Ministério da Saúde
FIOCRUZ
Fundação Oswaldo Cruz

Spatial distribution of schistosomiasis after repeated praziquantel treatments in a rural community in Brazil

Rafael Ponce-Terashima[1], Patricia Bartley[1], Lúcio M. Barbosa[2], Mitermayer G. Reis[2], Ronald E. Blanton[1]
[1] Case Western Reserve University, Cleveland, OH, USA; [2] Gonçalo Moniz Research Center, Oswaldo Cruz Foundation, Salvador, Brazil

Email: rafael.ponce@case.edu

ABSTRACT

Background:
Schistosomiasis is a disease of contact with fecally contaminated surface waters with the appropriate snail intermediate host, rather than ingestion. Repeated treatments with praziquantel reduce schistosomiasis prevalence and morbidity, however transmission persists and prevalence of infection often recovers within a few years.

Methods:
In a community in rural Bahia, Brazil that straddles a river, we surveyed and treated all individuals that tested positive for schistosomiasis by Kato Katz in stools in 2009, 2012, 2013, 2015, and 2017. Upstream and downstream, as well as common water contact sites in the river were sampled and analyzed by microbial source tracking for human fecal indicator markers. The location of each home and water contact site was registered with a hand held GPS unit. Spatial analyses were performed by using QGIS software version 2.14.

Results:
In 2009, schistosomiasis prevalence was 45%. After successive rounds of community-wide treatment with praziquantel, in the years 2009, 2012, 2013, 2015, and 2017, prevalence decreased to 24%, 16%, 13%, and 5.8%, respectively. Among the river water samples, human fecal indicator markers were detectable in minimal quantities upstream of the village. The highest concentrations were found in the downstream sections of the village. Hotspot analysis and raster calculator were used to display the prevalence of schistosomiasis. Distribution of disease was widespread initially and clustered in the downstream sections of the village after successive treatments.

Conclusion:
In this rural community in Brazil, sustained decrease in schistosomiasis prevalence was seen after multiple community-wide treatments over 5 years. Reinfection was not distributed randomly but concentrated in the downstream portion of the village, where human fecal water contamination is increased. Targeting sanitation in key areas may decrease sources of transmission persistence after cessation of community-wide treatment efforts.

RESULTS

Table. Population characteristics.

Population	459
Houses Residents/house	128 3.6
Age, mean (SD)	30.5 (21.6)
Sex, male (%)	221 (48.1%)
Tap water (%)	459 (100%))
Flush toilet (%)	453 (98.7%)
Sewage destination by house (%) Septic tank River	 68 (53.2%) 60 (46.8%)

Figure 1. Study area: Jenipapo.

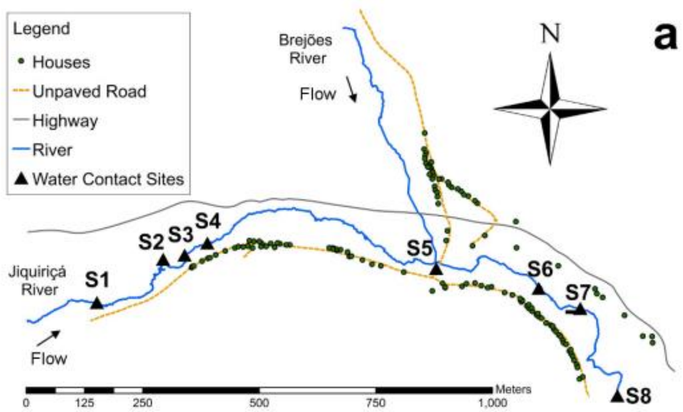
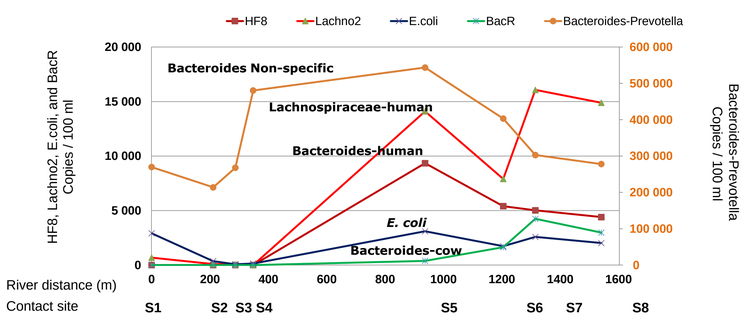
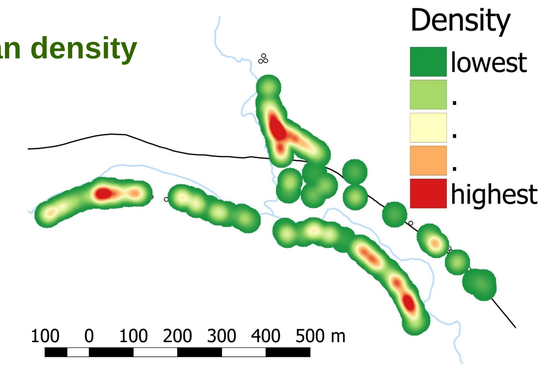


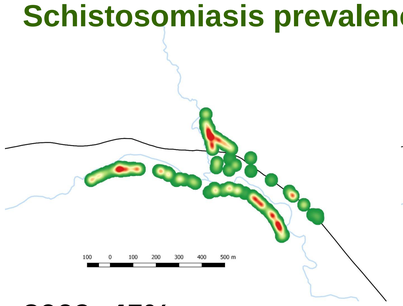
Figure 2. Bacterial concentrations in water contact sites.



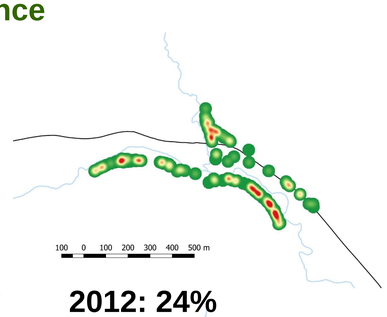
Human density



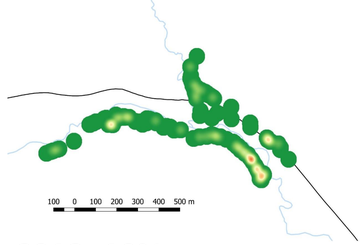
Schistosomiasis prevalence



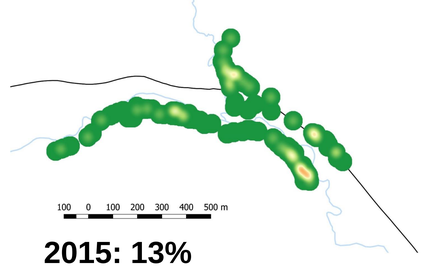
2009: 45%



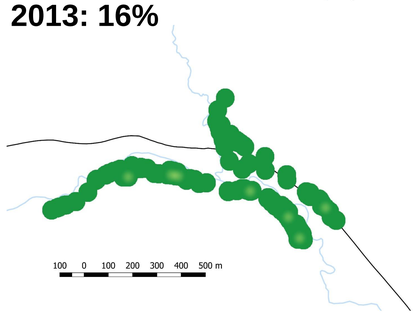
2012: 24%



2013: 16%



2015: 13%



2017: 5.8%

CONCLUSIONS

- Sustained decrease in schistosomiasis prevalence was seen after multiple community wide treatments over 5 years.
- Reinfection was not distributed randomly but concentrated in the downstream section of the village, where human fecal water contamination is increased.
- Targeting sanitation in key areas may decrease sources of transmission persistence after cessation of community-wide treatment efforts.