Community responses to malaria: interventions in sub-Saharan Africa

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Chapter one

Introduction

This thesis presents data from two multi-site programmes of research that have examined the *social* responses to malaria interventions in sub-Saharan Africa. The first dealt specifically with the attitudes and behaviours linked to a single intervention aimed at reducing malaria morbidity and mortality amongst infants (intermittent preventive treatment, IPTi). The subsequent research addressed more broadly the social and cultural context to malaria during pregnancy (MiP), but also encompassed attitudes towards and behaviours around interventions, such as intermittent preventive treatment (for pregnant women, IPTp). During the research both on IPTi and MiP, we also addressed wider relevant issues, such as local understandings of malaria, care-seeking and illness prevention.

Chapter one provides background and context to the research. With a broad audience of non-malaria specialists in mind, I detail current estimates of malaria mortality and morbidity across sub-Saharan. I then describe the interventions that were the foci of the research and the rationale for their study and implementation. In addition, the chapter seeks to contextualize the research within the broader social science literature on malaria in sub-Saharan Africa and discusses the relationship between our research and medical anthropology. In the subsequent section, I describe the two programmes of research and the research consortia into which they were integrated. This includes details of the research objectives, the methodologies and the study sites. Finally, I briefly summarize the results of the following chapters.

Malaria in sub-Saharan Africa

Despite recent decreases, malaria continues to cause significant mortality and morbidity in sub-Saharan Africa [1]. Indeed, although questions have been raised about the accuracy of regional (and global) estimates of malaria-related morbidity and mortality, the most recent data suggest that, in 2010, malaria was responsible for 1.2 million deaths in sub-Saharan Africa [2][1]. Moreover, in spite of the uncertainties associated with the mortality data, it is accepted that these deaths are concentrated amongst children less than five years of age (around 700 000) [2]. Pregnant women are also identified as a population group that bears a significant burden of malaria-related morbidity and mortality and for whom infection has implications for infant morbidity and mortality [3-5].

[1] There is debate about the accuracy of these most recent estimates that, in light of the limitations around all-cause mortality data in low-income settings, also incorporate data from verbal autopsies and hence lead to greater estimates, particularly amongst adults [2].

The concentration of malaria-related morbidity and mortality in sub-Saharan Africa has complex underpinnings. Moreover, data on rates of malaria-related morbidity and mortality illustrate varied levels and trends across the continent [1].[2] Across Africa, malaria endemicity is heterogeneous: from low, seasonal to year-round holo-endemic and this has varied implications in terms of the likelihood of malaria infection and population immunity to malaria (and the consequent risk of malaria-related morbidity and mortality[3]). In addition to environmental and climatic factors, although the relationship between socio-economic status and malaria prevalence is complex, poverty plays a role [6]: it is no coincidence that malaria-related mortality and morbidity is concentrated in the world's poorest region [1].

Recent, though not universal, improvements in malaria-related mortality have coincided with unprecedented increases in the funding available for malaria research and interventions. The increased financing, mainly focused on sub-Saharan Africa, has contributed to greater access to malaria interventions, particularly insecticide-treated bed nets (ITNs) [7, 8] and to increased procurement of rapid diagnostic tests (RDTs) and Artemisinin-based Combination Therapies (ACTs) [9][4]. Trends in malaria-related morbidity and mortality are however uneven across the continent and cannot simply be explained in terms of increased overall funding.[5]

The increased funding has also led to a rapid increase in malaria research – demonstrated by the increased output of peer-reviewed articles [10] and the emergence of large international research consortia focused on the comprehensive evaluation of malaria interventions[6]. The findings presented in this thesis are the fruit of two such consortia, which have brought together malariologists, health system analysts, health economists and medical anthropologists. What is more, these large research consortia are complex social phenomena and, although not the focus of the thesis, in chapter seven, I touch

[2] As does the coverage and reliability of the data [1].
[3] Populations in non-endemic areas are less likely to have naturally acquired immunity and are therefore vulnerable to symptomatic (and severe) malaria infection in the case of an epidemic.
[4] Although how this translates into the use of ACTs for malaria treatment is more difficult to evaluate due the complicate factors that medicate the delivery and uptake of ACTs on the ground.
[5] Furthermore, the current global financial downturn threatens the sustainability of the unprecedented levels of funding for malaria prevention and control [1].
[6] The rationale for undertaking research as part of large multi-national consortia is linked to the greater coordination of research, particularly clinical trials, in terms of harmonized clinical outcomes and methodologies, and a more comprehensive evaluation of alternative drug regimens (with clinical, immunological, cost-effectiveness and acceptability research), which provides a sufficient evidence base for policy making [11].

upon the social relations and interactions that are brought about by this configuration of research and discuss them in the concluding chapter[7].

Infants and pregnant women

Infants and pregnant women are recognized as two of the population groups that suffer the most deleterious health outcomes as a result of malaria infection. For infants, the increased risk of morbidity and mortality, due to developing severe malaria, is explained in terms of immunological naivety: generally, although the mechanism is relatively unknown, in malaria endemic areas, continued exposure to malaria parasites results in naturally acquired immunity, which provides some prevention from symptomatic malaria [12]. For pregnant women, a temporary loss of naturally acquired immunity – linked to a reduced ability to limit parasite levels [13] – plays a role in their greater susceptibility to symptomatic malaria [13]. Pregnant women are also more attractive to mosquitoes [12] and the accumulation of parasite-infected red blood cells in the placenta results in specific pathologies [13][8].

Indeed, MiP provokes a double burden of morbidity and mortality because it has implications for both maternal and child health [3]. For example, MiP compounds or provokes maternal anaemia, which when severe, increases the risk of maternal death: globally, estimated at around 10 000 maternal deaths each year [4]. Furthermore, MiP contributes to low birth weight (estimated to cause around 100 000 infant deaths in Africa [4]), pre-term delivery, congenital infection and reproductive loss [5]. In spite of its dual burden of morbidity and mortality, MiP was until recently a neglected area of research [14]. But recognition of this double morbidity and mortality burdens of MiP and the many lacunae in the evidence base for interventions, combined with the recent increases in funding for malaria research in general, has led to greater clinical and non-clinical research in this area, such as the work undertaken by members of the MiP Consortium, of which our work forms a part [15].

Interventions

In light of the disproportionate burden of morbidity and mortality that they experience, interventions aimed at reducing malaria-related morbidity and mortality often focus on children and pregnant women. Furthermore, pregnant women and infants, particularly in low-income settings, have greater contact with healthcare facilities than other population groups – during antenatal care

[7] Moreover, the articles compiled in this volume have required cross-disciplinary and institutional collaboration, a theme that I return to in chapter seven.
[8] The effects on the placenta are limited to falciparum malaria.

(ANC) and for infant vaccinations (within the Expanded Programme on Immunization [EPI]) – and are therefore appropriate targets for the implementation of facility-based interventions, such as IPTp and IPTi, and the facility-based dissemination of ITNs. The suitability of interventions for the prevention and control of malaria in these (and other) population groups however depends on the local disease context and prevailing levels of drug resistance. Therefore WHO recommendations are qualified by local epidemiological characteristics.

Intermittent preventive treatment of malaria entails the administration of treatment doses of an anti-malarial at predetermined intervals, regardless of malaria infection. The anti-malarials are generally administered during routine health visits [16] and IPT differs from the approach of chemoprophylaxis – commonly used to prevent malaria amongst travellers to endemic areas – because drug levels are allowed to fall below the protective threshold [17]. This approach is therefore intended to have a less negative effect on the development of naturally acquired immunity [17]. Intermittent preventive treatment was initially developed to replace the chemoprophylaxis that pregnant women previously received in malaria endemic settings. This chemophrophylaxis entailed pregnant women taking preventive doses of chloroquine weekly or twice monthly during pregnancy. However, in light of questions about the effectiveness of this intervention – caused by increasing drug resistance and questions about adherence – attention became focused on IPT [18]. Therefore, in 2004, the WHO recommended the roll-out of IPTp in areas of endemic malaria transmission [19].

Currently, for malaria prevention amongst pregnant women in areas of moderate to high transmission, the WHO recommends the administration of IPTp as part of routine ANC (of which the first dose should be administered as soon as possible in the second trimester) [20]. In spite of questions about increasing resistance, due to the current lack of appropriate other drugs and the suitability of Sulfadoxine pyrimethine (SP) for use during pregnancy, it remains the antimalaria administered for IPTp in many sub-Saharan African countries [20-22].

Although IPTp with SP is established in malaria prevention policies across sub-Saharan Africa [23], coverage of IPTp has often not reached agreed targets [24, 25]. For example, the 'Roll Back Malaria' "Abuja" target set in 2000 aimed for 60% coverage of recommended MiP prevention and treatment by 2005 [26] and was subsequently increased to 80% by 2010 [27]. Data from 2009 to 2011 suggest that, in spite of national policies for prevention and control of MiP, insufficient progress has been made towards the targets for coverage of IPTp

and ITN use during pregnancy: around 20% of pregnant women received at least two doses of IPTp and, overall, coverage was lowest in poor, rural areas [25].

In light of their regular contact with health facilities for EPI vaccinations (and the burden of malaria-related morbidity and mortality that they suffer), infants in malaria endemic area were also identified as a population group that could benefit from IPT. As a result of the research carried out under the auspices of the IPTi Consortium [28-30], for infants in sub-Saharan African countries with moderate to high malaria transmission (and low levels of SP resistance), the WHO recommends the administration of three doses of SP alongside the diphtheria I and II, and measles vaccinations as part of the routine immunization programme [31].[9]

In addition, the WHO recommends that pregnant women and infants receive ITNs, preferably long-lasting insecticide-treated nets (LLINs), as part of routine healthcare, and that they are used regularly [1]. Current recommended therapies for appropriate malaria case management include (for uncomplicated falciparum malaria) quinine/artesunate plus clindamycin and locally effective ACTs [33]. The most appropriate malaria treatment however depends on the malaria species and severity, local patterns of drug resistance, drug availability, and, for pregnant women, gestational age [34].

The effectiveness of these interventions, as is the case of all health interventions, not only depends on their clinical efficacy, but also on additional factors, such as the attitudes and behaviours of target groups, and of the wider community (including those implementing interventions) [35]. Gaining insight into how the social and cultural context influences the effectiveness of malaria interventions has become one of many research areas for social scientists interested in malaria [36, 37]. Indeed, social science research has been identified as a key element of efforts aimed at reducing the global burden of malaria-related morbidity and mortality [37].

Social science research on malaria in sub-Saharan Africa

Over the past 10 to 15 years, social scientists have increasingly studied malaria in sub-Saharan Africa, and particularly within international/public health (exemplified by the trend in published qualitative research on MiP highlighted in chapter two). This research has taken a range of guises: from questionnaire-

[9] Currently, only one country, Burkina Faso, has instigated a policy of IPTi implementation [1]. It has been suggested that the fact that the WHO recommended IPTi only in areas of low SP resistance combined with the lack of data on SP resistance and the presence of resistance above the stated threshold have contributed to a lack of national implementation of IPTi [32]

based studies that seek associations between socio-economic indicators and malaria prevention and treatment-related behaviours [38], to long-term ethnographic research largely based on participant observation [39]. The limitations of more quantitative research that relies solely on questionnaires are widely acknowledged but reviewers have also pointed to a common lack of methodological rigour in qualitative social science research on malaria [40]. Particularly among more applied studies, there has been neglect of observational methods that can be used for the triangulation of interview responses and often poor reporting of study methods [37]. The research on which this thesis is based, in contrast, sought to address such criticisms through long-term data collection involving a range of methods, including observation, and the detailed reporting of methods.

Chapter two presents a review of the qualitative research on MiP in sub-Saharan Africa and several other scholars have reviewed the social science literature on malaria in Africa more broadly [36, 37, 41]. From these reviews, prominent areas of enquiry for social scientists interested in malaria (in Africa) can be identified. Key topics include local illness terms and classificatory systems, understandings of disease causality, treatment-seeking behaviours, attitudes towards preventive or curative interventions, and the implementation of prevention and control policies [36, 37, 41]. Many of these topics are closely linked, and although greater emphasis was placed on particular aspects, to examine the responses to IPTi and the social and cultural context of MiP, our work touched on aspects of each area: for example, the IPTi research was focused on the attitudes towards and behaviours around a particularly intervention, yet this required analysis of local ideas of illness causality.

Previous reviews of social science research on malaria in sub-Saharan Africa have also identified a lack of translation of the findings into policy [37, 40, 42]. Influencing policy was a central aim of our work: the IPTi research was integrated within a broader consortium whose aim was to provide the evidence necessary to support a policy recommendation regarding the implementation of IPTi; whereas the MiP research, though taking a slightly broader approach also addressed specific interventions and we sought to outline clearly the policy-considerations of our findings.[10]

<u>The programmes of research</u>

[10] Several future publications based on data collected as part of the MiP research will be focused on specific prevention and control interventions, such as the acceptability of IPTp with mefloquine in western Kenya.

Our research on IPTi and MiP was integrated into two large international research consortia, which were funded by the Bill and Melinda Gates Foundation. Both consortia developed from looser networks of researchers working in these areas who recognized the need to coordinate their efforts to produce a strong evidence base for policy making. From an early stage in their planning, research on the social responses to malaria interventions aimed at infants and pregnant women was recognized as necessary to ensure that the evidence put forward to policy makers was sufficiently comprehensive.

The IPTi Consortium, formed in 2003 was made up of 17 research institutions from Africa, Europe, the US and Papua New Guinea, together with UNICEF and the WHO. The objectives of the consortium included assessing the efficacy of IPTi in different settings and with different drug regimens, evaluating the safety of the intervention, its effect on the development of immunity to malaria and possible interactions with the immunological responses to other infant vaccinations. Moreover, a team of researchers investigated the cost effectiveness of IPTi across a range of research sites. The consortium also developed a policy platform to facilitate the translation of the findings from its clinical and bench research, health economics and our anthropology into policy [43].

The MiP Consortium, also brings together institutions from across the globe: 47 partners in 31 countries, across Africa, Asia, Europe, South and North America. The consortium's work is organized across several key areas: assessing accurately the burden of MiP; evaluating MiP treatment and prevention; and maximizing that the public health impact of MiP interventions [15]. Our research was conducted under the umbrella of the public health impact group and complemented mixed methods research that was focused on the delivery of MiP interventions within health systems [44]. As part of the broader research on MiP, we also collected data on the responses of interventions that were evaluated within clinical trials that were conducted by other members of the MiP Consortium.

Although our research on IPTi and MiP formed part of two different consortia, there was some overlap in terms of the study sites. In the Kassena Nankana District of Ghana's Upper East Region and in adjoining areas in Nyanza Province, western Kenya (Rarieda and Siaya Districts), we collected data for the IPTi and MiP research. In Malawi, we collected data at two different sites: centrally located Lilongwe and Salima for IPTi and the southern Chikwawa and Blantyre Districts for MiP. Also, data were only collected in Tanzania and Gabon for the IPTi research. As is described further below in the section on study sites, the site selection (and the differences between the two programmes of research) were a result of the pragmatics of the research consortia and were influenced by the locations for clinical trials, selected by the collaborating medical researchers.

The MiP and IPTi research had distinct aims (see table 1) and this, together with the changes in the organization of the consortium – as part of the MiP Consortium public health impact group, which incorporated other social scientists conducting mixed methods research focused on the delivery of MiP interventions – resulted in different methodologies (see table 2). The IPTi research employed a mixed methods approach, using both surveys, semi-structured, in-depth and group interviews. To investigate the social and cultural context of MiP, however, surveys were not used and greater emphasis was placed on qualitative methods, with case studies forming a key element. Both programmes however relied heavily on observational methods.

Table 1. Research objectives

IPTi	1.	To describe knowledge, perceptions, experiences and responses relating to IPTi and EPI of trial participants, community members, and local health care providers across a range of geographical and cultural settings and transmission areas, and involving a range of anti-malarial drugs and regimens.
	2.	To identify and understand the mutual interactions between perceptions of, attitudes to and experiences with EPI and IPTi.
	3.	To identify and understand local barriers to the acceptance of and long-term adherence to IPTi.
	4.	To identify wider socio-cultural, national and regional factors that affect, or may affect, the implementation or acceptability of IPTi.
MiP	1.	To describe the social context of disease due to MiP in African settings
	2.	To assess the acceptability of different drugs for treatment of malaria, and of different approaches to prevention of MiP in Africa
	3.	To identify the broader social and cultural determinants of demand for and reception of MiP interventions (including both users and non users)
	4.	To identify the socio-cultural factors at facility and district levels which influence the supply of MiP interventions in the context of other reproductive health (or ANC) interventions
	5.	To explore the socio-cultural factors influencing policy uptake and nationwide implementation

Table 2. Data collection techniques and respondent types

	Data collection technique	Type of respondent
IPTi	In-depth individual interviews	Participant mothers
		Trial drop out mothers
		Health workers
		Opinion leaders
		Traditional healers
		Non-participant mothers
	Informal conversations	Community members
	Focus group discussions	Participant mothers
		Community members
	Semi-structure interviews	Fathers
	Questionnaire	Participant mothers
		Health workers
		Community members
	Observations	(In communities and health facilities)
MiP	Case studies	Pregnant women
	In-depth individual interviews	Pregnant women
		Health providers
		Relatives
		Opinion leaders
	Focus group discussions	Community members
	Observations	(In communities and health facilities)

There was some continuity in the management structure and personnel in both programmes of research, but there were also changes, some of which had implications for data collection. Both involved the collaboration between researchers based in Barcelona and at the field sites, and were led by the same Principal Investigator. However, during the IPTi research, day-to-day supervision of data collection was delegated to local social scientists who resided at the field sites. During the MiP research, team members based in Barcelona took on this role and made longer and more frequent site visits. These changes were also based on the lessons learnt from the IPTi research, particularly with regard to the high turnover of field-based staff, and the disruptive impact that this had on data collection in terms of delays as a result of repeated recruitment and retraining.

Although I was personally involved in both programmes of research, my roles were slightly different. For the research on IPTi, I directly supervised data collection at the Kenyan site and made field visits of several weeks at a time, during which I also conducted interviews and focus groups, and carried out observations. As a member of the team based in Barcelona, I compiled data collected at the field sites, read and coded the interviews from all sites, created the databases for inputting the questionnaire responses and analyzed the quantitative data. For the MiP research, I collected and supervised data collection at the Kenyan site, coded and analyzed this qualitative data. I also took

the lead on several articles, which have drawn on data from various research sites and which I have brought together in this thesis.

Our research and (medical) anthropology

Anthropology is a theoretically (and methodologically) "broad church" involving scholars with diverse interests, approaches and theoretical orientations, whose work has varied degrees of policy-relevance. In light of its aims and its contribution to large, multi-disciplinary consortia, our research on MiP and IPTi occupies a position at the more applied end of the spectrum. As a result, the findings have been largely presented in a format that is relevant and accessible for a broad public health audience. The articles collated in this thesis therefore make infrequent explicit reference to anthropological theory. It does not follow however that these programmes of research were not *anthropological*.

Many of the basic tenets of (medical) anthropology were central to our research both on IPTi and MiP. Findings were based on long-term fieldwork, which incorporated observational techniques; we collected data with an awareness for and examination of *emic* and *etic* perspectives – particularly mindful of local illness terms and concepts; we made efforts to contextualize findings and to avoid abstracting phenomena from their wider social context; reflexivity was encouraged amongst team members; and *culture* was not considered deterministic, but rather its influence on practice explored and unpacked. This is however unsurprising: both programmes of research were conceived and undertaken by researchers with backgrounds in medical anthropology.

The multi-site nature of the MiP and IPTi research means that it departed from the single-context ethnographic research that characterized much of 20th century anthropological enquiry. However, multi-site anthropology has been conducted since Malinowski pursued the Trobrianders around the Kula ring [45]. Anthropologists perhaps more commonly follow the people, but we followed the intervention (IPTi) in one programme of research and the illness (MiP) in the other. Indeed, for the MiP and IPTi research, a multi-site approach was essential because implementation of the interventions affects socially, culturally and linguistically diverse populations. The use of multiple sites also allowed us to take a comparative approach and, through analyzing similar phenomenon across diverse social, cultural and healthcare contexts, we were able to identify and interrogate relevant themes that might otherwise be taken for granted [46].

Study sites

Data were collected at 11 sites spread across five countries (Gabon, Ghana, Kenya, Malawi and Tanzania). In addition to the scientific objectives, the pragmatics of collaborating with clinical trial and implementation studies, as part of the research consortia, played a key role in study site selection. For the IPTi research, the choice of study sites was a result of the scientific need to include as broad and representative a range of settings, IPTi drugs and regimens as possible and the pragmatic limitations imposed by the location of the relevant IPTi Consortium studies, the readiness of local research institutions to host our research and the available funds. The MiP study sites were chosen to reflect social and cultural diversity, varied malaria prevalence, heterogenous pregnancy care practices (specifically, ANC at health facilities), and practical factors, such as the presence of relevant clinical research, existing collaborations and the availability of personnel to carry out data collection. There was therefore great diversity across the research sites, for example, in terms of the predominant ethnic groups, malaria endemicity, climate and previous experience of medical research. Although more details is provided in the individual chapters, some of this diversity is summarized in tables 3 and 4. The sites are also summarized in figures 1 and 2.

Table 3. The IPTi research sites[11]

Site		**Malaria transmission**	**Companion study**
Kenya	Asembo (Rarieda District)	Stable, perennial transmission [48]	Randomized controlled trial
Tanzania	Korogwe District Same District	Medium transmission [49] Low transmission [49]	
Gabon	Lambaréné	High, perennial transmission [50]	
Ghana (Upper East)	Bawku District Bolgatanga District Builsa District Kassena-Nankana District	Seasonal transmission [51]	Implementation study
Malawi (central)	Lilongwe Salima	Low stable transmission* [52]	

*Lack of data but fall within a region of low stable transmission.

[11] As part of the wider IPTi acceptability research, data were also collected at a site in Papua New Guinea. This thesis however concentrates on the data collected in sub-Saharan Africa and therefore reference is not made to this study [47]. Data were also previously collected at two other African sites (southern Tanzania and Mozambique). I was not directly involved in these studies and therefore the resulting publications are not included here. Reference is however made to these studies in chapter two.

Figure 1. The IPTi research sites

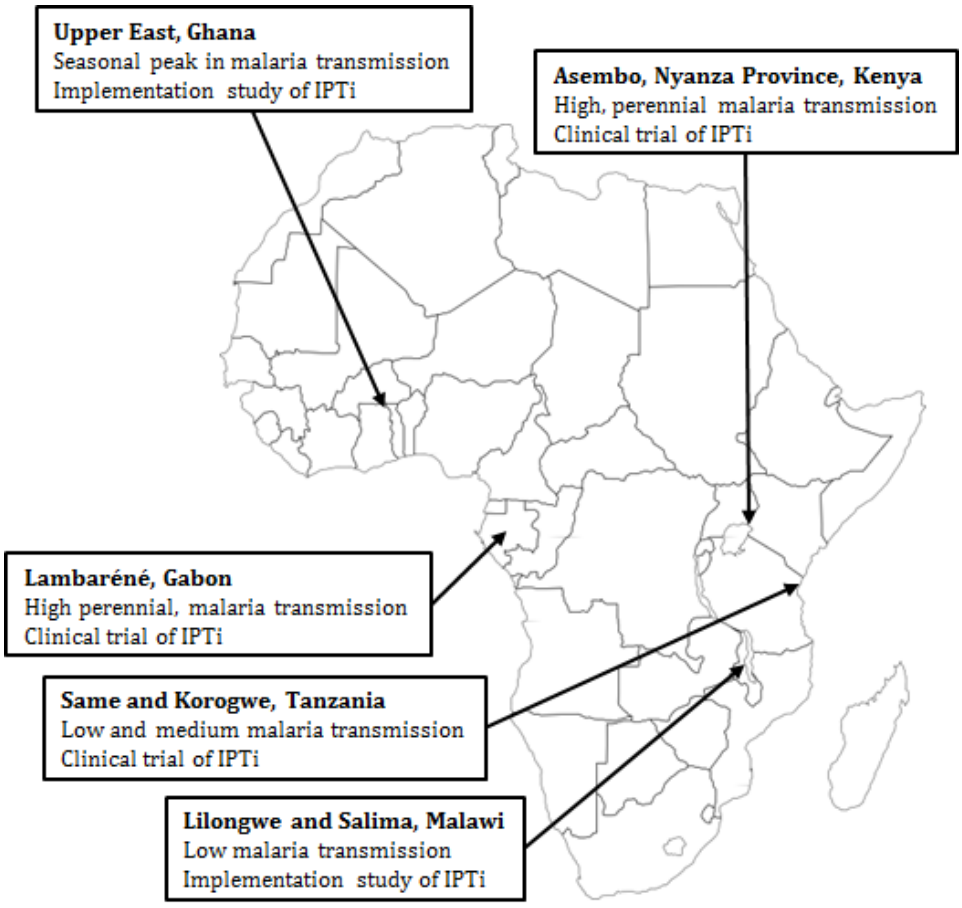


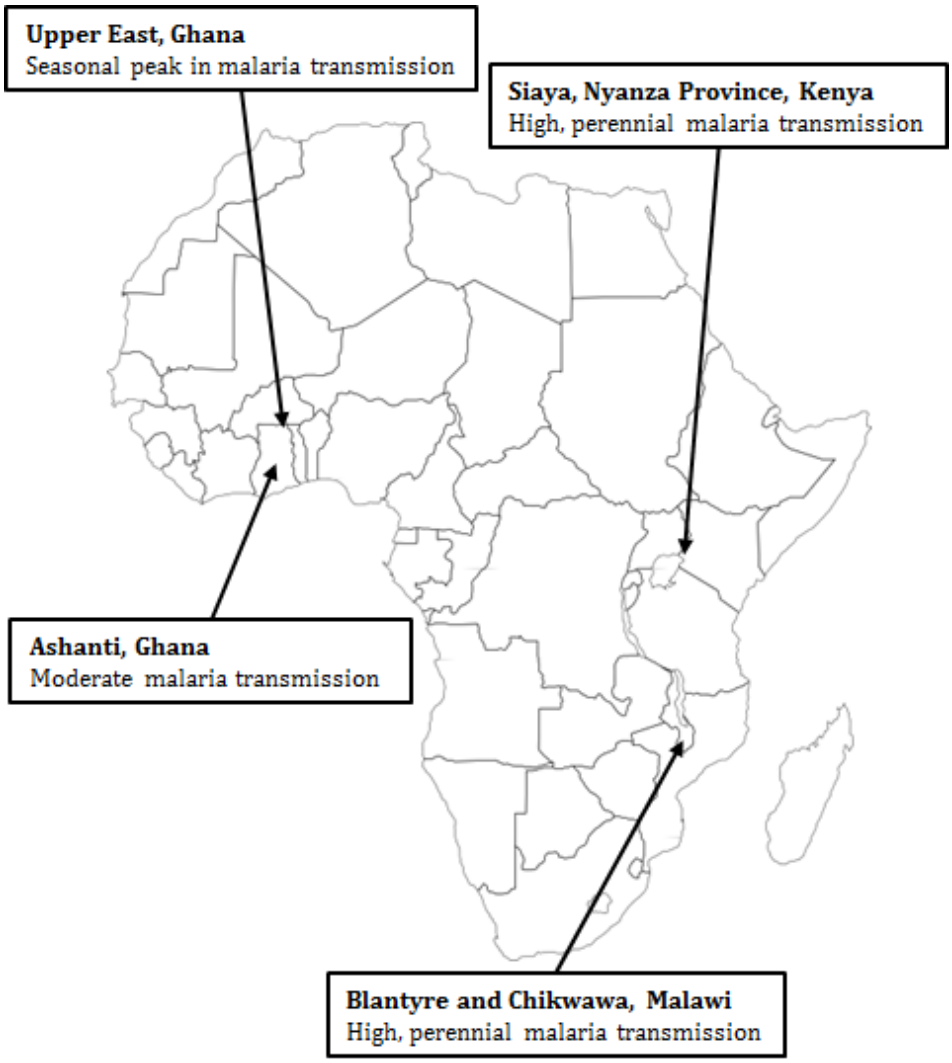
Table 4. The MiP research sites[12]

Site		**Settlement types**	**Malaria transmission**	**ANC attendance** (% ≥4 visits)
Kenya	Siaya District	Rural and peri-urban	Stable, perennial transmission [48]	47
Ghana (Upper East Region)	Kassena Nankana District	Urban, peri-urban and rural	Seasonal transmission [51]	78
Ghana (Ashanti Region)	Ejisu Juaben District	Urban, peri-urban and rural	Moderately high with seasonal peaks [53]	
	Ahafo Ano South District	Peri-urban and rural		
Malawi (Southern Region)	Blantyre District	Urban and peri-urban	Medium to high transmission* [52]	46
	Chikwawa District	Rural		

*Lack of data but fall within a region of medium to high transmission.

[12] As part of the MiP research, Data collection was also undertaken in Papua New Guinea. However, because this thesis focuses on sub-Saharan Africa, these data are not presented here.

Figure 2. The MiP research sites



Overview of the following chapters

The articles collated in this thesis are divided into two groups. I present the work on the social and the cultural context of MiP, and then the research on IPTi. Although the IPTi research was conducted first, the greater breadth of our work on MiP prompts me to start with that.

Chapter two

Chapter two provides a comprehensive overview of qualitative research on social and cultural factors relevant to uptake of MiP interventions in sub-Saharan Africa. The chapter is a systematic review and synthesis of findings from qualitative studies. In this article, we sought to identify gaps in the qualitative research on MiP, discover complementary or contradictory findings and develop priorities for further research. We focused on studies based on qualitative research methods to ensure that the synthesis of findings was manageable and to draw attention to a neglected body of research.

In total, we identified 37 studies; fourteen of which concentrated on MiP. Other identified studies focused on malaria treatment and prevention, ANC, anaemia during pregnancy or reproductive loss. From the included studies, we identified several key themes: concepts of malaria and risk in pregnancy, attitudes towards interventions, structural factors affecting delivery and uptake, and perceptions of ANC.

The synthesis of findings highlighted that although malaria risk is associated with pregnancy, women's vulnerability is often considered less disease-specific and MiP is interpreted in locally defined categories. Local discourse and health workers' ideas and comments also influence concerns about MiP interventions. Understandings of ANC, health worker-client interactions, household decision-making, gender relations, cost and distance to health facilities affect pregnant women's access to MiP interventions and lack of healthcare infrastructure limits provision of interventions. We highlighted that further qualitative research was however required: many studies were principally descriptive and an in-depth comparative approach is recommended.

Chapter three

Drawing on data from the research programme on the social and cultural context of MiP, chapter three explores and compares local understandings of MiP and their links with other pregnancy-related health problems. The article illustrates how across the four sites, local malaria concepts overlapped with biomedically defined malaria. In terms of symptoms, at-risk groups, outcomes and aetiology of malaria during pregnancy, this overlap was however both site-specific and partial. Moreover, the local malaria concepts were not monolithic and their descriptions varied amongst respondents. The symptoms of pregnancy and malaria also overlapped but, for respondents, symptom severity was the distinguishing factor. Malaria was generally, though not universally, perceived as serious for pregnant women. Miscarriage was the most widely known outcome, and links with anaemia, low birth weight and congenital malaria were

mentioned. Nonetheless, amongst many potential causes of miscarriage, malaria was not recognized as the most important, but rather interacted with other pregnancy-related problems. Given the overlap of common pregnancy problems with the symptoms of malaria, and the limited association of malaria with its main outcomes, a comprehensive ANC programme is the most appropriate strategy for the provision of health education, prevention and treatment for MiP. Variations in locally shared understandings of MiP must however be taken into account when designing and promoting MiP intervention strategies.

Chapter four

Chapter four focuses on current recommended MiP prevention and control: IPTp, distribution of ITNs and appropriate case management. The article explores the social and cultural context to the uptake of these interventions at four sites across sub-Saharan Africa. The findings illustrate that although ITNs were generally recognized as important for malaria prevention, their availability and use differed across the sites. In Malawi and Kenya, ITNs were sought-after items but there were complaints about availability. In central Ghana, women saved ITNs until the birth of the child and they were used seasonally in northern Ghana. In Kenya and central Ghana, pregnant women did not associate IPTp with malaria, whereas, in Malawi and northern Ghana, IPTp was linked to malaria, but not always with prevention. Whether delivered with directly observed treatment or not, although IPTp adherence was the norm, at all sites, some women did not comply with IPTp, often because of previous side effects. Although generally viewed as positive, experiences of malaria testing varied across the four sites and in both Ghana and Malawi there were cases of overtreatment. Despite generally following the advice of health staff, particularly in Kenya, the availability and accessibility of medication – including antimalarials – influenced where women received malaria treatment.

Two key recommendations from this article are: due to the cases of IPTp non-adherence, further research is require regarding IPTp delivery and, given the importance of side effects, measures are required to mitigate their impact on adherence; and because negative malaria test results did not necessarily lead to non-treatment (particularly in Ghana and Malawi, and in the former as a result of a misinterpretation of national policy) local implementation of national malaria plans must be monitored carefully.

Chapter five

Chapter five comparatively explores the factors that influence ANC attendance across four sub-Saharan African sites in three countries (Ghana, Kenya and Malawi) with varying levels of ANC attendance. At these sites, interventions for

the prevention and control of malaria during pregnancy (IPTp and ITNs) are recommended as part of routine ANC at health facilities. Utilization of ANC at health facilities plays a crucial role in uptake of these interventions, and therefore exploring factors that influence ANC attendance was a key objective of the research into the social and cultural context of MiP.

In these socially and culturally diverse research sites, the findings suggested that both demand *and* supply side factors have an important influence on ANC attendance. Timely ANC attendance was influenced by: women's and health staff's uncertainties in early pregnancy; the design of ANC and its capacity to deal with uncertainty around pregnancy status and the degree to which care is orientated towards women's health concerns; the provision of clear, unambiguous recommendations about the timing of ANC and messages that identify ANC as a service that deals with health concerns during early pregnancy; and the perceived normality of ANC initiation in early pregnancy. Furthermore, a perceived lack of flexibility regarding follow-up appointments increased the total cost of ANC, which can result in delayed ANC, particularly amongst women with limited resources and who face high transport costs. Moreover, the direct charges levied for ANC procedures – not authorized in national ANC policy – represented only part of the wider cost of ANC.

In light of these findings, to ensure appropriate design and effective delivery of ANC, attention should be paid to the *on-the-ground* implementation of ANC. Women's understanding of these local forms of ANC at health facilities, how women deal with reproductive uncertainty and the efforts that women make to care for themselves and their pregnancies should also be considered.

Chapter six

Chapter six provides an overview of the IPTi acceptability research. The findings presented are mainly based on data from five sites (in five countries) across East, West and Southern Africa. At these sites, the studies were conducted in the context of clinical trials and implementation studies of IPTi. The social and cultural acceptability of IPTi formed the central research question, but the research also examined the influence of people's response to IPTi on attitudes to and uptake of immunization, malaria prevention and treatment. A mixed methods approach was taken and questionnaires, semi-structured interviews, in-depth interviews and focus group discussions were carried out. Respondents included the mothers and fathers of infants who received IPTi, health workers who administered IPTi, along with community members, opinion leaders, and traditional healers.

The data from these five sites illustrated that IPTi was widely acceptable because it resonated with existing preventive practices and a general concern about infant health and good motherhood. It also fit neatly within already widely accepted routine vaccination. Acceptance and adherence were further facilitated by the hierarchical relationships in healthcare settings and resulting authority of health staff, and by the social importance of clinic attendance for women, which was in addition to obtaining health care. The type of IPTi drug administered and regimen were shown to be important: newer drugs were seen as more effective, as well as potentially more dangerous. Single dose infant formulations delivered in the clinic seemed to promote acceptability and adherence. The studies revealed little to suggest that IPTi *per se* had a negative impact on attitudes to other vaccinations or that it had any effect on adherence to other vaccinations. Evidence of any negative impact on health seeking for infants with febrile illness or existing preventive practices was absent.

Chapter seven

In this chapter, I explore the dispute that took place when I attempted to publish an article on the persistence of blood stealing rumours at a site where we collected data for the IPTi research. I discuss the responses of some of the medically trained collaborators to the proposed article and reflect on what their responses suggest about inter-disciplinary collaboration more broadly. Ultimately, in this chapter I aim to highlight useful lessons for cross-disciplinary collaboration.

This chapter provides an outline of the argument that I put forward in the manuscript on blood stealing rumours. I then describe the collaborators' criticisms of the draft and offer some analysis of their responses. Within the overall positive collaborations with medically trained researchers during IPTi and MiP research, the dispute was an exceptional occurrence: it took place within a confluence of individual, institutional and inter-disciplinary differences. The dispute illustrates some of the pitfalls of this type of collaboration and I therefore seek to highlight potential strategies that can be employed to obstruct the publication of research findings if they are objectionable to collaborating researchers. More broadly, this episode also draws attention to the *realpolitik* and pragmatism of international public health research, for which anthropologists wishing to engage in applied collaborative research should be prepared.

Chapter eight

Chapter eight draws together the findings presented in this thesis. I address the chapters' broader themes and discuss them with regard to the wider research. I

also discuss some of the challenges and benefits of multi-site team-based social science.

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