Evaluating the geographic distribution of cervical cancers diagnosed at two tertiary hospitals in Gaborone, Botswana

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BACKGROUND

- Cervical cancer (CC) is the leading cause of cancer incidence and mortality in Botswana
- Botswana is a low resource setting in sub-Saharan Africa characterized by a large geographic area and a dispersed population with a population of approximately 2.4 million people
- Botswana has one CC treatment facility located in the capital city of Gaborone
- Geographic Information systems (GIS) are a powerful epidemiologic tool for understanding variability in health patterns that can help identify areas in need of public health intervention

Purpose

To determine if the spatial distribution of cervical cancer cases being diagnosed at two tertiary hospitals in Gaborone is random

To identify villages in Botswana with low rates of cervical cancer cases being diagnosed and treated in Gaborone that could potentially benefit from public health interventions

METHODS

Data from women diagnosed with invasive cervical cancer at a gynecological multidisciplinary clinic (MDT) in Princess Marina Hospital (PMH) coordinates CC care with two tertiary hospitals in Gaborone, Botswana
PMH
Gaborone Private Hospital (GPH) (treatment facility)
Eligibility
Informed consent
>18 years
No prior history of gynecological cancer
Not pregnant

Data linking
    Abstracted residential village of CC patients
    Identified geography of villages using United States Census Bureau (USCB) public database/shape file
Analyzed patterns of CC rates
    Global Moran's *I*, Ripley's K function
Identified statistically significant clusters of CC rates
    Local indicator of spatial autocorrelation (LISA)/Anselin Local Moran's *I* values
        Queen continuity
        Villages with significantly higher (H) or lower (L) rates than expected if the distribution was random were designated as HH/LL clusters or HL/LH outliers
Characterized clusters/outliers with chi-square and student t-tests
Analysis done in ArcMap 10.6.1, STATA 16.1, & Geo-da

Results: Local Moran's I identified 83 villages as HH clusters, 75 as LL clusters, 25 HL outliers, and 61 LH outliers

Legend

	Not Significant
	High-High Cluster
	High-Low Outlier
	Low-High Outlier
	Low-Low Cluster
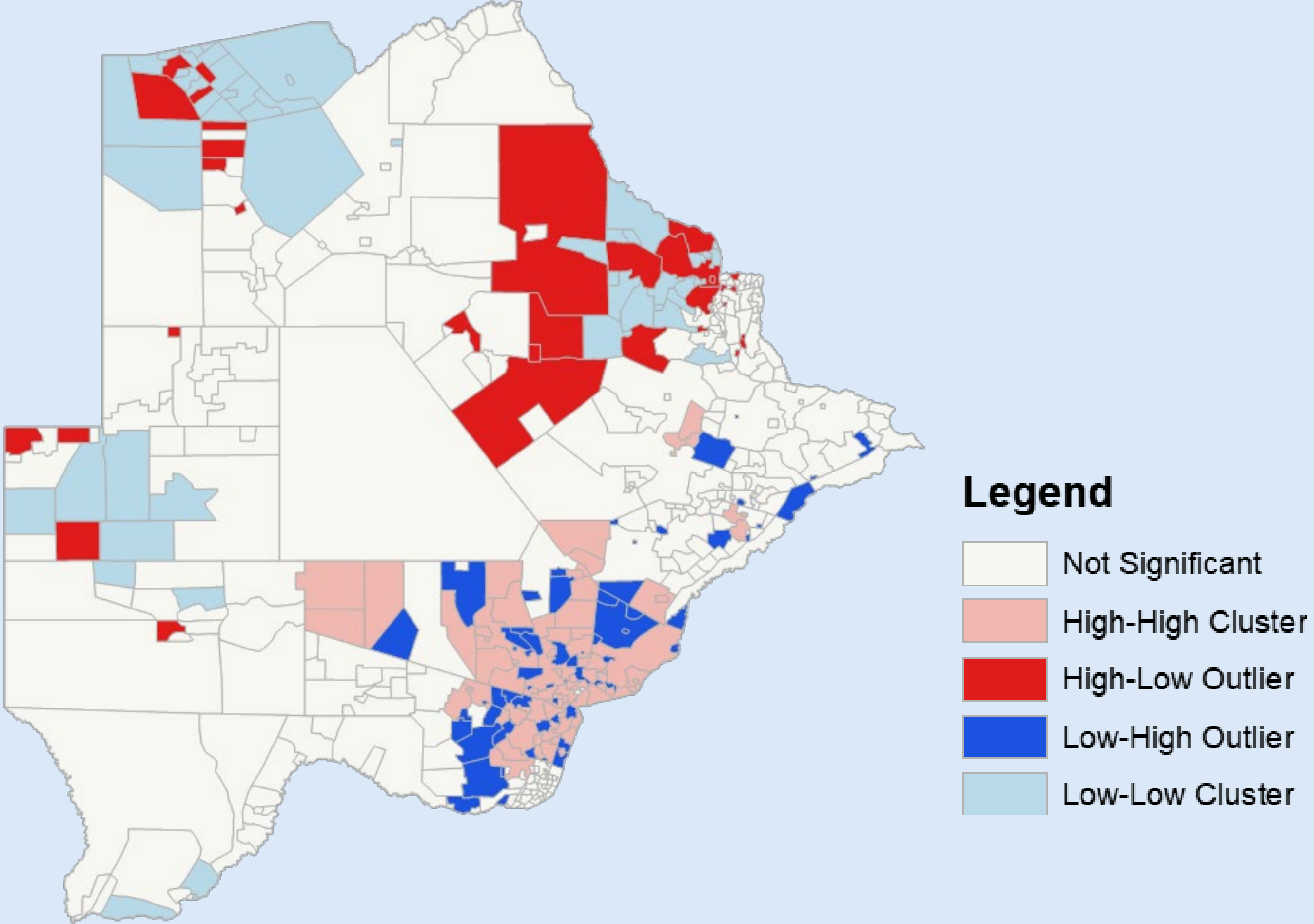
Results

- 1033 women were diagnosed with CC at MDT clinic between January 2015 and June 2020
- Matched 1007 of 1033 (97.5%) CC cases to USCB villages
- Global Moran's I revealed statistically significant spatial clustering (p<0.001)
- Local Moran's I identified 83 villages as HH clusters, 75 as LL clusters, 25 HL outliers, and 61 LH outliers

Conclusions

We identified a clustered distribution of CC rates across Botswana among 1033 women diagnosed with CC at 2 tertiary hospitals in Gaborone between January 2015 and June 2020
We identified statistically significant high and low clusters, as well as outliers, of CC rates among villages
Individual characteristics of CC cases, such as age, HIV status, proximity to Gaborone were different among the clusters
HH clusters identified located within close proximity to PMH, while LL clusters were located further away in the north-western rural area of Botswana
LL areas may benefit from public health interventions, i.e. education and screening

Acknowledgements

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