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Bottlenecks for High Coverage of Intermittent Preventive Treatment in Pregnancy: The Case of Adolescent Pregnancies in Rural Burkina Faso

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Abstract

Background: While IPTp-SP is currently being scaled up in sub-Saharan Africa (SSA), the coverage with the required ≥2 doses of SP remains considerably short of the Roll Back Malaria (RBM) goal of 80%, not to mention of the recently advocated universal coverage.

Methods: The study triangulates quantitative data from a health center randomized community-based trial on IPTp-SP effectiveness and the additional benefit of a promotional campaign with qualitative data from focused ethnography.

Findings: In rural Burkina Faso, despite the significantly higher risk of malaria infection among adolescent primigravidae (PG) (OR 2.44 95%CI 1.81–3.28, p<0.001), making them primary target beneficiaries of IPTp-SP, adolescents adhered to the required three or more ANC visits significantly less (PG: 46.6%; SG 43.7%) than adults (PG: 61.9%; SG 54.9%) and had lower SP uptake during the malaria transmission season, further showing the difficulty of reaching this age group. Adolescents’ structural constraints (such as their social position and household labor requirements) and needs (such as anonymity in the health encounter) leave them highly vulnerable during their pregnancies and, especially, during the high malaria transmission season.

Conclusion: Our study shows that adolescents need to be targeted specifically, prior to their first pregnancy and with measures adapted to their social context, addressing their structural constraints and needs and going beyond standard health promotion campaigns. Unless such specific measures are taken, adolescents’ social vulnerability will present a serious bottleneck for the effectiveness of IPTi-SP.

Introduction

In areas of high transmission, intermittent preventive treatment with sulfadoxine-pyrimethamine (IPTp-SP), is recommended for all pregnant women and is one of the cornerstones of malaria control together with insecticide treated bed nets (ITNs) and effective case management [1–5]. While IPTp-SP is being scaled up in sub-Saharan Africa (SSA) and despite high uptake of the first dose, the coverage with the required ≥2 doses of SP falls significantly short of the Roll Back Malaria (RBM) goal of 80%, not to mention of the recently advocated universal coverage [6–9]. There is, therefore, an urgent need to identify possible bottlenecks in order to allow this public health intervention to be efficiently translated into daily practice.

IPTp-SP delivery is closely linked to the access and utilisation of antenatal clinics (ANC), but little is known about the factors influencing the utilisation of antenatal health care, SP uptake and the interface between both factors [10]. Insufficient ANC attendance has been related to numerous factors such as distance, perceived inadequacy of services and high costs, and lack of privacy [11,12]. Infrequent use of ANC and late attendance during pregnancy, the latter influencing the number of SP doses a woman can take, have also been related to education, low socio-economic status, high parity and unplanned or mistimed pregnancies [13]. At the health facility level, poor health worker performance, drug shortage, confusion about timing and spacing of SP doses, and correct assessment of the gestational age have further been identified as additional obstacles [14–17]. Among
pregnant women, primigravidae, many of them still adolescents, have an increased susceptibility to malaria and are, therefore, one of the main beneficiary groups for IPTp-SP [10].

In this paper we describe age and parity specific patterns of SP uptake in the context of a targeted health promotion campaign that was conducted in rural Burkina Faso in order to stimulate ANC attendance and IPTp-SP adherence. Quantitative and qualitative methods are combined to explore and discuss socio-cultural aspects that set adolescents apart from other pregnant women and constitute bottlenecks for IPTp-SP coverage.

Methods

Study Site & Population

This study was conducted between 2003 and 2006, in Western Burkina Faso, in the rural health district of Boromo. In 2004, the estimated population of 204,117 people was distributed in 133 villages and 37 hamlets belonging to a variety of ethnic groups (Bassari, Dafing, Bo, Nounouna, Mossi, Peuhl, and others). Almost all practiced subsistence farming (sorghum, millet, maize, peanuts) and growing cotton for cash income. The climate is of Sudano-Sahelian type with a rainy season from May/June through October (mean rainfall 800 mm/year). Malaria is holoendemic with highly seasonal transmission during and after the rains. Formal health services are provided by a district hospital situated in the provincial capital Boromo and 27 peripheral health centers (HCs) situated in larger villages up to 85 km from Boromo.

Study Design & Research Strategy

The health center randomized community-based trial on IPTp-SP effectiveness and the additional benefit of a promotional campaign has been described in detail elsewhere [19]. Briefly, twelve peripheral HCs were selected; in 8 of which IPTp-SP (2 doses, one in the second, and one in the third trimester of pregnancy) was introduced at ANC while the remaining HCs offered weekly chloroquine (CQ) according to the national policy (around 3–5 days) were repeatedly carried out in the selected villages (Ny and Ouahabou; Serena and Zinakongo; Mou and Seyou; Toné and Laro Bidouané; and Bana and Wona). Reiterated and shorter visits and conversations were preferred as they establish better relations with informants and provide more reliable information than do longer stays where the researcher's presence risk becomes taxing or imposing. Additionally, all 13 HC in the study area were visited.

Interviewing. General and in-depth interviews were held in the selected locations. Interviews were recorded and transcribed after respondents’ verbal consent. In those cases when the interviewer(s) considered that recording or taking notes in the presence of the respondent was not appropriate due to the sensitive nature of the subjects discussed, the required informality of the interview, the respondents’ preferences or other limitations, the conversation was not recorded but the content written down immediately after the interview. 48 interviews were carried out with health staff and 35 with other community members and key informants (not including informal interviewing).

Group discussions. Both formal and informal group discussions were carried out in combination with the above-mentioned techniques. Group discussions were held with community promoters trained for the health promotion campaign (4GD; N = 12); pregnant women and extended family members that belong to the same couv (literally courtyard); forming a unit of social and economic cooperation (9GD; N = 32).

Structural characteristics of the data collection techniques. The degree of formality/informality and pre-defined structure of the mentioned research techniques was decided upon...
by the researchers in each specific context and based on the criteria of reliability of data. In general terms, research techniques were used in a less structured way in the beginning of the study and gradually defined while insights and preliminary knowledge was gathered. Reiterated informal conversations were held with the same respondents, especially adolescents, to increase trust and reduce bias - a possible problem since respondents generally tend to claim adherence to prescribed public health interventions, irrespective of their personal experience, opinions or actions, in order to avoid being seen as ‘negligent’ and/or ‘ignorant’ of basic biomedical health ordinances. A record of the most important informal conversations was kept until saturation.

**Sampling.** Sampling in the study localities was purposive. Informants were segmented according to relevant criteria such as gender, age, religion, ethnicity, locality, number of pregnancies, social acceptability of the pregnancy, access to ANC, timing of ANC-visits, etc. to allow for maximum variety and internal diversity, including critical cases. Guided observation, conversations, interviews and group discussions were held in all study locations and among a sufficient number of respondents to obtain a coherent picture of the social setting and the local social context. Participants in group discussions were selected by respondent driven sampling based on the criteria of confidentiality.

**Data Analysis**

**Quantitative data.** Data were double entered in an Access 2003 database and analyzed using Epi Info 2000 (version 3.2.2; Centers for Disease Control and Prevention, Atlanta) and STATA (Intercooled version 10; Stata Corp., College Station, TX) software packages. Differences in proportions were tested with the chi-square test and a p-value of $<0.05$ was considered statistically significant. Linear regression was used to compare means. Odds ratios (OR) with corresponding 95% confidence intervals (95%CI) were computed using logistic regression and adjusted for the cluster randomized design of the survey. Women experiencing a miscarriage were not included in the analysis. Gestational age was computed only for women with singleton live-births and analyses involving SP-uptake are restricted to 1,514 women who delivered in IPTp-SP study arms.

**Qualitative data.** In accordance with the research strategy, data analysis was a flexible and iterative process: preliminary data from different techniques were collected and analyzed; further research was then conducted confirming or refuting temporary results until saturation was reached and data could be theoretically supported. Interviews were systemized and analyzed with N/Vivo Qualitative Analysis software (QSR International Pty Ltd. Cardigan UK).
Ethical clearance. The study was approved by the Burkina Faso Ministry of Health and the Ethical Committees of the Prince Leopold Institute of Tropical Medicine. Local health authorities and community leaders were informed about the study objectives and procedures for data collection. All study participants gave informed consent after explanation of the procedures in the local language. Focused ethnography followed the Code of Ethics of the American Anthropological Association [21,22]. Oral consent was preferred, since the interviewees were not put at any risk of being harmed in their safety or psychological well-being and because the act of signing one’s name when providing data can be considered a potential reason for mistrust.

Results

Baseline characteristics of participants in the intervention study

Within the community-based trial, 2,240 pregnant women were followed up until delivery; 1,235 (55.1%) of them were PG and the remaining 1,005 SG, equally distributed across the three study arms (Table 1). More than half (55%) of the women were adolescents (≤19 years) with about one third of PG younger than 18 (31.8%). Despite the young age, the majority (95.0%) were married. Only 474 (21.2%) women had received any formal education. Affiliation to ethnic and religious groups reflected the cultural variety in the study area. About half of the women lived in villages with a HC, a quarter in villages with a HC within 5 km and a quarter with a HC more than 5 km away (Table 1).

Malaria infection

Thick blood films were prepared during antenatal booking visits for 1,382 women (751 PG and 631 SG) prior to antimalarial treatment and the proportions of women with peripheral parasitaemia are presented in Figure 2. Overall, 809 (58.5%) women had malaria parasites, all *P. falciparum*, in the peripheral blood. The risk of being infected was lowest for adult SG followed by adolescent SG (OR 1.35 95%CI 0.93–1.96, p = 0.101). Adolescent PG had a more than two-fold increased risk of malaria infection (OR 2.44 95%CI 1.81–3.28, p<0.001) compared with adult SG. Among adults, PG had an equally increased risk when compared with SG (OR 1.64 95%CI 1.07–2.54, p = 0.028).

Number of ANC Visits

All but 86 (3.8%) women attended antenatal clinics at least once during pregnancy, but only 51% completed the recommended three or more ANC visits. The total number of ANC visits was lower for adolescents (median [range] PG: 2 [0–6]; SG: 2 [0–5]) than adults (PG: 3 [0–5]; SG: 3 [0–6]) both in PG and in SG. The proportion of women having completed three or more ANC visits was significantly lower in adolescents (PG: 46.6%; SG 43.7%) than in adults (PG: 61.9%; SG 54.9%) (PG: OR 0.54; 95%CI 0.38–0.76, p = 0.002) [SG: OR 0.64; 95%CI 0.45–0.90, p = 0.015].

Social factors related to the number of ANC-visits

Various social factors can account for fewer ANC visits among adolescents, most importantly (i) the social position of the adolescent mother; (ii) the social acknowledgement process of the pregnancy, especially in the case of PG; and, (iii) the cultural sense of shame or embarrassment, especially relevant when bringing the pregnancy into (iv) the public space of the health center.

Adolescents’ social position. In the study area, settlements consist of patrilineally (kinship through the father’s line) and patrilocally (in the place of residence of the husband) structured extended family clusters living in contingent or independent homes usually situated around the same cour or courtyard. Family members belonging to the same cluster function as a domestic group and can be referred to as belonging to this cour (Zaka in Moré and Lou in Dioula). Marriage can be born of individual initiative or arranged by the future spouses’ families and exists with the option of further polygamous unions both in traditional

Table 1. Baseline characteristics of primi (PG) and secundigravidae (SG) followed until delivery in Boromo Health District, Burkina Faso, 2004–2006.

| Characteristic      | Subcategory | PG (n = 1,235) | SG (n = 1,005) |
|--------------------|-------------|---------------|---------------|
| Age (years)        | ≤17         | 393 31.8      | 30 3.0        |
|                    | 18–19       | 553 44.8      | 231 23.0      |
|                    | ≥20         | 289 23.4      | 743 73.9      |
|                    | Missing     | 0 1           | 0.1           |
| Matrimonial status | Married monogamous | 852 69.0 | 693 69.0 |
|                    | Married polygamous | 288 23.3 | 296 29.5 |
|                    | Single      | 95 7.7        | 16 1.6        |
| Formal education   | None        | 960 77.7      | 798 79.4      |
|                    | Primary school (1–3 ys) | 65 5.3 | 54 5.4 |
|                    | Primary school (4–6 ys) | 165 13.4 | 122 12.1 |
|                    | Secondary and higher | 40 3.2 | 28 2.8 |
|                    | Missing     | 5 0.4         | 3 0.3         |
| SES                | Most poor   | 283 22.9      | 225 22.4      |
|                    | Poor        | 344 27.9      | 253 25.2      |
|                    | Less poor   | 300 24.3      | 258 25.7      |
|                    | Least poor  | 295 23.9      | 259 25.8      |
|                    | Missing     | 13 1.1        | 10 1.0        |
| Ethnic group       | Bwaba       | 460 37.3      | 351 34.9      |
|                    | Dafing      | 210 17.0      | 192 19.1      |
|                    | Ko          | 144 11.7      | 123 12.2      |
|                    | Nounouma    | 149 12.1      | 100 10.0      |
|                    | Mossi       | 142 11.5      | 128 12.7      |
|                    | Peuhl       | 70 5.7        | 55 5.5        |
|                    | Other       | 60 4.9        | 56 5.6        |
| Religion           | Moslem      | 589 47.7      | 484 48.2      |
|                    | Christian   | 230 18.6      | 200 19.9      |
|                    | Traditional | 414 33.5      | 321 31.9      |
|                    | Missing     | 2 0.2         | 0 0           |
| Residence          | Village with HC* | 619 50.1 | 551 54.8 |
|                    | Next HC at ≤5 km | 260 21.1 | 206 20.5 |
|                    | Next HC at >5 km | 356 28.8 | 248 24.7 |
| Season of delivery | Low transmission | 621 50.3 | 513 51.0 |
|                    | High transmission | 606 49.1 | 488 48.7 |
|                    | Missing     | 8 0.7         | 3 0.3         |
| Intervention arm   | IPTp-SP**+promotion | 407 33.0 | 314 31.2 |
|                    | IPTp-SP alone | 442 35.8 | 351 34.9 |
|                    | Weekly CQ   | 386 31.3      | 340 33.8      |

*Health Center.
**Intermittent preventive treatment in pregnancy with sulfadoxine-pyrimethamine.

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adolescents are required to tend to the additional domestic obligations in addition to other activities outside the new household, especially when the couple is young, is in the hands of the parents-in-law, as household related authority is defined by gender (principally male > female) and age (older > younger). This limits adolescents' bargaining power and is especially relevant for intra- and inter-household labor substitution: when adult women of the same age have work obligations in addition to other activities outside the cour (such as attending health promotion activities, antenatal care ...), adolescents are required to tend to the additional domestic activities.

Social acknowledgement of the pregnancy. Directly related to the number of ANC-visits and possible delays, especially with first pregnancies, is the period during which the pregnancy remains hidden and is not socially acknowledged. This initial stage, between the first signs of pregnancy and its acknowledgement - until the belly shows - has specific characteristics. First, early pregnancy is considered highly fragile and vulnerable and it is, therefore, considered dangerous/imprudent to reveal it at this early stage. Due to this initial vulnerability, strict laws of behavior apply, such as avoiding upsetting or insulting people, avoiding certain foods and places. These rules include not making the pregnancy public, especially for first pregnancies. This is because adolescents are considered to be young and vulnerable and it is, therefore, considered dangerous/imprudent to reveal it at this early stage. The health center as public space. Attending the ANC brings a woman's pregnancy into the public sphere where her actions and behavior are weighed and measured according to community expectations and existing social rules. This lack of privacy and confidentiality in the health encounter can make adolescents reluctant to attend ANC and publicize their pregnancies or can even directly stop adolescents from seeking antenatal care at an early stage of pregnancy. Additionally, health centers are often located in larger villages or towns near markets that are important meeting places. Consequently, women will only go to the health center if (i) they are ready to make their pregnancy public; or, (ii) if there is an acute health problem since going to the health center if (i) they are ready to make their pregnancy public; or, (ii) if there is an acute health problem since going to the health center often amounts to an official disclosure of pregnancy (Table 2.3).

Overall, uptake of at least 2 doses of IPTp-SP was 60.0% and was significantly lower among adolescent PG (OR 0.57 95%CI 0.43–0.75, p = 0.001) and SG (OR 0.53 95%CI 0.32–0.87, p = 0.017) when compared to adult SG, but only slightly lower in adult PG (Figure 2). IPTp-SP uptake was significantly lower in women delivering during the high malaria transmission season when compared with the low transmission period (Figure 4 left side) (OR 0.61 95%CI 0.51–0.73, p < 0.001 adjusted for age and parity). Therefore, the effect of the promotion campaign for improving IPTp-SP uptake is presented stratified by season (Figure 4 right side). During the low transmission season, SP uptake increased significantly in all age and parity groups (OR 3.63 95%CI 1.89–7.0, p = 0.001) with no major differences between adolescents and adults and almost all groups reaching the 80% coverage RBM goal. However, among women delivering during the high transmission season, adolescent PG had a lower SP uptake when compared to adult SG (OR 0.38 95%CI 0.39–0.86, p = 0.012). The effect of the promotion campaign during the high transmission season was of borderline significance (OR 2.11 95%CI 1.0–4.49, p = 0.051) and mainly due to increased SP uptake among adult SG. The uptake of SP was significantly lower in adolescent SG (OR 0.26 95%CI 0.09–0.78, p = 0.021) and both adult (OR 0.37 95%CI 0.18–0.73, p = 0.010) and adolescent PG (OR 0.31 95%CI 0.12–0.79, p = 0.019).
The reduced impact of the promotion campaign on SP uptake among adolescents, especially in the rainy season, can be related to the following factors. First, the promotion campaign did not directly target adolescents but, instead, addressed pregnant women in general. Therefore, in local communities, the campaign was considered of less direct interest to adolescents with pregnancies that are still not socially acknowledged or hidden. Second, internal authority and status regulations limit adolescent participation during the health promotion campaign when they are gathered in the same information sessions as adults. Third, especially during the work-intensive rainy season, when most of the income for the rest of the year is secured, intra and inter-household labor substitution requires additional domestic work from adolescents, negatively affecting adolescents’ ANC attendance.

### Discussion

Despite the significantly higher risk of malaria infection among adolescent PG, making them primary target beneficiaries of IPTp-SP, adolescents completed the required three or more ANC visits significantly less than adults and had lower SP uptake during the malaria transmission season. The uptake of IPTp-SP was lowest in adolescent PG during the high malaria transmission season and was only marginally improved by health promotion activities. In contrast, good coverage was achieved in older SG despite otherwise similar socio-economic characteristics.

Moreover, while unmarried pregnant adolescents have been identified as a high risk group insufficiently reached by health interventions [5], our results shows that in rural Burkina Faso even married adolescents had impaired access to malaria prevention. Three kinds of factors were identified accounting for adolescents’ vulnerability: (i) the adolescent’s social position; (ii) the recognition process of the pregnancy - especially for PG; and, (iii) health system factors.

With regard to their social status, newly married adolescents have the most demanding social position in the *couv.* Household related authority is defined by gender and age, leading to limited bargaining power in the domestic negotiation process for adolescent females. In her new social position, the newly wed...
adolescent is subject to stricter social expectations, which include being a hard worker, respecting her in-laws, bearing children and accepting additional domestic tasks related to intra and inter-household labor distribution. Despite the fact that women have legitimate claims on common resources within the household, traditional norms and mechanisms of intra-household resource allocation have been shown to directly influence women’s access to healthcare [25]. In this way, married female adolescents are less mobile and their mobility is restricted to locations that allow them to fulfill household and child-care responsibilities [26]. Paradoxically, despite IPTp-SP being a child-care responsibility, there is less willingness to negotiate the adolescent woman’s obligations and resources in the household when preventive care is needed than in cases where curative care is required, leading to a more precarious situation for the pregnant adolescent, especially in the first stage of her pregnancy and as long as no apparent problem occurs.

In terms of the public acknowledgment of pregnancies, a pregnant woman does not publicly disclose her condition at an early stage due to a sense of shame or embarrassment and rules of propriety, the pregnancy’s vulnerability, the fact that publicizing a pregnancy can expose a woman to (magico-religious) harm and because pregnant women are expected to follow a certain number of rites, prescriptions and interdictions before the pregnancy is made common knowledge. This initial ‘hidden’ phase of the pregnancy has been reported in other contexts, such as in Gabon and Cameroon (Peeters Grietens, unpublished data) and The Gambia, where young women hide their pregnancies for as long as possible for fear of attracting evil or misfortune to their unborn child [27]. Late booking or non-attendance at antenatal clinics by young pregnant women [12,23,24] and low uptake of malaria preventive measures [28–30] have also been reported in other studies and can jeopardize the effectiveness of preventive programs for malaria in pregnancy.

In relation to health system factors, maternal health policies are based on general indicators for ANC coverage and assisted delivery, which do not include (age-) specific sub-groups. As such, health policies and health promotion do not specifically target adolescents, leaving their needs unaddressed [31,32] despite the fact that, in social settings such as in rural Burkina Faso, as many as three quarters of PG are adolescents.

The public health services’ limitations in addressing the specific difficulties faced in adolescent pregnancies were apparent in the lack of anonymity and privacy during the health encounter, which represents one of the main barriers to adolescents’ access to care in the study setting. Being a public space, attending the health center often amounts to an official disclosure of pregnancy while this might not be desired. This lack of confidentiality for adolescents in the health encounter has also been shown, in other contexts, to make adolescents reluctant to identify themselves as being pregnant [5], therefore hindering antenatal care attendance. Targeting adolescents directly and prior to their first pregnancy

![Figure 4. IPTp-SP uptake (≥2 doses) in adolescent (≤19) and adult (>19) primigravidae (PG) and secundigravidae (SG) in villages with and without promotion during the high and low transmission season. * difference compared with reference group (SG/>19) significant (p<0.05) in logistic regression analysis. doi:10.1371/journal.pone.0012013.g004](image-url)
while assuring anonymity in access to and during the health encounter can contribute to meeting the needs of early ANC booking while respecting the socio-cultural demand of keeping early pregnancies hidden. Other health system factors that relate directly to adolescents’ work activities such as appropriate opening hours, reduced HC waiting times, and adapted outreach programs, have to be further evaluated in order to address more structural constraints of access to ANC.

Finally, the data on the impact of the health promotion campaign in relation to seasonality provide us with valuable supplementary insights into the effectiveness of IPTp-SP. While the health promotion campaign improved ANC attendance and SP uptake during the dry season, it failed to bring about behavioral change during the rainy season when malaria is highest but work is also most demanding. This shows that although SP uptake can be improved through a combination of information campaigns and community involvement in health promotion during the dry season, other structural factors limiting adolescents’ access to IPTp-SP, such as labor requirements and poverty, remain despite IEC-campaigns. This also suggests that rituals and possible beliefs, which are independent of the season and that can cause initial delays among adolescents, are more easily overcome with health promotion than are the structural constraints of adolescents’ social position and the limitations of health services for adolescent care. In other words, the importance of seasonality illustrates that IEC campaigns alone are not enough to foster an effective IPTp-SP program for the most vulnerable groups in the season that they most need it. Seasonality merits more research as little is currently known about its importance for preventive health [33,34] (i.e. how do work requirements and seasonal mobility patterns influence adherence to IPTp as farmers often reside at fields for longer periods when work is intensive, decreasing accessibility to the health center; Peeters Grietens unpublished data).

The lack of priority given to adolescents and the absence of a framework for delivering health and health-related interventions to this high-risk group has been repeatedly highlighted [35]. In line with these findings, we conclude that a general framework for delivering IPTp-SP to adolescents is urgently needed, reiterating the need for adolescent specific health care.

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Author Contributions

Conceived and designed the experiments: KPG SG ET JMR UD. Performed the experiments: KPG SG CK JS ET. Analyzed the data: KPG SG ET JMR. Contributed reagents/materials/analysis tools: KPG SG ET JMR. Performed the experiments: KPG SG CK JS ET. Analyzed the data: KPG SG ET JMR. Contributed reagents/materials/analysis tools: KPG SG ET JMR. Wrote the paper: KPG. Preparation phase of the study: SOC. 16. Newman RD, Moran AC, Kayentao K, Benga-De E, Yameogo M, et al. (2006) Prevention of malaria during pregnancy in West Africa: policy change and the power of subregional action. Trop Med Int Health 11: 462–469.

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