Geospatial Analysis of Cholera Cases in Lusaka District, Zambia: Oct 2023 - Mar 2024

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Acknowledgements/Disclosure

Zambia Field Epidemiology Training Program

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Back ground

- **Cholera:** An acute gastroenteritis caused by Vibrio Cholerae
- **Africa Impact**: 335,059 cases and 6,197 deaths (Jan 2022 - Mar 2024)
- **Zambia**: Repeated outbreaks since 1977; over 30 outbreaks with 10,000+ cases (1977-2019)
  - Major outbreak in Lusaka district (2017-18): 5,000+ cases, 90 deaths .
  - High-risk areas: Low-income areas like Kanyama, linked to poor water, sanitation, and hygiene (WASH

Current Outbreak in Lusaka (2023-2024)

- **Start:** October 15, 2023, in Kanyama area
- **Peak:** January 8, 2024; Largest epidemic in Zambia since 1977
  - Nationwide Impact: 22,565 cases, 725 deaths (as of April 3, 2024)
  - Lusaka District: Epicenter with 14,492 cases, 514 deaths

Study Objective

- To determine the geographical distribution patterns and environmental factors associated with the 2023-2024 cholera outbreak in Lusaka district.

Specific Objectives

- To describe the characteristics of the cholera cases

- To identify potential risk factors contributing to the increase in cases using GIS

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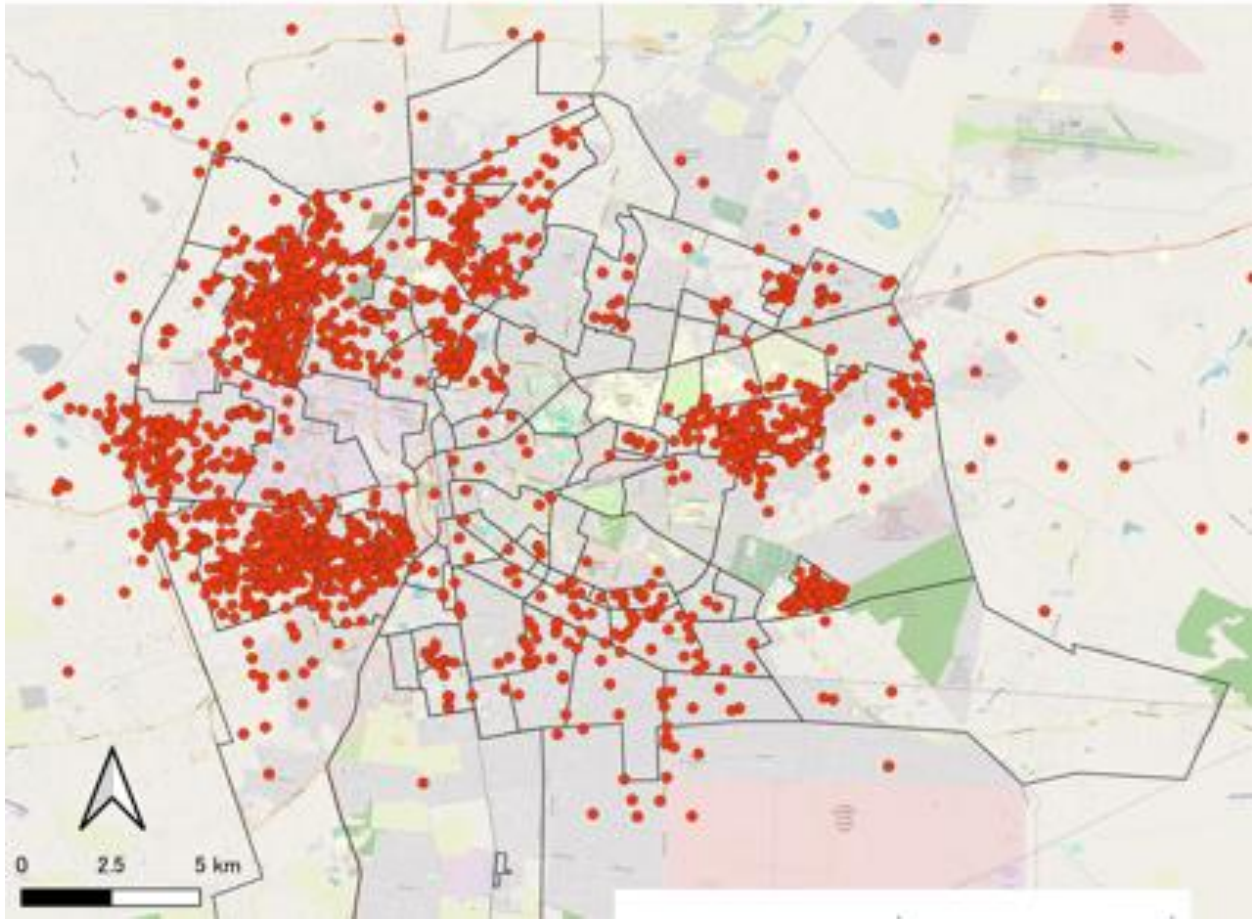
Materials and Methods

- **Study Site**
  - Conducted in Lusaka District, the capital of Zambia with a population of over 2.2 million

- **Data Collection**
  - Patient and geocoordinate data collected using electronic-IDSR
  - Geocoordinate data of water tanks and Oral Rehydration Points(ORPs) collected using KoboToolbox

- **Data analysis**
  - Maps created in QGIS to show cholera cases and associated spatial factors by epidemiological weeks (epi-weeks).
  - Chi-square and Fisher's exact tests compared incidence between factors(residenatial,environmental,water tanks and ORPs).
  - Analysis of spatial and temporal clusters of cases conducted using SaTScan™

Results



Study Population

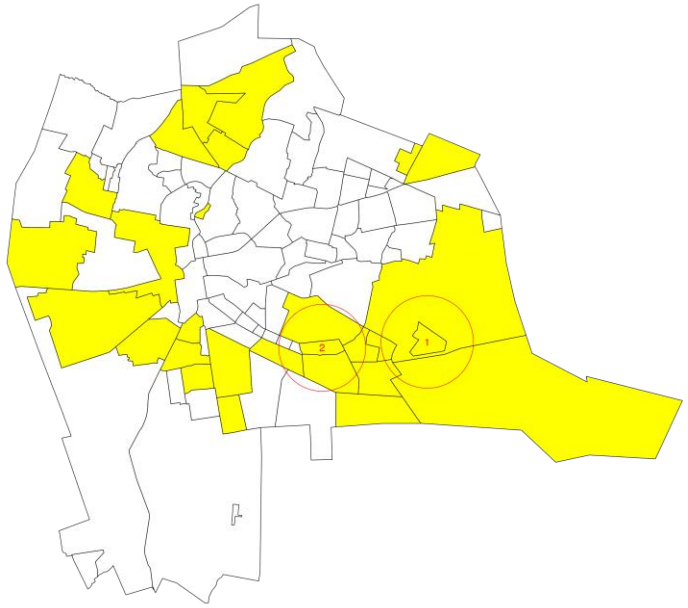
- 4,591 cholera cases with geocoordinate data identified (28.4%)
- lowest in October 2023 (14.9%), highest in December 2023 (36.3%)
- 44.3% female, median age 23 years. Fatal cases: 2.6%.

Geospatial Distribution of Cholera Cases

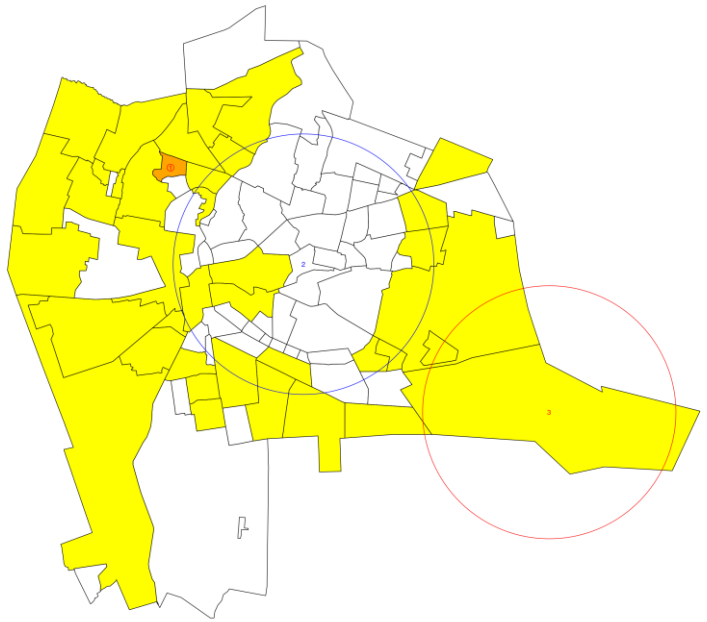
- 4,201 cases identified in 86 out of 94 townships (91.5%).
- 59.1% of cases from unplanned areas; cholera incidence higher in unplanned areas (median 0.86) than in planned areas (median 0.47).
- High case numbers in Kanyama, Matero North, and Bauleni during the peak period (EW1-4).

Results -Space-time Clusters of Cholera

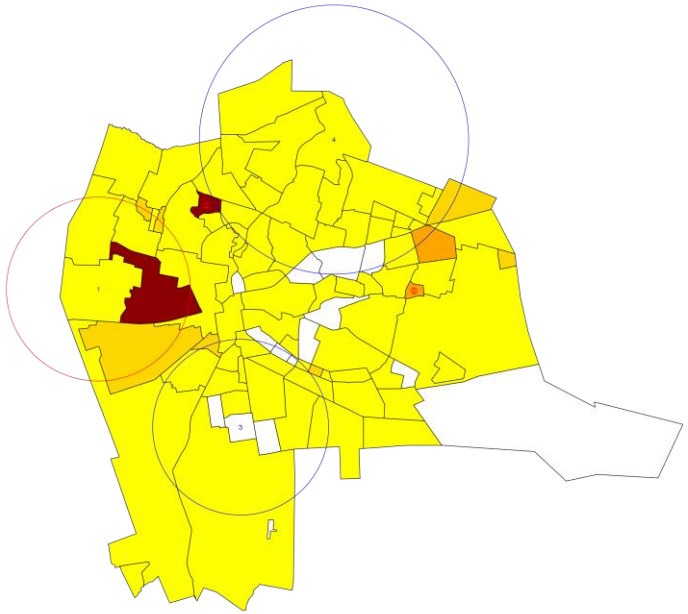
Incidence between EW 41-44



Incidence between EW 45-48



Incidence between EW 1-4



Incidence per 1000

- 0
- 0-2
- 2-4
- 4-6
- 6-8
- 8-10
- 10+

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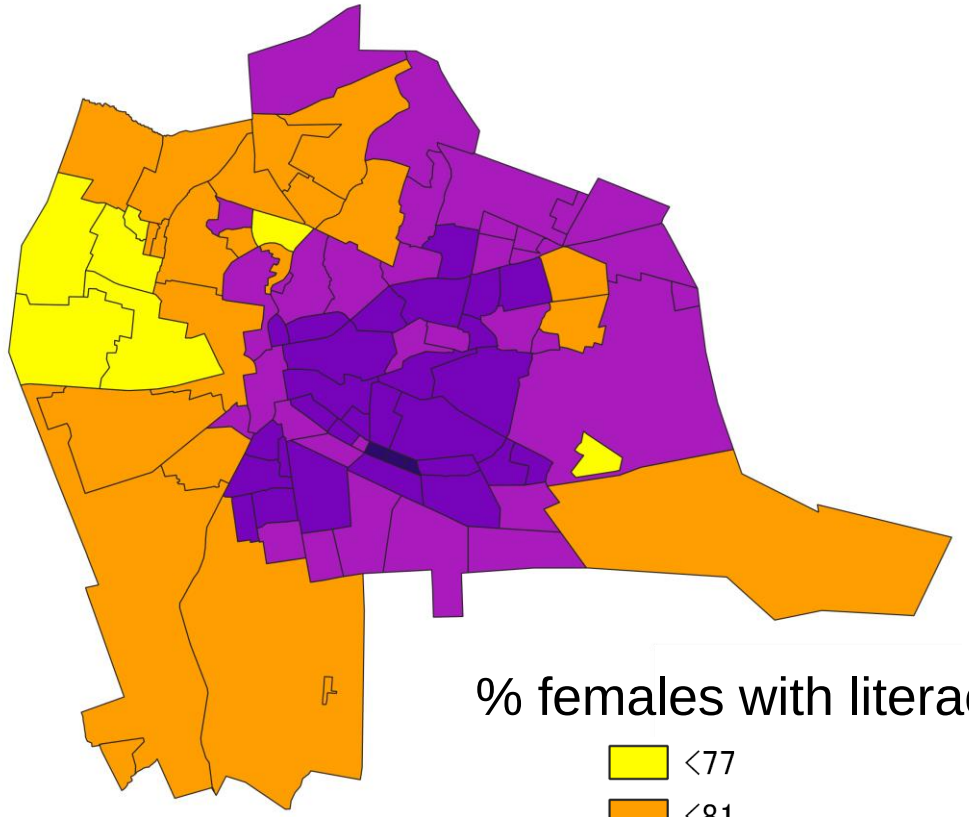
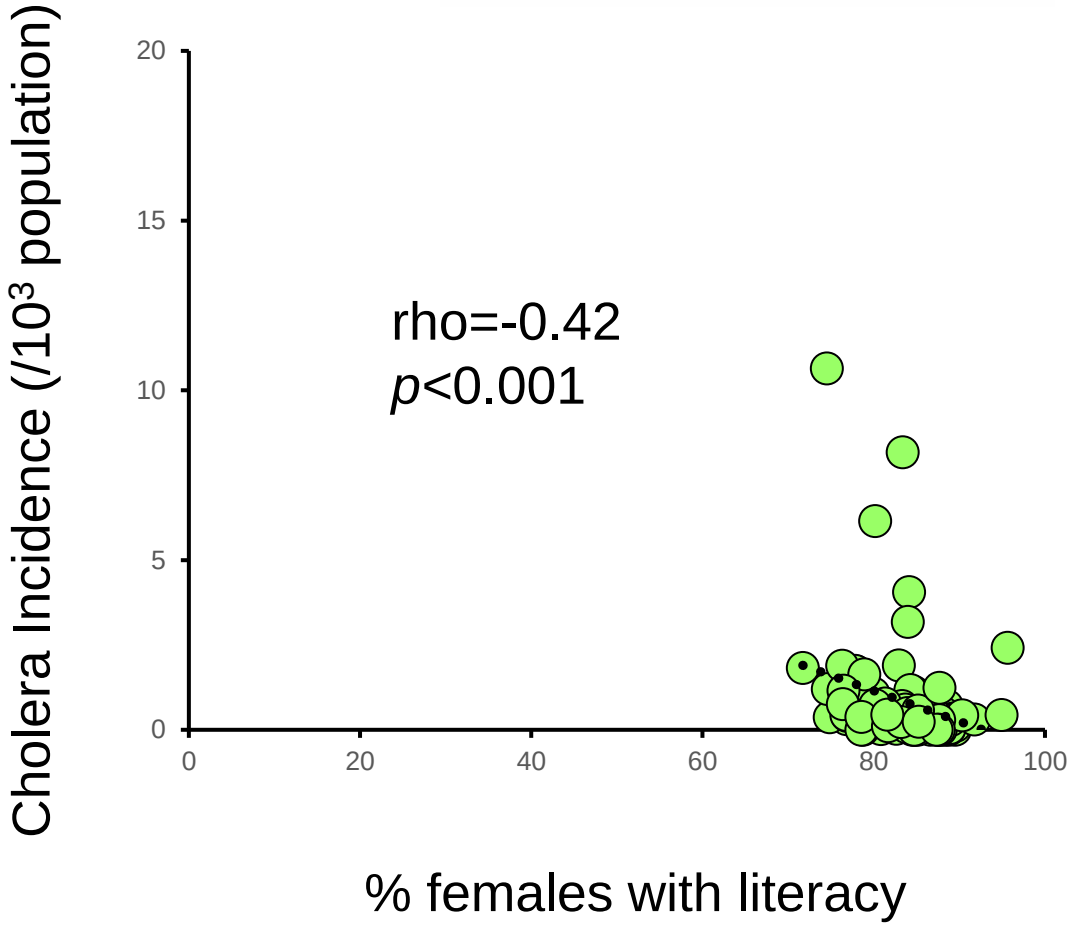
Results –Spatial factors

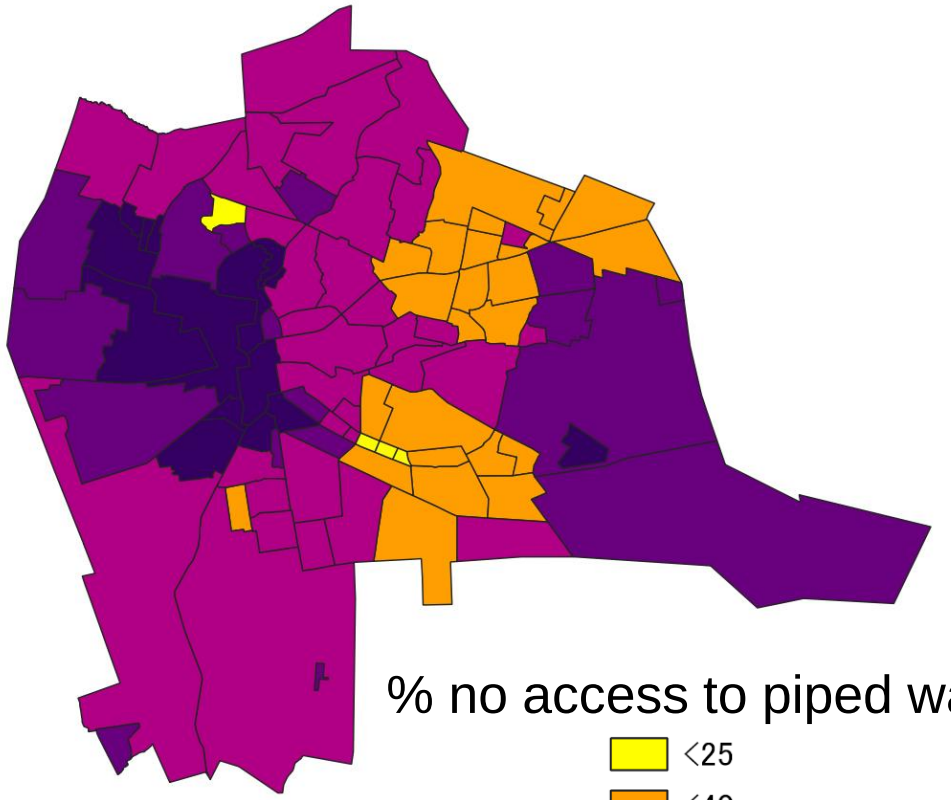




Lower % literacy

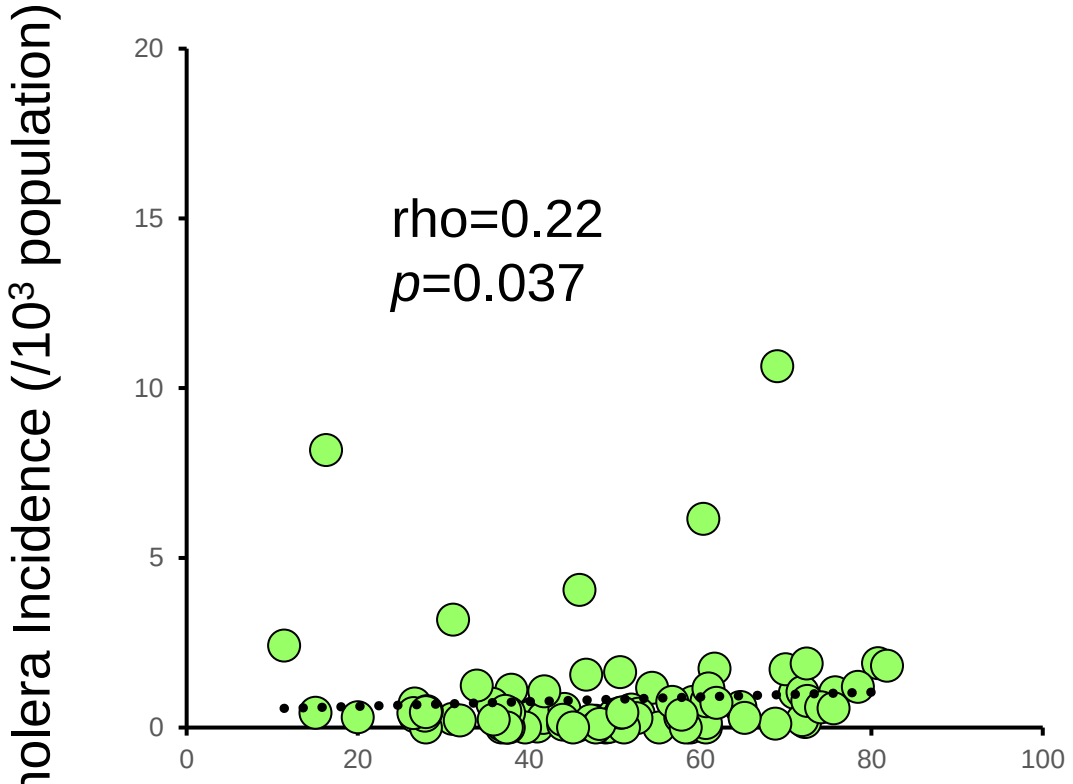
Higher % literacy

Results –Spatial factors



% no access to piped water

<25
<40
<54
<68
<82



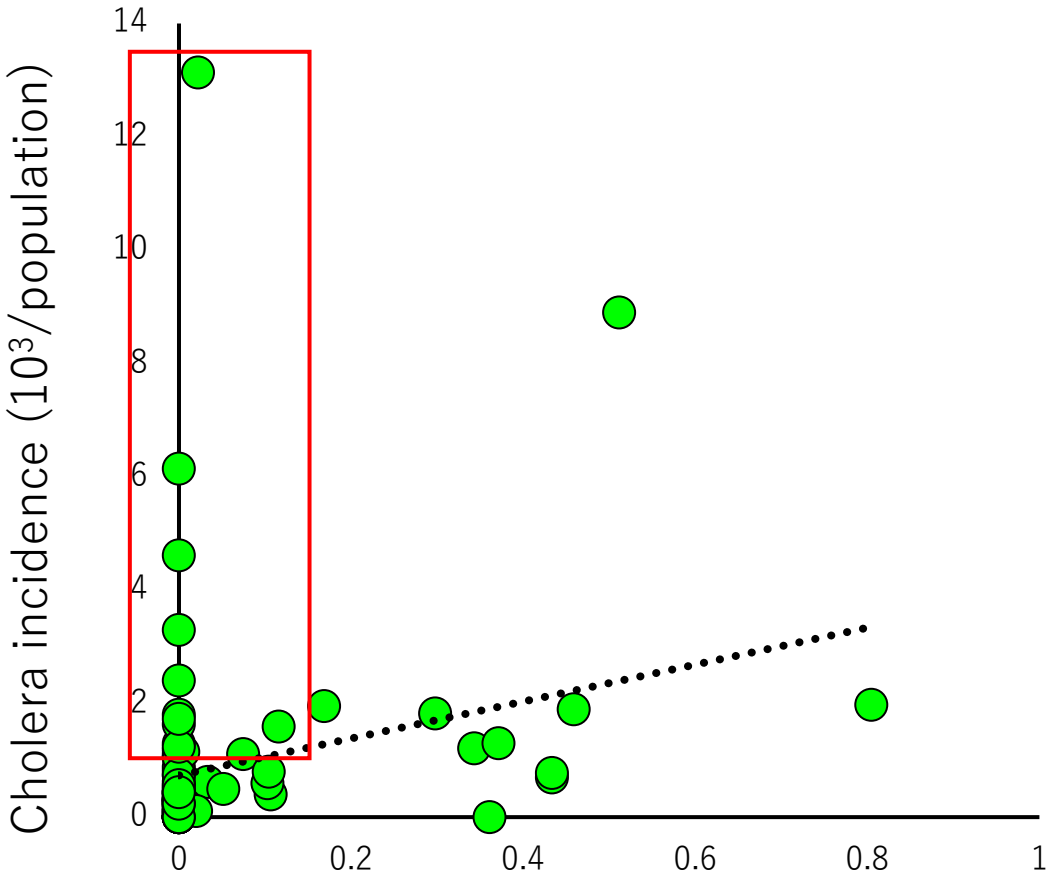
% individual without access to piped drinking water

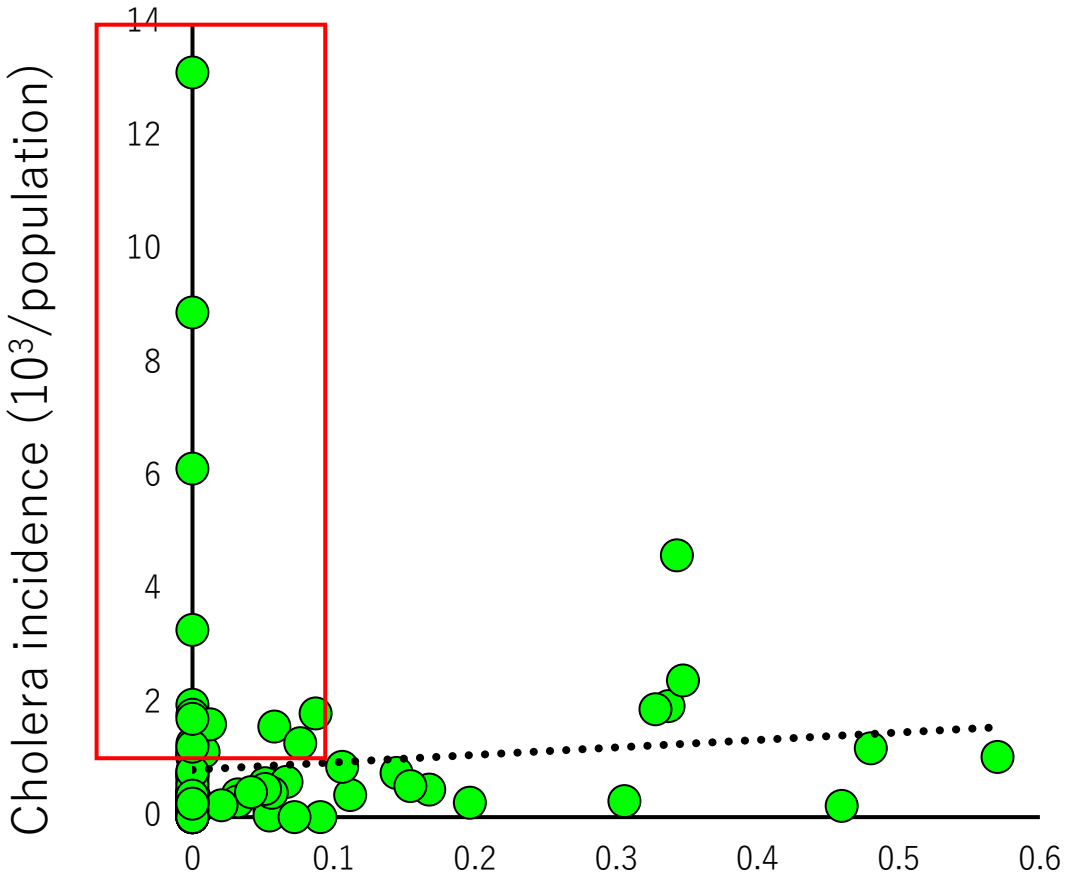
Good access to WASH

Bad access to WASH

Zambia Data Hub

Results-ORPs and Water Tank





Key findings

- Cholera incidence was higher in unplanned, low-income areas, similar to past outbreaks (e.g., 2017-18).
- Significant correlation between inadequate WASH facilities and higher cholera incidence.
- Water tanks and ORPs were strategically placed in high-risk areas, reflecting targeted interventions.
- Persistent Vulnerability: Low-income areas like Kanyama remain at high risk for cholera outbreaks.
- Importance of WASH: Reinforces global findings on the need for improved water and sanitation systems.

Key findings

- Initial clusters in eastern Lusaka (Bauleni, Chilenje) with later spread to western areas
- Need to prevent cholera spread from initial hotspots and monitor broader areas
- Lower female literacy rates correlated with higher cholera incidence
- Importance of enhancing risk communication in low areas.

Conclusion

- **Higher Cholera Incidence:** Found in unplanned residential areas
- **Key Factor:** Inadequate access to WASH facilities likely contributed to outbreak spread
- **Recommendation:** Continuous improvement of water, sanitation systems, and targeted public health interventions are crucial for high-risk areas.

Thank you!!!
Zikomo!!!
Natotele!!!

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