Invasive MDR NTS Hotspots in Kenya: opportunities for vaccine introduction

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Background

- In Kenya invasive NTS infections, are of great public health importance, especially in poor-resource settings where clean water supply and sanitation conditions are inadequate.
- Invasive NTS, frequent in children, associated with anemia, malnutrition, malaria or HIV
- The epidemiology, transmission dynamics and spatial-geographic distribution of these infections, are critical info in instituting appropriate disease management and prevention strategies

Aims

Hypothesis: That there are unique genotypes of NTS in hotspots that cause invasive illnesses in children, perpetuated by specific host and environmental factors

- A 5-year study of population-based surveillance for invasive NTS in <16 yr olds
- Describe the spatial and spatio-temporal clustering in reference to household and environmental risk factors.

Study sites

- Mukuru informal settlement 25 km from Nairobi city centre
- One of the largest slums in the city, approx. 250,000 people (KNBS, 2010).
- Densely populated, extreme poverty, overcrowding, substandard housing, insufficient water, and inadequate sanitation, contribute to a high incidence of infectious diseases and increased mortality


HAIR

METHODS

Recruitment and evaluation of patients

- <16 years of age on the date of presentation
- History of at least 3 days of fever and have an axillary temperature of at least 37.5^{o}C or they present with a history of fever
- Three or more loose or liquid stools in the 24 hours before presentation, or one or more loose or liquid stool with visible blood.
- **Controls**: Age matched children from same clinic coming for routine vaccination.

Laboratory Procedures

- **Blood for culture**
  - 1-3 ml for children < 5 years of age and 5-10 ml for 5-16 year olds using Bactec Culture
  - **Blood for HIV-testing-** On site after counselling
- **Stool cultures**
  - The rectal swab or loopful of the stool specimen cultured on selenite F broth aerobically at 37^{o}C overnight.
  - subcultured on MacConkey agar and *Salmonella-Shigella* and incubated at 37^{o} C overnight.

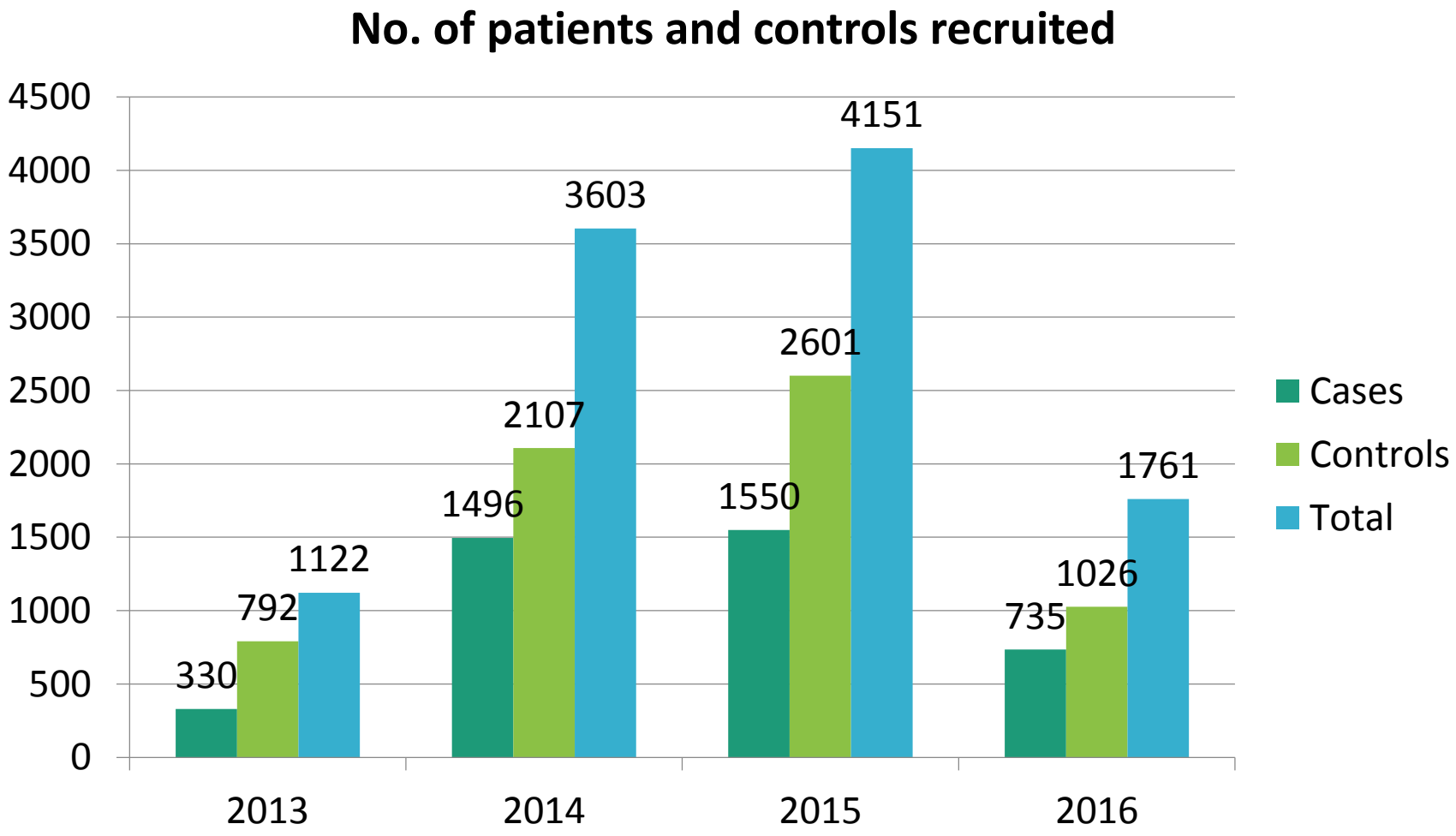
Genotyping of NTS isolates and GIS mapping

- WGS of NTS from blood and stool for detection of phylogenetically informative recently acquired genetic variation.
- GIS mapping of serotypes onto DSS site and correlation with environmental and sociedemographic factors.

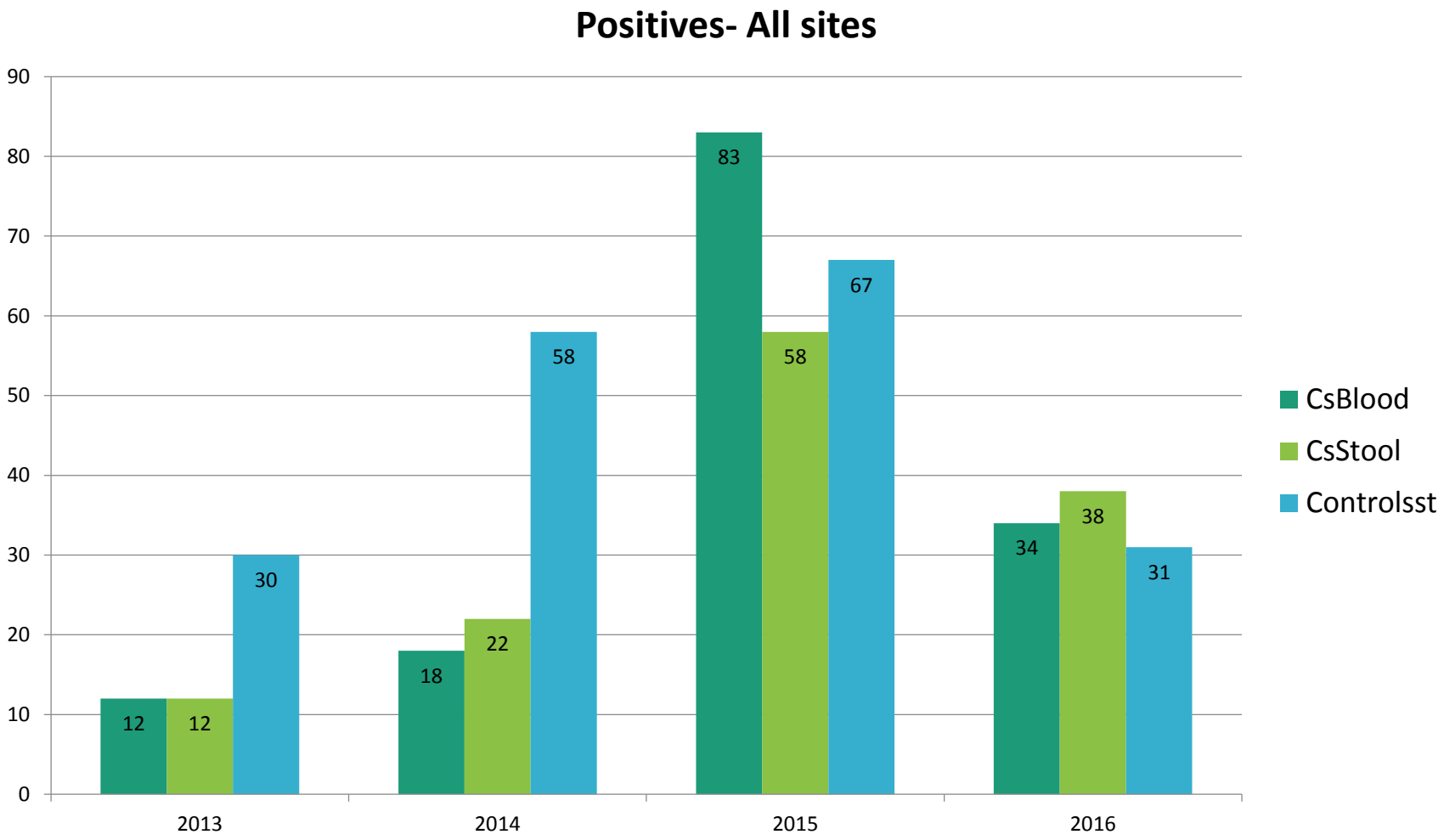
Results
HH Census

- 35,000 households covered in Household Census
- Data from 2,553 households from Mukuru Reuben and 970 from Mukuru kwa Njenga was missing because the occupants were away during the scheduled visits

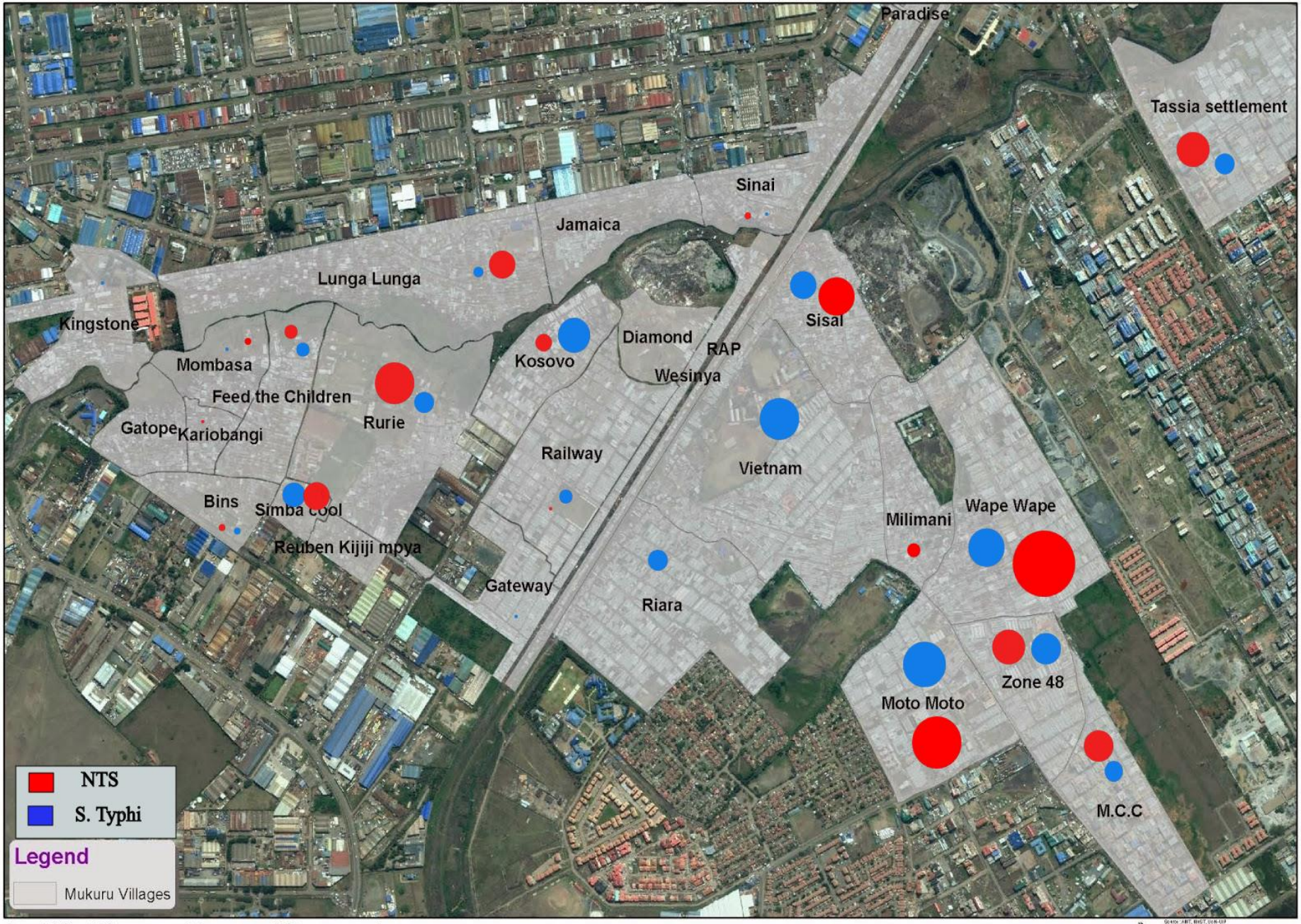
Patient recruitment



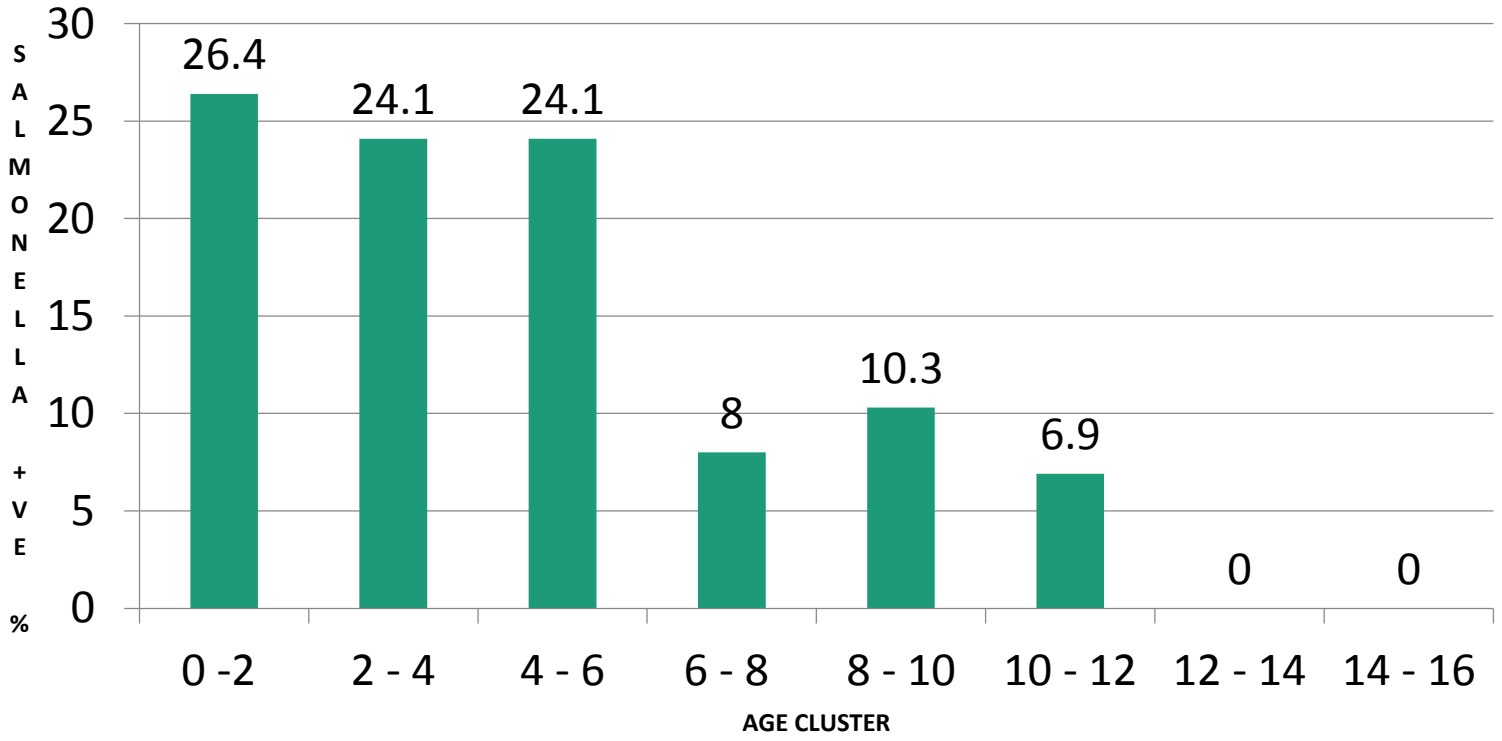
Salmonella positive samples- all sites



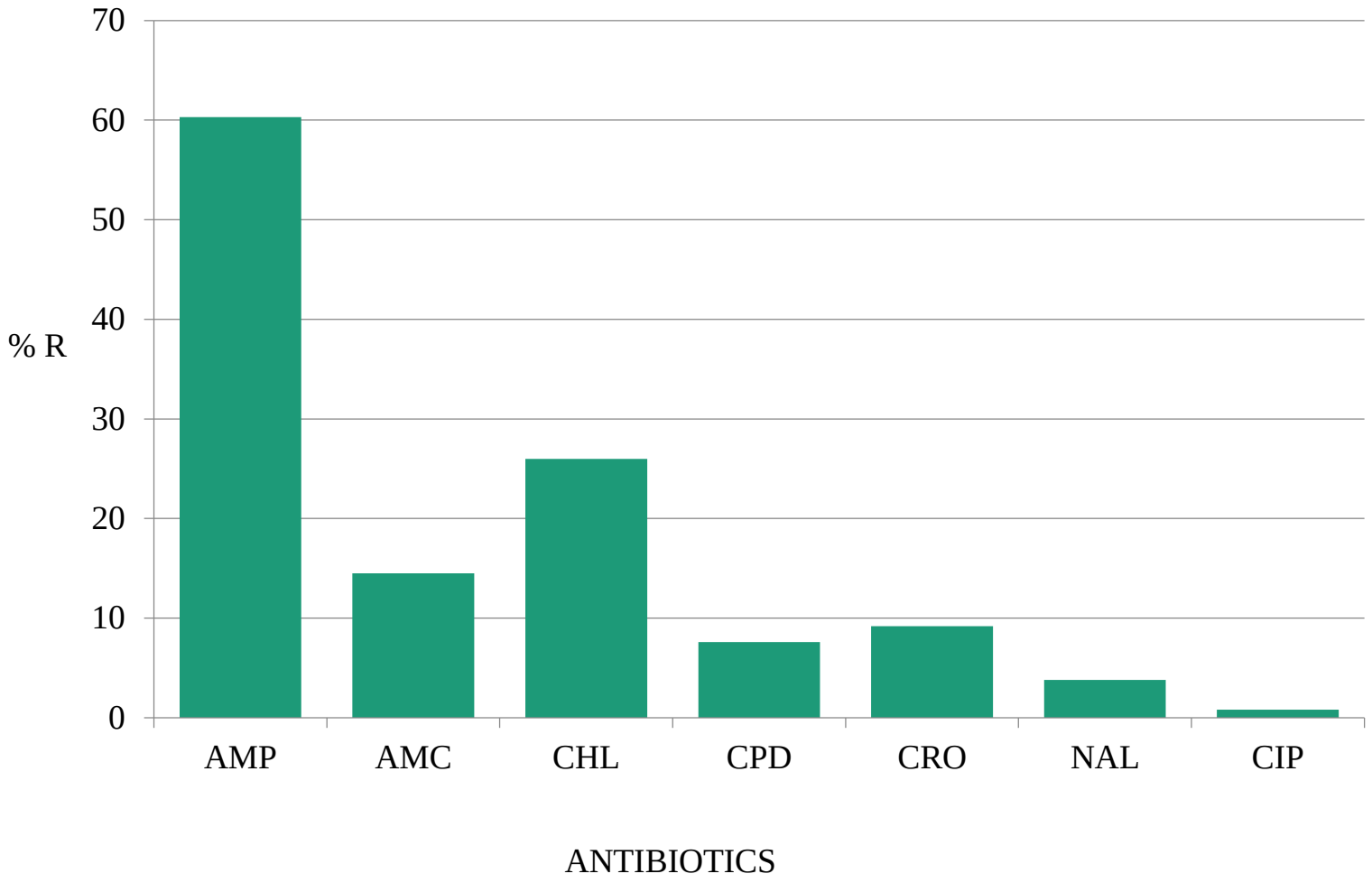
MUKURU VILLAGES



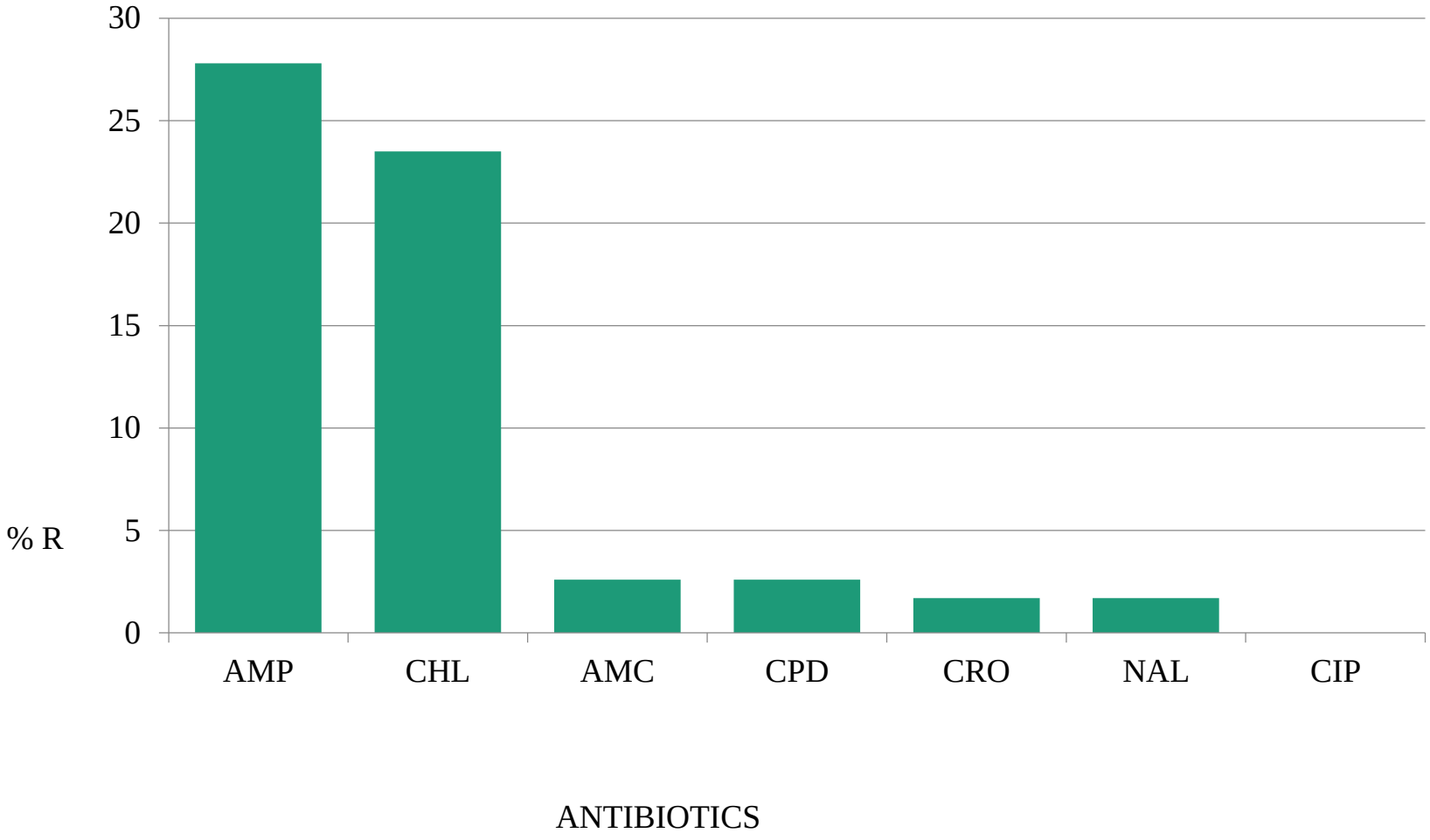
Proportions of Salmonella positives by Age -%



Resistance Patterns of *S.* Typhimurium Isolates from 2013-2016 (N=131)



Resistance Patterns of *S.* Enteritidis Isolates from 2013-2016 (N=115)



Conclusion

- This is a high density slum area with endemic enteric diseases including high incidence of iNTS
- We have mapped hotspots of disease close to key water vending points and close to healthcare centres
- Rates of MDR high for both Typhimurium and Enteritidis
- We recommend these hotspots to be considered for any planned vaccine intervention.

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