



*Resistant Humans, Mosquitos and Parasites in Cambodia: Producing
Contested Evidence for Malaria Elimination Strategies in the Margins of a
Repellent Trial*

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Summary

This PhD-thesis presents results from mixed method studies performed within two malaria research projects conducted in Ratanakiri province, Cambodia. The first research project focused on identifying human factors involved in the maintenance of malaria transmission at the border of Vietnam and Cambodia. The second project concerned a community-randomized trial investigating the impact of mass use of repellents in addition to the use of Long-Lasting Insecticidal Nets (LLIN) on residual malaria transmission in Ratanakiri province.

The region where these research projects took place is inhabited by indigenous people socio-culturally different from the majority Khmer population of Cambodia and is characterized by ‘residual malaria transmission’, defined as persisting transmission after full coverage of LLIN or Indoor Residual Spraying (IRS) has been achieved. In Ratanakiri, residual transmission is hypothesized to mainly occur by vectors that are active during early evening and morning hours when people are not sleeping in mosquito nets. A close look at the characteristics of the relationship between vector and human behaviour shows a complex interaction over time and place, related to the presence of early and outdoor biting malaria vectors, the indigenous slash-and-burn farmers’ multiple residence system, locally used (partially-) open housing structures, variance in labour and social activities, sleeping times according to the place of residence and season, and variance in bed net use depending on related user preferences.

Other socio-cultural factors unique to particular subgroups among the indigenous peoples or among the Khmer labour migrants flooding the province, such as age-specific sleeping patterns and structures, low uptake of preventive measures and lack of administrative registration, also increased their exposure to malaria. Ethnographic observations revealed that the estimated protection from malaria infection by bed nets was not only low among indigenous youth, but also lower than expected among indigenous and Khmer migrant household leaders. While quantitative survey results reported high LLIN use, actual LLIN use was not as high as self-reported data from surveys indicated when taking into account the amount of households where market nets were being used. By carrying out structured observations instead of relying on self-reported use, we avoided response bias and the often sub-optimal operationalization of the concept ‘net use’ in questionnaires. Moreover, by characterizing the different structural types of human mobility in Ratanakiri, and their differential risk and vulnerability towards malaria exposure, the need for different and adapted malaria prevention and control measures among the groups that are, nevertheless, usually jointly categorized under ‘mobile populations’, is clearly shown in this thesis.

The repellent trial aimed at filling the protective gap in the evenings and mornings when people are still active outdoors by the mass distribution of topical repellents. During the repellent trial, all inhabitants of the study villages were expected to use topical repellents twice on a daily basis, in the morning and in the evening, with the

aim of maximizing the community-wide protective potential of repellents. Access to repellents was assured, acceptance of the product high and efficacy to reduce mosquito bites confirmed. However, no reduction in malaria prevalence could be recorded at the end of the cluster-randomized trial, suggesting that the effectiveness of the intervention mainly depended on human behavior. Our structured observations suggested a daily use by 8% of the study population, far below the minimum required coverage to obtain a mass effect on the vector population and thus on malaria transmission and prevalence.

Although these human practices shape the practice of interventions, many scientists consider them inconvenient challenges and limitations to the production of scientific knowledge. When the protocol of the repellent trial played out into a real life intervention, however, such human practices significantly affected the data upon which the primary outcome of the intervention was built. Context-specific factors, variable human behavior of study staff and study population and the shifting social networks in between, changed the way the protocol of the repellent trial worked out in practice.

Capturing human behavior and human practices in a way useful to public health interventions requires appropriate research techniques and innovative research designs. A design continually adapted to emerging results, combining qualitative and quantitative research techniques, provided an in-depth understanding of the practices of the indigenous people of Ratanakiri, improved epidemiological data collection and finally resulted in a rigorous methodology that allowed a common mode of communication with other disciplines as well as a translation of anthropological findings to a more bio-medically standardized language and system of knowledge production.