Moran's I estimation for Coverage of Birth Dose of Hepatitis B Vaccination

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Findings

- Health clinics seem evenly distributed across states and geo-political zones in Nigeria
- Univariate local Moran's I analysis show significant autocorrelation and clustering with:
  - high-high patterns of clinic densities in Bayelsa and Delta states (SS)
  - low-low patterns in Benue and Nasarawa states (NC).
- Significant high-high cluster of HBsAg positive status of WRA in
  - Katsina, Jigawa, Kano (NW)
  - and Bauchi (NE)
- Low-low clustering of birth dose of HBV vaccination in
  - Sokoto, Kebbi, Jigawa, Zamfara, Kaduna, Katsina (NW),
  - Niger (NC),
  - Bauchi and Borno (NE).

- **Bivariate LISA**
- Significant high-high clustering pattern between clinic densities and HBsAg status of WRA in
  - Jigawa, Kano (NW)
  - and Bauchi (NE)
- Hot spot clustering of low clinic densities surrounded by states with low HBV vaccination coverage
  - Katsina (NW)
  - and Niger (NC)

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Conclusion

- This ESDA found significant spatial autocorrelation between clinic densities and HBV positive status of WRA
- as well as low coverage of birth dose of HBV vaccination clustered in a few states and mainly in Northern Nigeria.
- The finding is an added information to other established risk factors for perinatal transmission of HBV and helps in planning intervention programs.
- The implementation of the national hepatitis guidelines should pay particular attention to these states.
- Other policies that may be useful in freeing resources to implement interventions like human resource for health (HRH), commodity procurement, and logistics, will be necessary to sustain the efforts until Hepatitis B virus is eliminated in Nigeria.

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