COUNTDOWN
Calling time on Neglected Tropical Diseases

April 2019

Mapping the Elimination of Schistosomiasis:
Using Precision Mapping to better target interventions

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Background

Schistosomiasis affects more than 240 million people globally including those living in sub-Saharan Africa. Disease control is primarily through preventive chemotherapy (PC) with praziquantel. The drug is targeted toward school-aged children, based on the disease endemicity within a subset of surveyed schools, classified using prevalence of the parasite and intensity of infections [1].

This approach is no longer suitable for achieving schistosomiasis elimination goals and World Health Organization (WHO) roadmap targets. Due to the high focality of schistosomiasis transmission and its dependence on several environmental and epidemiological factors [2], there is a significant difference in infection rates between subsets and schools within the same health districts. Using a few schools to decide treatment for an entire district leads to uncertainty and errors if site selection and sampling are not conducted properly. At-risk communities may not be treated while others may be over-treated, jeopardising the achievement of schistosomiasis elimination [3].

Our recent studies have shown that precision mapping of schistosomiasis is an essential requirement to move towards disease elimination. This involves sampling at a much finer geographical resolution, potentially examining all schools within every sub-unit in order to eliminate errors caused by variation in schistosomiasis rates.

To assess the role precision mapping could play in the move toward elimination of schistosomiasis, we conducted a preliminary study in two health districts in Cameroon.

Key messages

- Precision mapping of schistosomiasis is an essential requirement to move from disease control toward interruption of transmission in sub-Saharan Africa.
- Precision mapping involves conducting sampling at a much finer geographical resolution, potentially examining all schools within each implementation unit to eliminate the errors caused by focal variation.
- This study produced detailed information on high-risk locations where intensified interventions should be focused to obtain higher impact, but also pinpointed areas of lower prevalence where drug needs should be significantly reduced.
- In March 2017, experts attending the international conference `Towards elimination of schistosomiasis: A paradigm shift', in Cameroon, endorsed the precision-mapping approach as one of the priority interventions for schistosomiasis elimination.

Methods

To assess the role precision mapping could play in the stages of moving toward elimination of schistosomiasis, we conducted a preliminary study in two health districts in Cameroon; Edea in the Littoral region, a low-transmission area for the rectal schistosomiasis *Schistosoma guineensis* [4], and Ndikinimeki in the Centre Region, where there occurs a high transmission of intestinal schistosomiasis *S. mansoni* [5].

The study consisted of an exhaustive sampling of all schools (maternal, primary and secondary) in each of these two districts. A total of 126 and 108 schools and 7,470 and 3,463 school children were sampled in the Edea and Ndikinimeki health districts respectively.

School infection prevalence ranged from 0% - 15% in Edea (non-endemic to moderate) and 0% - 50% (non-endemic to high) in Ndikinimeki.

Results

The point prevalence of schistosomiasis in all surveyed schools, shown in Figure 1, clearly illustrates the distribution of the disease in each district. The maps show significant variations in schistosomiasis prevalence within health districts and sub-districts. The majority of schools were negative for schistosomiasis.

For each district, a comparison of maps obtained using the 'conventional' mapping method with those from precision mapping shows significant differences. The precision map illustrates the high focality of schistosomiasis transmission and clearly provides detailed information on high-risk zones and locations where intensified interventions should be focused primarily to obtain higher impact. It also showed areas where schistosomiasis prevalence was lower than indicated by the 'conventional' mapping method and so drug needs would be significantly reduced.

This is the first description of precision mapping of schistosomiasis in Cameroon. However, as the schistosomiasis prevalence may vary significantly from one district to another, the subsequent gains may also vary.

Priority interventions for schistosomiasis elimination

The March 2017 international conference `Towards elimination of schistosomiasis: A paradigm shift', in Cameroon, endorsed the precision-mapping approach as one of the priority interventions for schistosomiasis elimination.

Looking forward to the 2020/2025 WHO roadmap targets and the World Health Assembly WHA65.21 resolution on elimination of schistosomiasis, the conference endorsed the WHO Regional Office for the Africa `PHASE approach', which refers to integrated implementation of a package of PC, health education, access to safe drinking water, sanitation and hygiene, and environmental improvement. The conference put forward four recommendations for priority interventions, the second of which reads:

'…to complete precision mapping to provide high-resolution information to better focus and tailor PC, to adapt treatment strategies to schistosomiasis transmission dynamics, and, where necessary, to introduce biannual treatment as intensification of current PC campaigns…' [6]

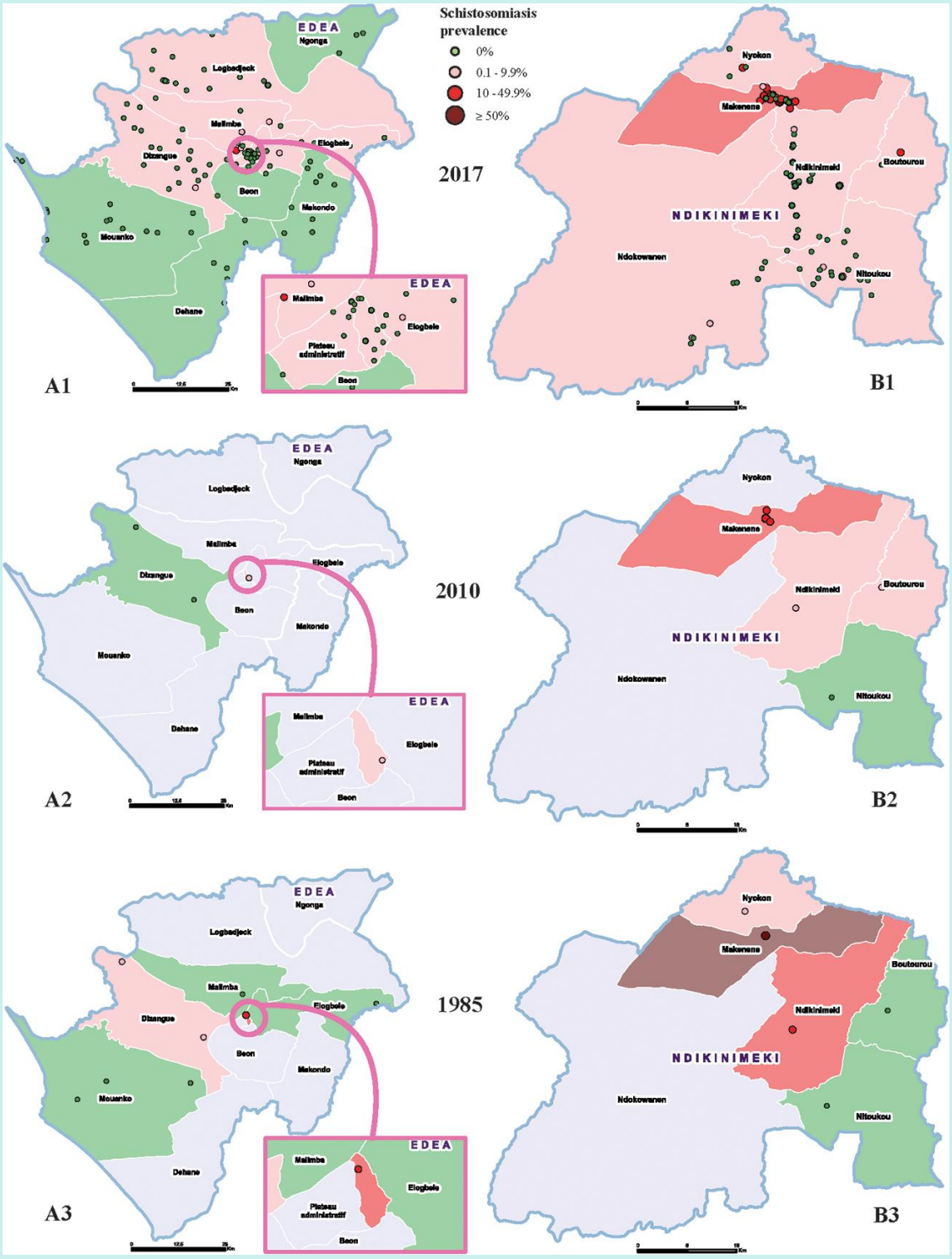

Figure 1. Comparison of precision and conventional maps of schistosomiasis prevalence in Edea (A) and Ndikinimeki (B) health districts, Cameroon.

The precision maps (A1 and B1) provide more accurate information on the distribution of schistosomiasis within districts and a clear precision on subdistricts or communities requiring
PC. Differences of subdistrict prevalence between 1985 and 2010 mappings further illustrate the limitations and uncertainties of the conventional mapping (A2 versus A3 and B2 versus B3).

Produced with Esri ArcGIS Pro 2.0.

Recommendations

Precision mapping should be used to generate the best evidence-based data to guide intensified interventions in targeted transmission zones. This will allow for a better and rational utilization of the donated praziquantel and available resources.

As the schistosomiasis prevalence may vary significantly from one district to another, the subsequent gains may also vary. Therefore, further studies are required to allow adequate assessment of cost-effectiveness and strategy optimisation of precision mapping.

Acknowledgments

The authors would like to thank the researchers at the Centre for Schistosomiasis & Parasitology and field staff, school headmasters, teachers, and all people who contributed in any way to the collection of information and necessary data for the precision mapping study.

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COUNTDOWN (grant ID PO 6407) is a multi-disciplinary research consortium dedicated to investigating cost-effective, scaled-up and sustainable solutions to control and eliminate the seven most common NTDs by 2020.

This is an output of a project funded by UK aid from the UK government. However the views expressed do not necessarily reflect the UK government's official policies.

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