ROLL BACK MALARIA PARTNERSHIP

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The contribution of malaria control to maternal and newborn health

mip malaria in pregnancy consortium

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ABBREVIATIONS

ACT	Artemisinin-based combination therapy
ANC	Antenatal care
ANC 1	One antenatal care visit
ANC 1+	Attending ANC at least once
DALY	Disability-adjusted life year
DHS	Demographic and Health Survey
DOT	Directly observed therapy
ERG	Evidence Review Group
FANC	Focused antenatal care
GMAP	Global Malaria Action Plan
HB	Haemoglobin
HIV	Human immunodeficiency virus
HMIS	Health Management Information System
ICER	Incremental cost–effectiveness ratio
IgG	Immunoglobulin G
IPTp	Intermittent preventive treatment during pregnancy
IPTp2	Two doses of intermittent preventive treatment during pregnancy
IPTp2+	At least two doses of intermittent preventive treatment during pregnancy
IPTp-SP	Intermittent preventive treatment of malaria in pregnancy with sulphadoxine-pyrimethamine
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
LBW	Low birth weight
LiST	Lives Saved Tool
LLIN	Long-lasting insecticidal net
MDG	Millennium Development Goal
MICS	Multiple Indicator Cluster Survey
MiP	Malaria in pregnancy
MIS	Malaria Indicator Survey
MoH	Ministry of Health
MPAC	Malaria Policy Advisory Committee
NMCC	National Malaria Control Centre
PCR	Polymerase chain reaction
PE	Protective efficacy
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
RH	Reproductive health
SP	Sulfadoxine-pyrimethamine
TT 2+	At least two doses of tetanus toxoid
UI	Uncertainty interval
UNDP	United Nations Population Division
US-PMI	United States President's Malaria Initiative
WHO	World Health Organization

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Stephen O'Brien meeting a woman in the Southern Highlands Province of Papua New Guinea who has been trained to test for malaria in her community.

FOREWORD

Malaria prevention, control, and ultimately, elimination feature prominently among the best public health investments available today. Remarkable progress has been made over the last decade, the "UN Decade to Roll Back Malaria", as was proclaimed by all Member States at the 2001 UN General Assembly. Over 3 million under-five children's deaths were averted between 2001 and 2012, meaning they have been able to live healthy social and economically active lives, whilst resources were freed up to fight other illnesses, children were enabled to stay in school and workers to remain in their jobs.

What is perhaps less known is the impact of malaria control interventions and prevention on maternal and newborn health. Today, easily implementable malaria control interventions are available to allow women to deliver healthy babies. The roll-out of two simple preventive measures, intermittent preventive treatment during pregnancy (IPTp) and insecticide-treated mosquito nets (ITNs) is significantly associated with an 18% decrease in the risk of neonatal mortality. A striking figure indeed, highlighted in this report, and definitely worth reporting widely to all interested in having real substantial impact on child mortality.

Furthermore, this report is timely in reminding us that countries with high coverage and use of malaria control interventions saw under-five child mortality rates fall by about 20%. This success reinforces the urgent call for accelerated action, a call to support the scaling up of coverage and access to malaria prevention and control tools to increase the magnitude of major health benefits, locking in success and building on a proven, effective track record.

Despite this known and documented effectiveness of malaria interventions during pregnancy, coverage remains much lower than for general antenatal care. This means that we are losing opportunities to protect pregnant women and their babies. One child still dies of malaria every minute in Africa in spite of widely available preventive interventions that could alleviate this intolerable burden. As an international community, we urgently have to respond to this shocking figure.

I encourage you to read carefully and reflect on the data presented in this report. Then, I hope you will join me in the fight against this public health scourge. We can and we must do much more on the path to malaria elimination. We have to take advantage of currently available interventions with major proven efficacy while we continuously develop new ones.

Every death from malaria is avoidable; every case of malaria is treatable.

Let's all do more to protect mothers and their children against malaria. Let's combine our forces to rid the world of malaria in our generation and on our watch.

The Rt. Hon. Stephen O'Brien MP (UK)
Global Advocate, Roll Back Malaria Partnership
Prime Minister's Envoy and UK Special Representative to the Sahel
Former International Development Minister
Trustee, Liverpool School of Tropical Medicine

EXECUTIVE SUMMARY

Prevention of malaria in pregnancy is a key component of malaria control and an important contributor to maternal and child health. National policies and effective delivery of available preventive measures in the antenatal setting will directly contribute to achieving the Millennium Development Goals (MDGs).[a]

Interventions that substantially reduce adverse outcomes of malaria in pregnancy have been available for more than two decades yet the coverage of such interventions is generally poor.

- **Malaria in pregnancy must be a priority component of antenatal care.**

  Malaria in pregnancy interventions save the lives of pregnant women and their *newborns* (1–28 days of age),[b] and should be an integral component of all reproductive, *maternal*, newborn and child health programmes. *Malaria* in *pregnancy* is a significant contributor to maternal and neonatal mortality. It is a major cause of *anaemia* in pregnant women, which contributes to maternal death at delivery due to haemorrhage, and causes *stillbirths*, *preterm birth*, and *low birth weight* increasing the risk of neonatal death. In Africa, 10 000 women and between 75 000 and 200 000 *infants* (children under the age of 12 months) are estimated to die annually as a result of malaria infection during pregnancy, and approximately 11% (100 000) of neonatal deaths are due to low birth weight resulting from *Plasmodium falciparum* infections in pregnancy. These outcomes are entirely preventable, and optimizing the delivery of malaria in pregnancy interventions will lead to direct improvements in *maternal*, newborn and infant health.

- **Malaria in pregnancy interventions can substantially improve maternal, newborn and infant health.**

  Under routine programme conditions, intermittent preventive treatment during pregnancy (*IPTp*) or insecticide-treated mosquito net (*ITN*)[c] use in first and second pregnancies in 25 African countries was significantly associated with an 18% decrease in the risk of neonatal mortality and 21% decrease in low birth weight. According to the Lives Saved Tool (LiST), about 94 000 deaths (uncertainty interval: 19 000–251 000) among newborns were averted between 2009 and 2012 thanks to the scale-up of prevention of malaria in pregnancy interventions. Had an 80% coverage of prevention of malaria in pregnancy interventions been achieved over these three years in these same countries, about 300 000 neonatal deaths could have been averted. Countries with high coverage and use of malaria control interventions saw child mortality rates fall by about 20%. Continued focus on scaling up coverage and access to these interventions

[a] MDG 4 – reduce child mortality; Target 4.A: Reduce by two thirds, between 1990 and 2015, the under-five mortality rate.
MDG 5 – Improve maternal health; Target 5.A: Reduce by three quarters the maternal mortality ratio; Target 5.B: Achieve universal access to reproductive health.
MDG 6 – Combat HIV/AIDS, malaria and other diseases; Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.

[b] Key terms used in the report are explained in greater detail in the glossary section at the end of the report; all are italicized on their first occurrence. For example, neonate or newborn is described further on page 136.

[c] As of 2007, insecticide-treated mosquito nets (ITNs) are long-lasting insecticidal nets (LLINs). ITNs are used as standard coverage and use indicators but after 2007 ITN data presented in this report refer mostly to LLINs.

will substantially increase the magnitude of these health benefits.

- **Cost-effective interventions to prevent and treat malaria in pregnancy are widely available.**

  Highly cost-effective interventions to prevent and treat malaria in pregnancy are available. Effective, prompt diagnosis and case management provide benefits to pregnant women infected with the malaria parasite and to their unborn children.

  Intermittent preventive treatment during pregnancy and ITNs are highly effective: research has shown that IPTp reduced severe maternal anaemia by 38%, low birth weight by 43%, and perinatal mortality by 27% among women in the first or second pregnancies; and that ITNs reduced *miscarriages*/stillbirths by 33%.

- **Despite global gains in malaria control and the known effectiveness of malaria in pregnancy interventions, coverage in some sub-Saharan African countries remains extremely low. Even though most countries have high antenatal care (ANC) coverage for one and two ANC visits, there is not a commensurate level of delivery of life-saving malaria control interventions, i.e. IPTp and ITNs.**

  IPTp and ITNs are delivered to pregnant women through antenatal clinics, IPTp at every ANC visit in the second and third trimester, and ITNs at the first ANC visit, as early as possible. However, despite relatively high antenatal care coverage (>77% of pregnant women attending ANC at least once [ANC 1+]) in most countries, IPTp and ITN coverage rates are well below global and national targets. IPTp coverage and ITN use among pregnant women increased only modestly between 2004–2008 and 2009–2012, respectively from 14% to 22% and from 17% to 39%.

- **Many obstacles to increasing coverage with intermittent preventive treatment can be overcome relatively quickly but others will require more integral and complex health system strengthening.**

  Research has shown that many obstacles to delivering IPTp are relatively simple barriers that are specific to IPTp and could be resolved in the short term. Other obstacles are more entrenched within the overall health system context, and will require increased support for health system strengthening. Improvements in the quality of ANC services and creating demand at the community level will also lead to higher attendance and better maternal and newborn health outcomes.

- **Malaria control interventions must be harmonized with other reproductive health policies and antenatal care services.**

  Focused antenatal care (FANC) aims to provide a comprehensive package of evidence-based services for all pregnant women; however there is fragmentation across programmes using the ANC platform for service delivery. Improved policy and programme coordination between reproductive, maternal, newborn and child health programmes, and other health programmes is required, with special attention to integrated mechanisms for budgeting and funding as part of the FANC package, and effective and appropriate integration at the service-delivery level (e.g. integrated laboratory services, integrated procurement/supply chain management, and task-shifting for improving human resources bottlenecks).

  The World Health Organization (WHO) updated its malaria in pregnancy policy in 2012 with the key recommendation of extending the provision of IPTp to four times during the course of gestation and also made key recommendations on timing of the intervention. Critical next steps are for

countries to harmonize malaria and maternal health policies, national guidelines and training materials based on the new policy including simplified guidance on how to deliver IPTp in the antenatal care setting. Strategies to encourage women to attend ANC as early as possible in pregnancy are also needed.

Partners from the RBM Malaria in Pregnancy Working Group recently released a consensus statement to engender further commitment, momentum and partnership between reproductive, maternal, newborn and child health programmes and malaria control programmes. Specifically, the aim is to **reprioritize** malaria in pregnancy as a core component of focused antenatal care, **advocate** for harmonized policy-making and integrated programme implementation and **reinforce** key interventions to optimize the delivery of malaria in pregnancy programmes, and prevent adverse maternal and newborn outcomes.[1]


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A pregnant mother from Nigeria embraces malaria prevention[d]

Nigeria has the highest malaria *burden* in the world, accounting for about one quarter of deaths due to the disease in Africa. Almost everyone is at risk of malaria but pregnant women and children under five years of age are particularly vulnerable to progression to severe disease.

For pregnant women, sleeping under a long-lasting insecticidal net (*LLIN*) is a very effective preventive measure along with intermittent preventive treatment during pregnancy (IPTp). Over the past few years, millions of LLINs have been distributed free across Nigerian states, with support from national and international partners. Additional LLINs have also been made available through antenatal clinics, and commercially.

However, having nets is not enough: families need to know how to hang them properly, and to use them every night, hence the requirement to support community-based behaviour change.

Tosin Kareem of Nigeria, 25 and mother of a four-year old girl, had never taken malaria prevention seriously until she visited her antenatal clinic in Lagos when four months' pregnant with her second child. "I had heard the messages, but I ignored them," she says. "When I had bouts of malaria, I went to the chemist and bought drugs without prescription." This time though, Tosin was prescribed IPTp at the clinic to make sure she did not get sick with malaria while she was pregnant, and has been taking part in discussion groups about malaria. She received direct and specific malaria prevention advice to minimize the chances of her, her daughter or the new baby contracting the disease. She said, "They also made sure I was using a net properly. Since then I have never been sick."

Back home, every time she goes to sleep she makes sure she and the child are under the net. Now she is also more aware of the importance of keeping the environment clean to prevent mosquito breeding. "I know more what malaria is all about," she says.

She also talked to her husband to impart her better understanding and increased awareness of malaria. "So, now my husband also realizes malaria is a threat to us all and sleeps under the net. Our daughter has not been ill since using the net," Tosin adds proudly. "In fact she has never had malaria again."

[d] *Source:* This story was adapted from an article available on www.malariaconsortium.org.

CHAPTER I

MALARIA IN PREGNANCY: GLOBAL DISTRIBUTION, CONSEQUENCES AND PREVALENCE FACTORS

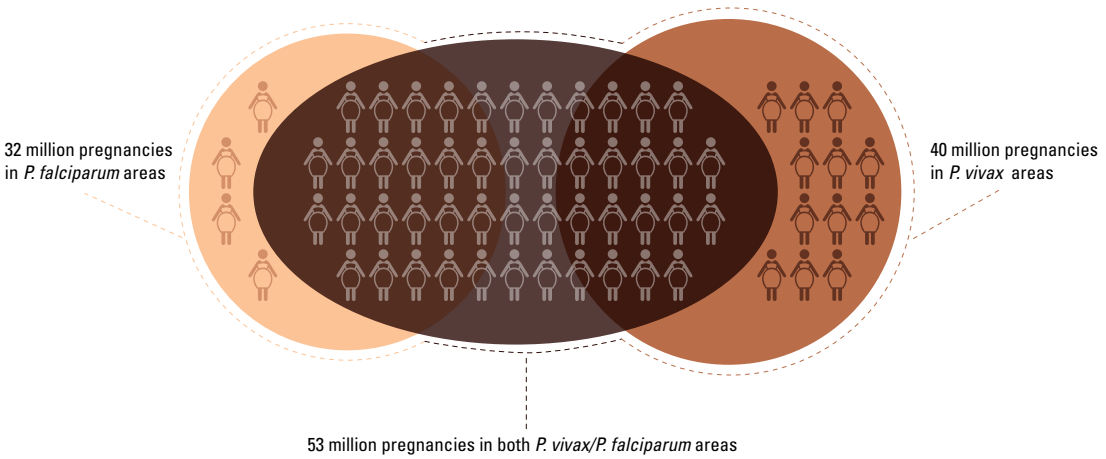
The disease burden at a glance

- Worldwide, an estimated 125 million pregnancies occurred in areas of malaria transmission in 2007, resulting in about 83 million live births.
- Pregnant women in malaria-endemic areas have an up to 50% higher risk of infection during pregnancy compared with non-pregnant women.
- In areas of high and stable *P. falciparum* transmission, maternal malaria infection is frequently asymptomatic but is associated with maternal anaemia. In low transmission or epidemic areas it more frequently triggers clinical symptoms and severe disease.
- Prevalence of malaria in pregnancy is much higher in women aged 15–19 years and decreases with each subsequent pregnancy. The disease is also much more prevalent in *HIV*-infected women regardless of the number of times they have been pregnant.

a. Global distribution of malaria in pregnancy

Malaria remains prevalent particularly in tropical countries, and wherever malaria is transmitted to a pregnant woman, her developing *fetus* and newborn are at risk of the infection and its adverse consequences.

An estimated 125 million pregnancies occurred in 2007 in malaria transmission areas, resulting in about 83 million live births.[2] About 53 million pregnancies were registered in areas where *P. falciparum* and *P. vivax* coexist, 40 million in temperate regions with *P. vivax* transmission only and 32 million in settings with *P. falciparum* transmission only. In total, 85 million pregnancies occurred in areas with *P. falciparum* transmission, two thirds in stable transmission zones.

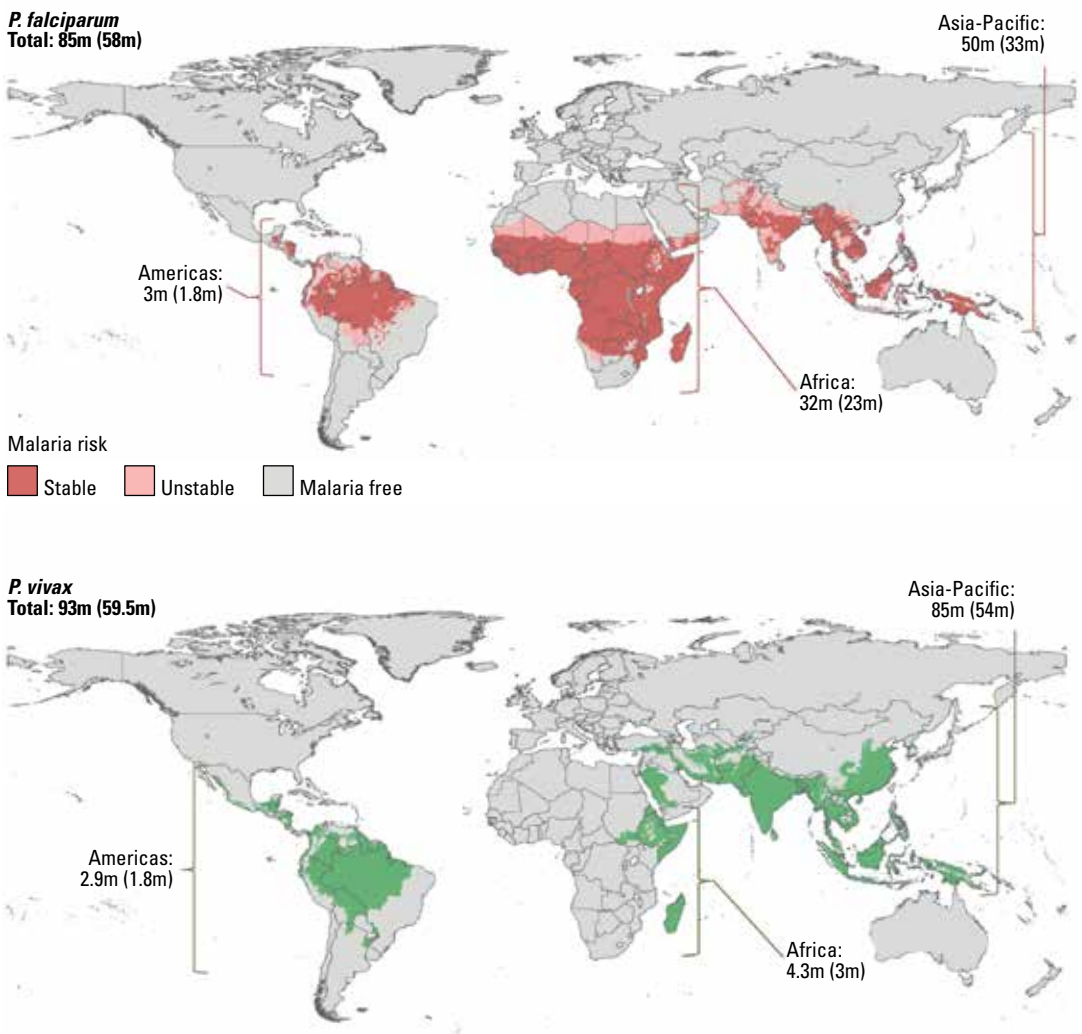


P. falciparum is the most common species of malaria in sub-Saharan Africa, whereas *P. vivax* is more common in South-East Asia, Latin America and the Western Pacific (see Figure 1).

Figure 1

Global distribution of malaria risk from *P. falciparum/P. vivax*, number of pregnancies at risk and of live births born to corresponding pregnancies in the three regions most affected, 2007

P. falciparum *transmission dominates across sub-Saharan African populations, while elsewhere both* P. falciparum *and* P. vivax *are found. Both maps show the number of pregnancies at risk, globally and for each region most affected (out of parentheses), as well as the number of live births born to corresponding pregnancies (in parentheses).*



Source: Dellicour S et al. Quantifying the number of pregnancies at risk of malaria in 2007: a demographic study. *PLoS Medicine*, 2010, 7(1):e1000221.

b. Pregnancy increases vulnerability

Pregnancy alters a woman's immune status, especially at the mother-fetal interface at the *placenta*, making her more susceptible to malaria as well as to other infections.[3]

Pregnant women living in malaria-endemic areas have an up to 1.5-fold higher risk of infection during pregnancy compared with non-pregnant women.[4] However, not all pregnant women who are infected with malaria parasites will develop febrile episodes. The clinical manifestation of maternal infection depends on the *transmission intensity* and the species of malaria parasite. In areas of high transmission, women are exposed to the disease from childhood and acquire considerable levels of *immunity*.

By contrast, women living in low transmission or epidemic areas are less exposed and consequently have little or no acquired immunity; therefore they are more likely to develop clinical symptoms and severe disease. However, regardless of endemicity or level of immunity, maternal malaria causes anaemia in the mother, which can, if severe, contribute to maternal mortality.

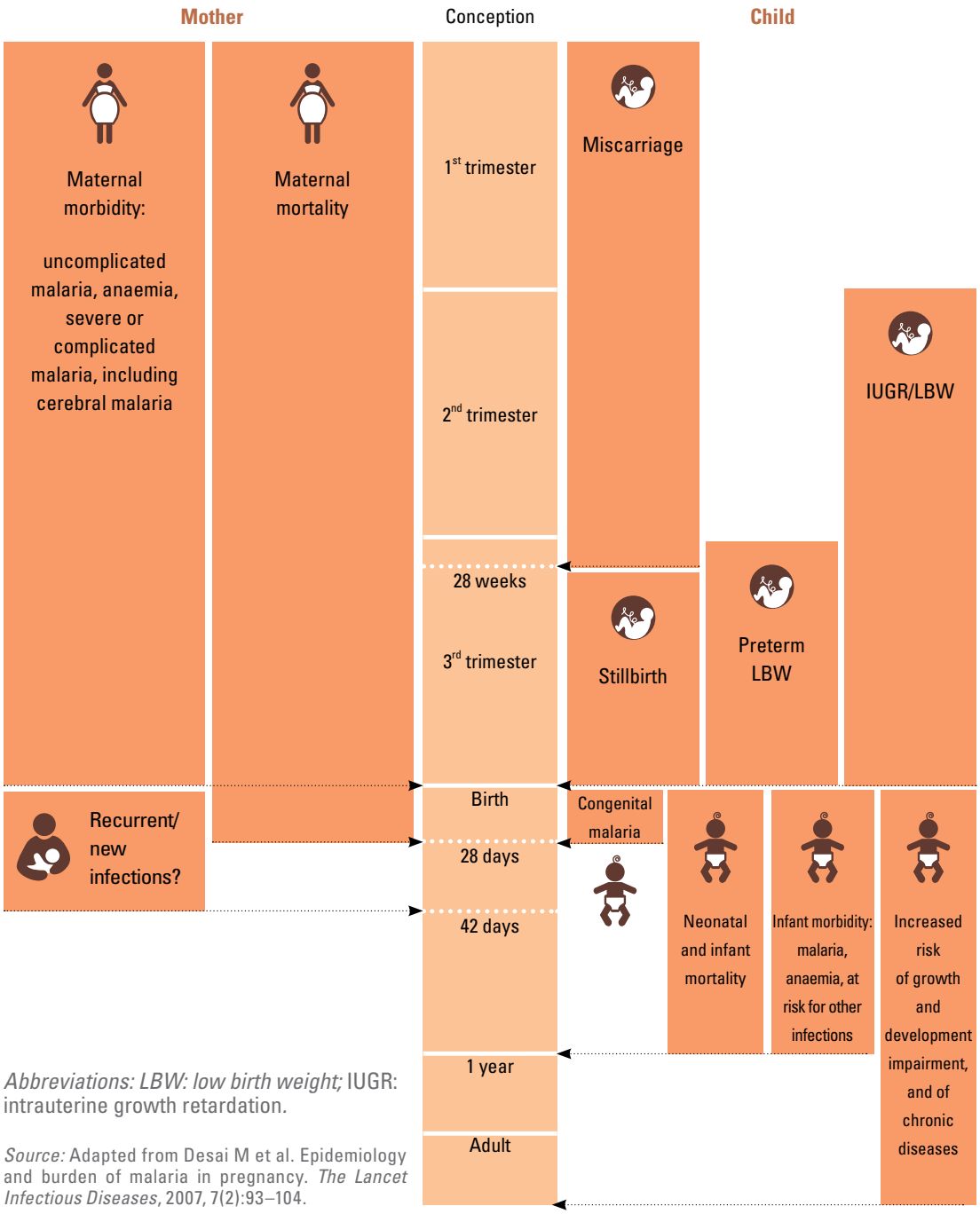
c. Devastating consequences

Malaria infection in pregnancy can have devastating consequences on maternal, newborn, infant and child health (see Figure 2). In areas of high and stable *P. falciparum* malaria transmission, maternal malaria infection is frequently asymptomatic but is associated with anaemia, which is most severe in the first pregnancy and decreases in subsequent pregnancies, and low birth weight (LBW) is common; stillbirth can occur. Women are at higher risk of delivering LBW babies during their first or second pregnancies. In areas of low transmission or epidemic malaria, women are more likely to present with clinical malaria, and malaria infection in pregnancy in these areas is associated with severe disease (symptoms may include hyperpyrexia, *hypoglycaemia*, severe haemolytic anaemia, cerebral malaria and pulmonary oedema) and a high risk of maternal mortality, pregnancy loss and poor infant outcomes.

Figure 2

Effects of malaria in pregnancy on the mother and child

Malaria in pregnancy affects both the mother (left side of the graph) and her child (right side of the graph).



Abbreviations: LBW: low birth weight; IUGR: intrauterine growth retardation.

Source: Adapted from Desai M et al. Epidemiology and burden of malaria in pregnancy. *The Lancet Infectious Diseases*, 2007, 7(2):93–104.

d. Malaria prevalence in pregnancy

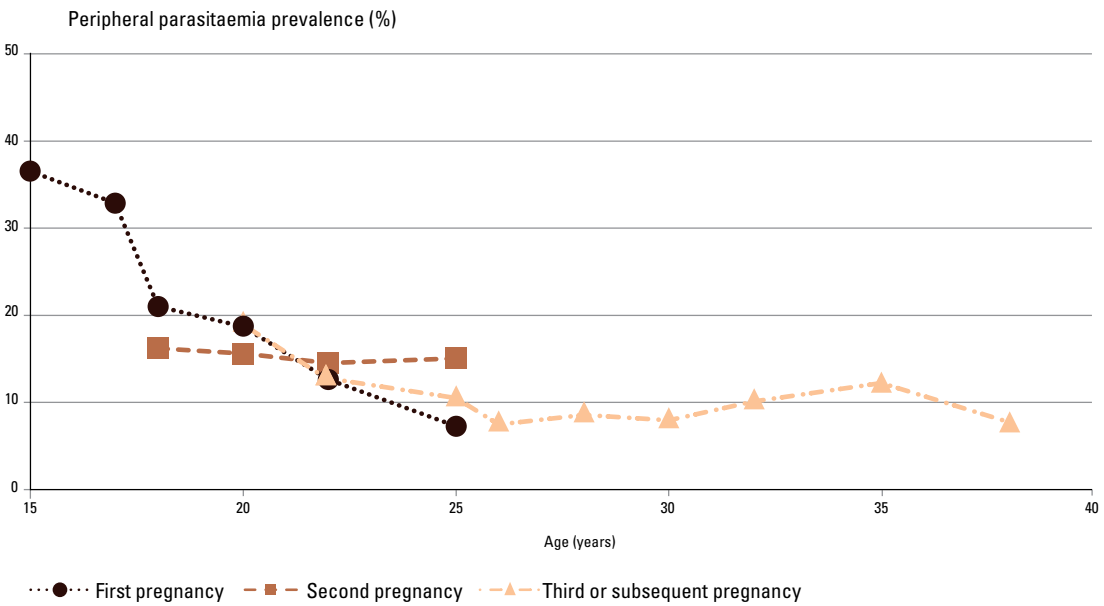
Not all pregnant women are equally susceptible to malaria. Factors associated with higher malaria prevalence in the general population, such as residence and age, are also associated with higher malaria risk in pregnancy (see Figure 5). Rural populations, for example, are more at risk than urban ones, while those aged under 20 are more at risk than their elders.

Malaria infection occurs more often in the first or second trimester of pregnancy. In areas with moderate to high transmission, women in their first pregnancy are at highest risk (see Figure 3) followed by those in their second pregnancy, such risk diminishing with each subsequent pregnancy. This is due to the development of pregnancy-specific immunity, when the placenta provides a temporary blood-filled organ that permits sequestration of *P. falciparum* parasites.[5]

Figure 3

Peripheral parasitaemia prevalence among women aged 15 to 38 and in their first, second or subsequent pregnancy, Kenya, 1996–2001

Malaria peripheral parasitaemia *was higher in 18-year-old women in their first pregnancy (prevalence 21%) than in a second pregnancy (16%). For a first pregnancy, it reaches 33% at the age of 17, and peaks at 36% in 15-year-olds.*



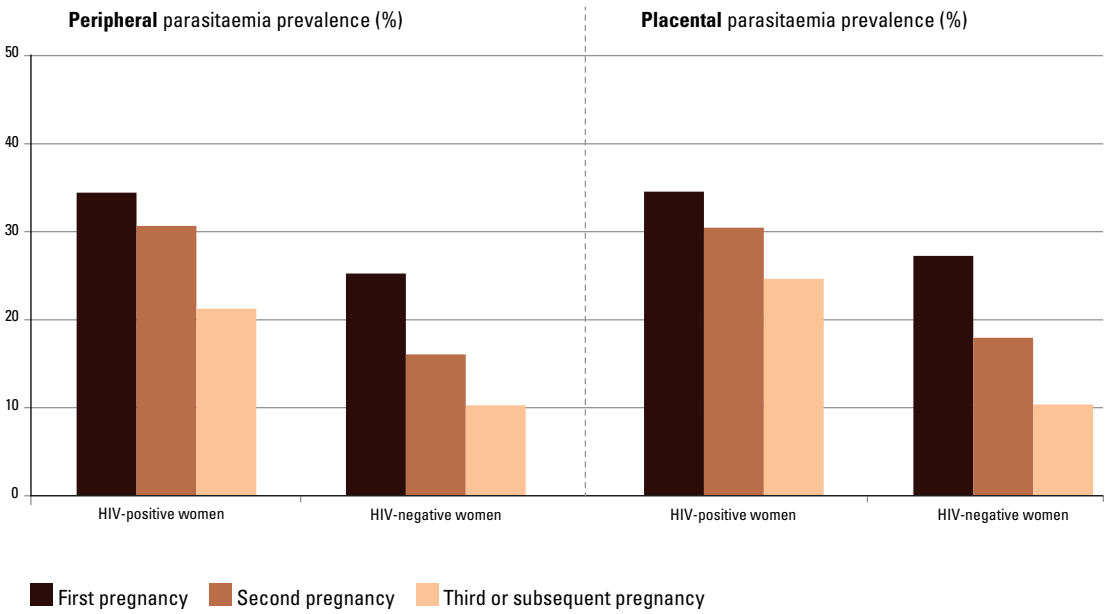
Source: Kisumu 1996–2001, adapted from van Eijk AM et al. Malaria and human immunodeficiency virus infection as risk factors for anemia in infants in Kisumu, western Kenya. *American Journal of Tropical Medicine and Hygiene*, 2002, 67(1):44-53.

In addition, pregnant women infected with the human immunodeficiency virus (HIV) have been found to have increased malaria parasite prevalence and density due to impairment of immunity to malaria, regardless of the number of times they have been pregnant[6] (see Figure 4).

Figure 4

Peripheral and placental malaria prevalence among HIV-positive vs HIV-negative women

Peripheral *(parasites in blood) and* placental *(parasites in placenta) malaria prevalence is higher among HIV-positive women in their first, second or subsequent pregnancy. When comparing the two groups, women who are HIV-positive are much more likely, at least twice as high in women in their third pregnancy, to be infected with malaria when compared with HIV-negative women.*



Source: Adapted from table 2 from studies in western Kenya and Malawi, from ter Kuile FO et al. The burden of co-infection with human immunodeficiency virus type 1 and malaria in pregnant women in sub-saharan Africa. *American Journal of Tropical Medicine and Hygiene*, 2004, 71(Suppl 2):41–54.

Malaria prevalence in pregnancy is evidently higher in the absence of malaria prevention tools. Sub-clinical infections are also often found when more sensitive diagnostic methods are used (such as polymerase chain reaction [PCR]) demonstrating that there are higher levels of parasite prevalence in communities than detected by blood smears.

There are various determinants of malaria in pregnancy (MiP) in different geographical regions, giving rise to differences in manifestation of the disease, which are important for regional control strategies (see Figure 5).

Figure 5

Factors affecting malaria prevalence in pregnancy

Compared with opposite groups or situations, malaria prevalence is higher in pregnant women who live in rural areas, are less than 20 years old, are in their first or second trimester of pregnancy, are HIV-infected, do not have/use malaria prevention tools, and where more sensitive diagnostic tools are used.

Location of residence	Rural>urban
Age	<20 year-old pregnant women are at higher risk
Trimester in pregnancy	1st or 2nd>3rd trimester
Number of pregnancies	One>two or more
HIV infection	HIV-positive>HIV-negative women
Use of malaria prevention tools reduces malaria prevalence	• Long-lasting insecticidal nets • Indoor residual spraying (IRS) • *Chemoprophylaxis* • Intermittent preventive treatment
Sensitivity of malaria diagnostic tools	PCR>microscopy

IMPACT OF MALARIA ON MATERNAL AND NEWBORN HEALTH

Impact on health at a glance

- Malaria in pregnancy can lead to miscarriage, severe anaemia and haemorrhage. Worldwide, it is estimated to result in 10 000 maternal deaths each year.
- Malaria infection during pregnancy accounts for 35% of preventable low birth weight and is estimated to be responsible for up to 200 000 infant deaths in Africa each year.
- Surviving infants may experience lasting effects from infection in the womb that can impede their development and learning.
- Infection rates among pregnant women are much lower in malaria-endemic regions outside of Africa but lower levels of immunity mean they are more likely to cause severe disease.

The presence of parasites in both peripheral blood and the placenta has a range of physiological effects that can be fatal for the mother and/or the fetus. Surviving infants can experience lasting effects from infection in the womb that impede their development and learning.[7]

a. Impact on maternal health in sub-Saharan Africa and other high transmission settings

Anaemia

The global prevalence of anaemia in pregnancy, defined as haemoglobin [Hb] <11 g/dL, in 2011 was estimated to be 38%, with higher estimates for Central and West Africa (56%) and in South Asia (52%), and lower for East Africa (36%) and South Africa (31%).[8] Infection with the malaria parasite increases the risk of anaemia. Malarial anaemia is caused by a combination of destruction of infected and uninfected red blood cells (haemolysis), splenic sequestration and bone marrow dysfunction.[9,10] It is unclear to what extent anaemia results from removal of red blood cells damaged in the placenta or elsewhere, or from reduced production of those cells (erythropoiesis).[10] Anaemia is a major contributor to maternal and infant mortality and morbidity.[11–14] Anaemia due to malaria is estimated to account for 26% (population attributable fraction) of all severe maternal anaemia (defined as Hb either <7 g/dL or <8 g/dL), regardless of the number of times a woman has become

pregnant.[15] The potential interaction between maternal iron deficiency and maternal malaria is still debated, but so far there is no evidence that iron supplementation would be harmful to pregnant women in malarious areas, and there is more evidence of the benefits in improving anaemia.[11,16]

Maternal death

About 10 000 maternal deaths are estimated to occur each year from malaria-related anaemia only;[17] many more are likely to be directly or indirectly related to malaria infections. An autopsy study in Mozambique (2002–2004) suggests malaria as a non-obstetrical cause in 10% of maternal deaths;[18] the range of maternal deaths due to malaria in a review of mainly hospital data was 0.5%–23%.[19] Maternal mortality among cases of severe malaria is approximately 50%, which is considerably higher than in non-pregnant adults.[8]

Malaria in pregnancy can lead to miscarriage and severe anaemia, both of which can result in maternal fatalities.[20] Given the indirectness of how malaria contributes to maternal mortality, the difficulties in diagnosing sub-clinical infections and weak reporting systems, the contribution of malaria to maternal deaths is likely to be vastly underestimated.

Haemorrhage is the leading cause of maternal deaths in Africa (34%),[21,22] and severely anaemic mothers are prone to lose more blood in the postpartum period and are less able to tolerate severe haemorrhage.[23] In addition, placental malaria may have a direct effect on the risk of postpartum haemorrage[24–25] and has been associated with a higher amount of blood loss at delivery.[26]

HIV increases the risk of malaria and its adverse effects, particularly in *multigravidae*

HIV increases the risk of malaria and its adverse effects, particularly in multigravidae, and recent observational studies suggest that placental infection with HIV women almost doubles the risk of malaria infection and morbidity in infants born to multigravid women.[27] The proportional increase of overall malaria prevalence during pregnancy, regardless of *gravidity*, that could be attributed to HIV is estimated to be 5% and 19% for areas with an HIV prevalence of 10% and 40%, respectively.[6]

There is some evidence that the HIV/malaria relationship is not just additive but that these infections may act synergistically because HIV aggravates malaria associated anaemia, and HIV-infected women are therefore at greater risk of severe anaemia and death.[6,27,28] Parasitaemia at baseline predicted an increased rate of AIDS-related deaths in a cohort study of Tanzanian pregnant women infected with HIV.[29]

b. Impact on the newborn in sub-Saharan Africa and other high transmission settings

Fetal loss and perinatal deaths

Miscarriage and stillbirths can result from complications of malaria during pregnancy, and placental malaria has been firmly associated with stillbirths.[30] Red blood cells infected with *P. falciparum* sequester in the small blood vessels due to increased adhesion to the inner layer of those vessels.[5] In this way, infected red blood cells accumulate in the placenta through adhesion to the fetal layer of the placenta which is in contact with the maternal blood.[31]

There is indirect evidence of an association between malaria in pregnancy and an increased risk of perinatal deaths, with malaria-endemic countries reporting a higher perinatal death rate than non-malarious countries in countries with comparable human development index,[30] a marker for socio-economic development. However, results from individual studies vary,[32,33] and malaria prevention trials with *antimalarials* show no consistent effect on perinatal mortality.[34,35]

Preterm births and low birth weight

Low birth weight (LBW, defined as birth weight of less than 2500 g) is the single most important risk factor for newborn and early infant mortality. Mortality in low-birth-weight infants is three times higher than in infants with normal birth weight.[36]

Malaria infection during pregnancy accounts for 20% of all low-birth-weight deliveries and 35% of preventable low-birth-weight births, regardless of the number of times a woman has been pregnant.[15] It is also estimated to be responsible for up to 200 000 infant deaths[37,38] (uncertainty interval [UI]: 62 000–363 000) in Africa every year. This is due to the effects of malaria on both preterm births (associated with a 8%–36% risk of LBW) and intrauterine growth retardation (associated with a 13%–70% risk of LBW).[37]

Several ways in which sequestration of malaria parasites in the placenta can lead to pathology in the fetus have been suggested: impaired blood flow from capillary blockage, impaired transfer of nutrients, poor development of placental vascularisation and altered immunological environment.[39]

Preterm births account for 28% of all newborn deaths[22] and have been closely associated with acute malaria infection and high parasitaemia at delivery.[10,40] Maternal anaemia (all cause) is also associated with LBW (7%–18%),[37] with malaria accounting for about one quarter of severe maternal anaemia and 9%–14% of all maternal anaemia (unpublished data, Malaria in Pregnancy Consortium).

P. falciparum and human immunodeficiency virus (HIV) are both risk factors for LBW and among multigravidae;[41] dual infection resulted in 9.6 times the risk of LBW compared with uninfected multigravidae in one study in Malawi. Several studies have reported on the synergistic action of malaria and HIV in pregnancy and the adverse consequences on birth outcomes such as LBW, preterm delivery, and perinatal mortality whereby the effect of coinfection is much worse than the effect of each infection separately.[6,42–44]

Neonatal mortality

Up to 200 000 infants are estimated to die as a result of malaria infection during pregnancy,[37,38] and about 100 000 of newborn deaths in malaria-endemic African countries are due to LBW resulting from *P. falciparum* infections in pregnancy.[15]

Estimates suggest that 11% of newborn deaths and 6% of all infant deaths may be caused by LBW associated with malaria in pregnancy.[36] LBW, together with maternal and fetal anaemia from malaria in pregnancy combined, are thought to contribute to 8% of all-cause infant mortality, with a greater effect seen in first pregnancies (18%) than in subsequent pregnancies (4%).[37]

Due to underreporting and the difficulties in determining the true underlying causes of deaths, it is highly likely that these figures are under-estimated. In addition, it should be noted that the studies excluded the impact of maternal deaths due to malaria and of *congenital malaria*, with concomitant risks to the infant.

Infant immunity and morbidity

In the early months of life, the prevalence of clinical malaria is low[45] and it is assumed that the transfer of maternal malaria *antibodies* and the presence of fetal haemoglobin may protect the infant against clinical malaria.[46]

Placental malaria does not seem to have an effect on the transfer of antimalarial antibodies but cellular responses to malaria *antigens* may differ, depending on intrauterine exposure.[31,47,48]

Several studies indicated malaria in pregnancy was a risk factor for the infant to acquire malaria, even though the period of highest risk of infant infection in the first year of life or the estimated risk according to the number of the mother's previous pregnancies differed by study.[47,49–52] Environment is also a determinant of intrauterine malaria exposure; pregnant women with malaria are more likely to live where there is a higher risk of malaria, and so their infants may have a higher exposure as well. Some studies took this increased malaria risk into account by including an environmental malaria risk factor in the analytical model.[53,54]

Malaria in pregnancy can potentially impact on the maternal response to vaccination during pregnancy (e.g. tetanus toxoid), the specific maternal antibody levels (e.g. measles), the placental transfer of specific antibodies to the infant and on the specific antibody level in the infant.

In addition, prenatal exposure to malaria antigens can potentially modulate the infant response to other infectious diseases and vaccination. A cohort study in Benin reported an increased risk of non-malaria-related episodes of *fever*, gastrointestinal and respiratory febrile syndromes among infants born to mothers with placental malaria.[55]

Placental malaria has also been reported to affect the transfer of antibodies to measles and tetanus.[56–61]

Infants of women with asymptomatic malaria in pregnancy had a lower response to measles vaccination measured at one year of age.[62]

Differences in disease-specific maternal immunoglobulin G (IgG) levels, or transfer of infant IgG due to placental malaria, have been reported for *Streptococcus pneumonia*,[60] varicella zoster virus, herpes simplex virus 1, and respiratory syncytial virus,[61] but not for *Haemophilis influenza* type b, or diphteria toxoid.[61]

CD4 T-cell responses to cytomegalovirus among infants were not different by placental malaria status, but responses to tuberculin-purified protein derivative measured at the age of 12 months among children who had received BCG were affected.[63]

Malaria during pregnancy is associated with fetal anaemia (a cord haemoglobin <12.5 g/dL)[64] and an increased risk of anaemia and reduced haemoglobin levels during infancy.[65–68]

Few studies report on the association between growth in infancy and malaria in pregnancy, but it would appear that weight for length could be impacted.[69,70] In addition, infant sex-dependent changes in blood pressure in relation to intrauterine exposure to malaria have been described, and these were independent of infant growth.[71]

Maternal HIV infection has been associated with an increased risk of malaria infections detected in cord blood.[72–74] In a Tanzanian study among HIV-infected women, cord parasitaemia was associated with a significant increase in the risk of neonatal death.[75] Studies examining the effect of maternal malaria on vertical transmission of HIV of the newborn have shown widely diverging results, with some no significant association,[76–79] and some showing an increased risk on vertical transmission of HIV in the presence of maternal malaria[80,81] or in the presence of more frequent episodes of malaria in pregnancy[82] or at high

parasite densities compared with low parasite densities,[83] and some showing a significant decreased risk of vertical transmission in the presence of placental malaria.[84]

c. Impact on maternal health and pregnancy outcomes based on modelling studies

In sub-Saharan Africa in 2010, without MiP preventive interventions, it is estimated that 11 million pregnancies (UI: 10–12 million) would have experienced *P. falciparum* placental infection at some stage of gestation, accounting for 41% of the estimated 28 million live births (Patrick Walker, personal communication).

Combined with a previous estimate of the relationship between placental infection and the risk of LBW,[85] the potential LBW burden due to placental malaria was estimated at 900 000 LBW deliveries for one year (UI: 530 000–1 240 000).

The end of the first trimester is a key period when the placenta is most susceptible to sequestration of parasites. An estimated 65% (UI: 61%-70%) of the potentially infected pregnancies first experience clinical infection at this point. Women in their first pregnancy experienced a disproportionately large proportion (39%) of the potential malaria-attributable LBW burden (UI: 33%-46%).

d. Impact on maternal and newborn health outside Africa (low transmission settings)

In malaria-endemic regions of the world outside Africa, malaria infection rates in pregnant women are much lower. Lower levels of immunity in these women, however, mean malaria infection is more likely to cause severe disease, preterm births, and fetal loss.

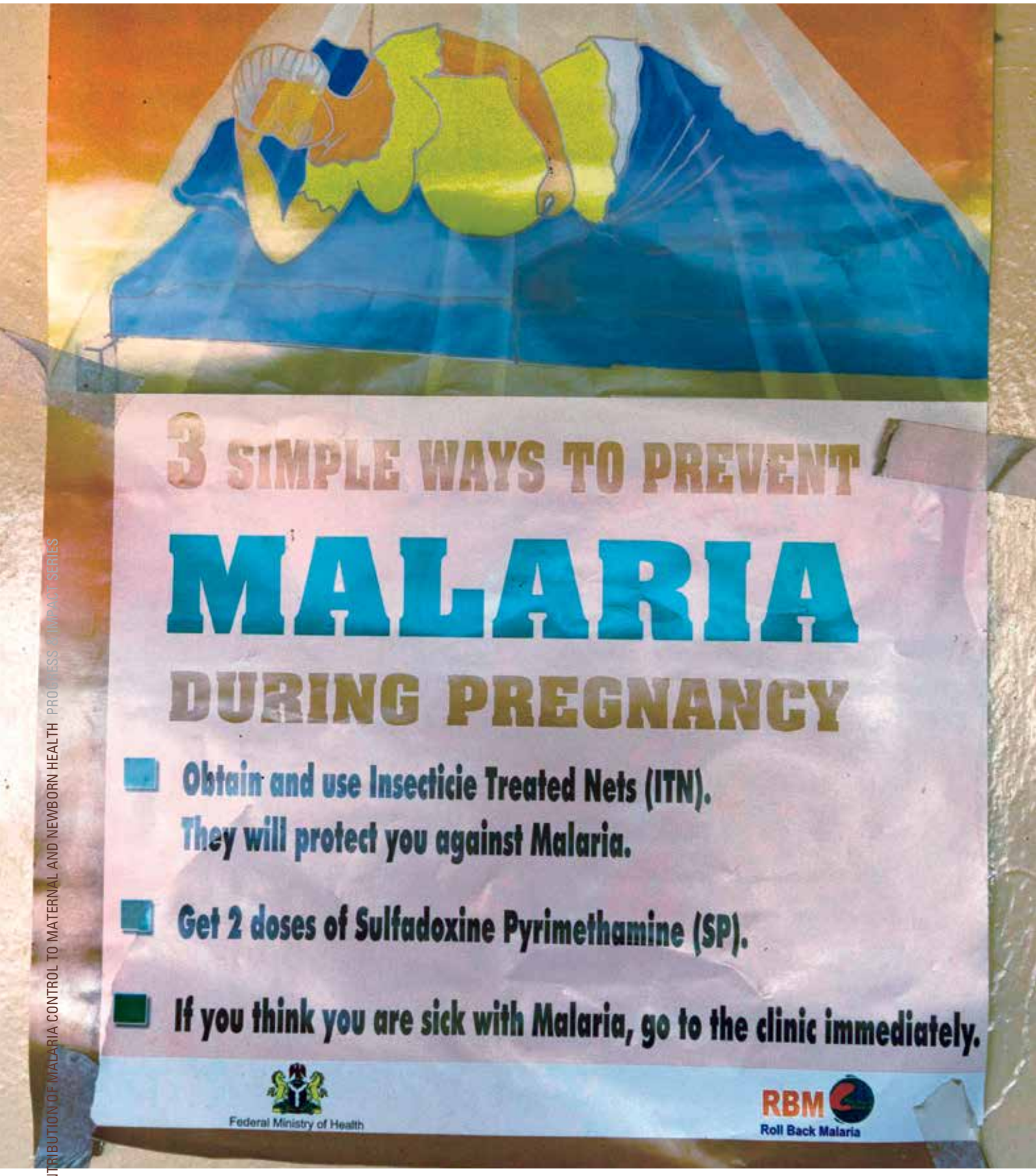
P. vivax is present in most malaria-endemic settings outside Africa and infections are associated with maternal anaemia and LBW. In these settings, an estimated 0.6%–12% of maternal deaths are thought to be due to malaria.[15]

The risk of miscarriage increases in women with both asymptomatic malaria (adjusted odds ratio 2.7, UI: 2.0–3.6) and symptomatic malaria (4.0, UI: 3.1–5.1), and are similar for *P. falciparum* and *P. vivax*.[86] In the same study in the Thailand-Myanmar border, higher *gestational age* at the time of infection in the mother was protective (adjusted odds ratio 0.86, UI: 0.86–0.91), highlighting the importance of early malaria prevention, possibly even before conception.

e. The economic burden of malaria in pregnancy

There is a paucity of data on the economic burden of malaria in pregnant women or in terms of pregnancy outcomes.[87] In terms of direct costs, it can be assumed that the cost of treating severe or complicated cases of malaria in pregnant women and malaria-associated severe anaemia is high.[e] Where the quality of antenatal care (ANC) services and/or access are poor, the outcome of malaria infection in pregnancy is likely to be poor. In turn, maternal death places a high economic burden on households (i.e. an indirect cost). The first cost evaluation of LBW in a low-income country, Mozambique, shows that reducing the prevalence of LBW would translate into important cost savings to the health system and the household.[88] Costs associated with LBW excess morbidity were calculated on the incremental number of hospital admissions in LBW babies compared with non-LBW babies. Direct and indirect household costs for routine health care were US$ 24 (UI: US$ 22–US$ 26), and an increase in birth weight of 100 grammes would cut these costs by half. These results are of relevance for similar settings.

[e] Inpatient treatment for severe malaria has been found to cost US$ 35 per admission in a typical Kenyan district hospital (Kirigia et al., 1998) compared with US$ 1.10 for an outpatient visit in Malawi (Ettling and McFarland, 1992).


3 SIMPLE WAYS TO PREVENT
MALARIA
DURING PREGNANCY
Obtain and use Insecticie Treated Nets (ITN).
They will protect you against Malaria.
Get 2 doses of Sulfadoxine Pyrimethamine (SP).
If you think you are sick with Malaria, go to the clinic immediately.
Federal Ministry of Health
RBM
Roll Back Malaria

PREVENTION AND CONTROL STRATEGIES OF MALARIA IN PREGNANCY

Prevention and control strategies at a glance

- Highly cost-effective interventions to prevent and treat malaria in pregnancy are available.
- Case management reduces the adverse consequences of malaria in pregnancy and can save lives, especially among low-immunity pregnant women with severe, life-threatening malaria. The use of highly sensitive tools improves detection of infections.
- ITN use in pregnancy reduces miscarriages/stillbirths by one third, and IPTp diminishes severe maternal anaemia by 38%, low birth weight by 43%, and perinatal mortality by 27% among women in the first or second pregnancies.
- Compared with newborn babies of mothers with no protection, use of ITNs or IPTp during first or second pregnancies was estimated to provide a protective efficacy of 18% against neonatal mortality and of 21% against low birth weight.

a. Brief historical perspective

The risks of malaria in pregnancy have long been recognized but the discovery that malaria occurs more frequently in pregnant women than in non-pregnant adults was only made about 75 years ago.[89] Until 2000, interventions to prevent and control malaria in pregnancy relied on weekly chemoprophylaxis with *chloroquine*, and treatment of clinical episodes with *quinine*, discovered in the 18th century and the oldest antimalarial.[90]

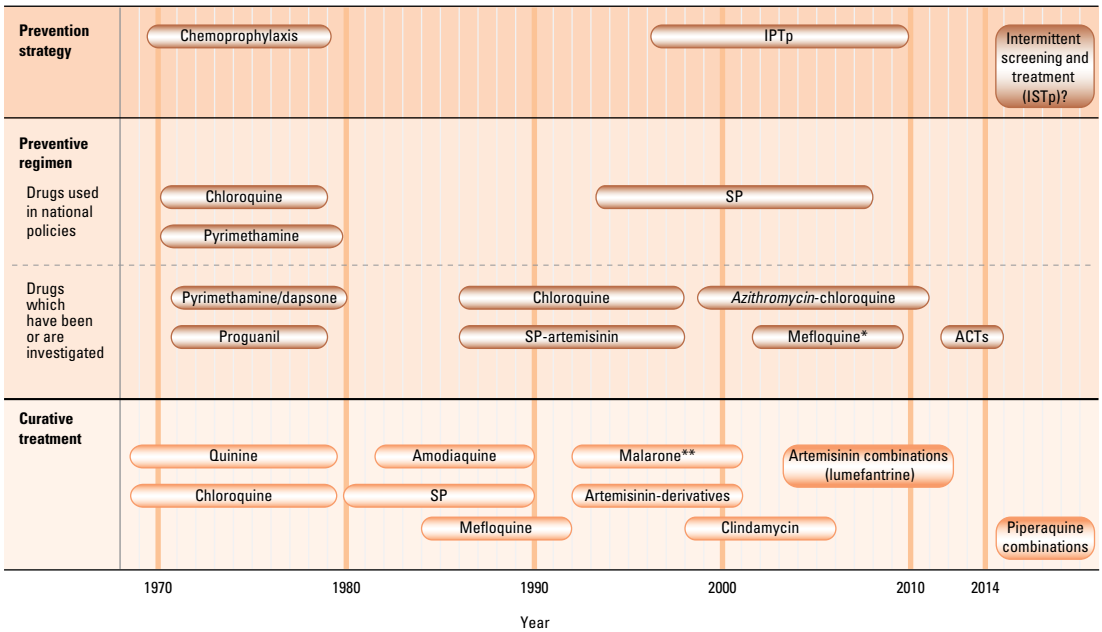
Research on alternative drugs and strategies to control malaria in pregnancy only began in earnest when increasing parasite resistance to chloroquine, contraindications with certain drugs, and poor adherence among pregnant women led to chloroquine chemoprophylaxis and quinine treatments being abandoned in many countries.[91]

Research in the late 1980s and 1990s focused on clinical trials of ITNs in pregnant women and alternative chemoprevention strategies, namely IPTp with sulphadoxine-pyrimethamine (SP). While the range of available antimalarials has grown steadily over the past 50 years (see Figure 6), relatively few of these drugs were proven to be safe and efficacious in pregnancy due to the systematic exclusion of pregnant women from clinical trials due to risks, complexities and cost.

Figure 6

Drugs for prevention and treatment of malaria in pregnancy

Over the past decades, a large number of antimalarial drugs have come out of the product development pipeline in such a way that the disease is entirely preventable and treatable today.



* *Mefloquine* and chloroquine have been used both for chemoprophylaxis and intermittent preventive treatment.

** Malarone: *atovaquone-proguanil.*

Note: Only an approximation of the timeline of the use of different drugs in pregnancy has been attempted.

b. Case management of symptomatic malaria

The diagnosis and case management of malaria infections in pregnant women is an important strategy in all malaria transmission settings, and potentially a life-saving intervention in pregnant women with low levels of immunity, when malaria can lead to rapid deterioration or preterm labour. Some symptoms of severe malaria, such as hypoglycaemia or pulmonary oedema, are more common in pregnant women.[92]

Diagnosis

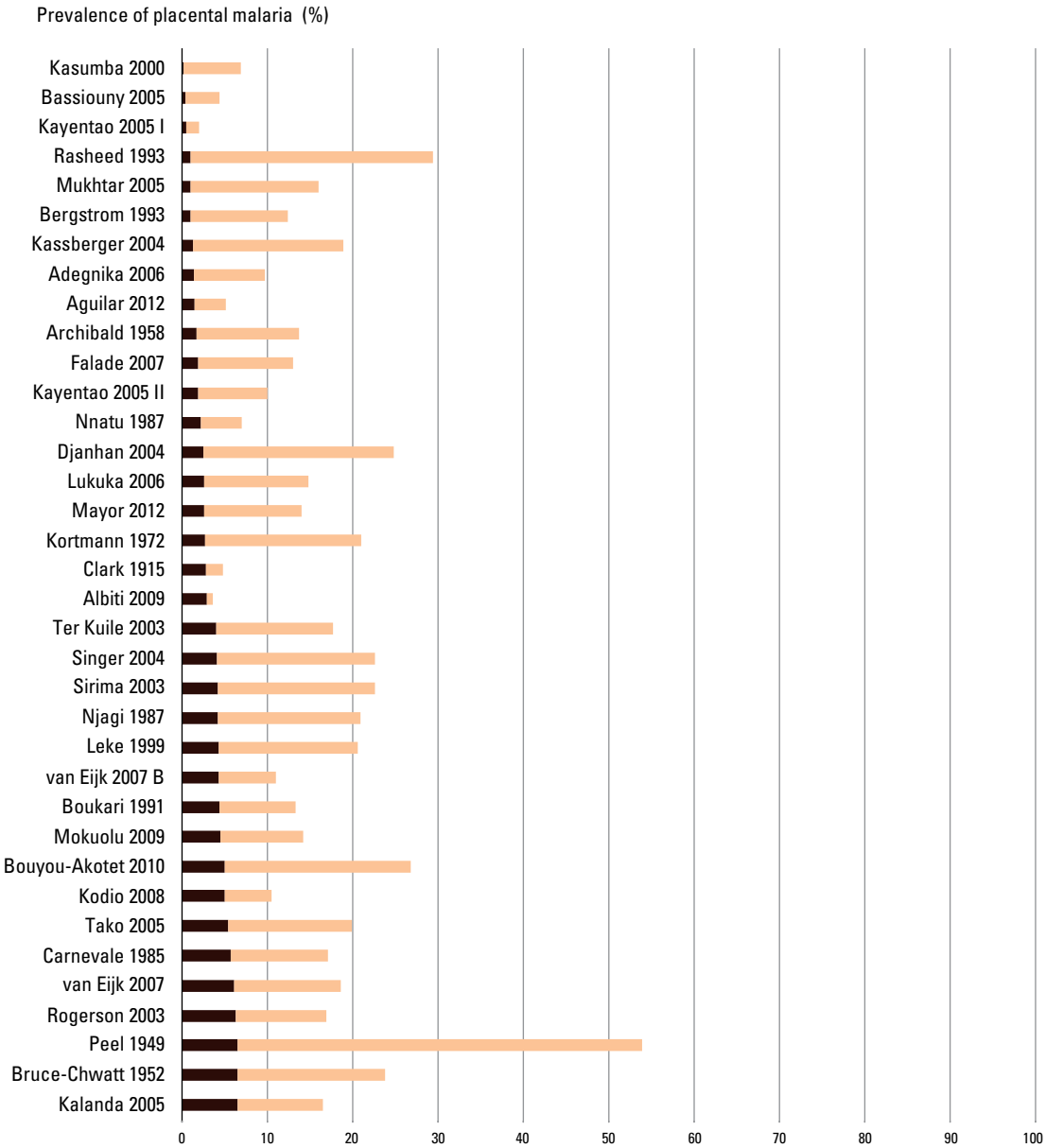
Malaria should be diagnosed parasitologically, using microscopy or rapid diagnostic tests (*RDTs*), to rule out other causes of fever-like symptoms, particularly in areas of high prevalence of HIV where HIV-infected patients have a high incidence of febrile illness. More sophisticated tests like PCR and enzyme linked immuno-sorbent assays (ELISAs) are generally restricted to research studies or high-income countries. One of the challenges in using peripheral blood tests such as RDTs or microscopy is that they will not detect sequestered parasites in the placenta. Therefore, a negative malaria test in a pregnant woman in the routine setting using either microscopy or RDTs does not preclude malaria infection. According to studies conducted in sub-Saharan Africa between 1915 and 2012 (see Figure 7), the proportion of placental infections that are missed by microscopy or RDTs varied considerably, from 0.2 to 22 percentage points of prevalence with a pooled estimate of about 5 percentage points.

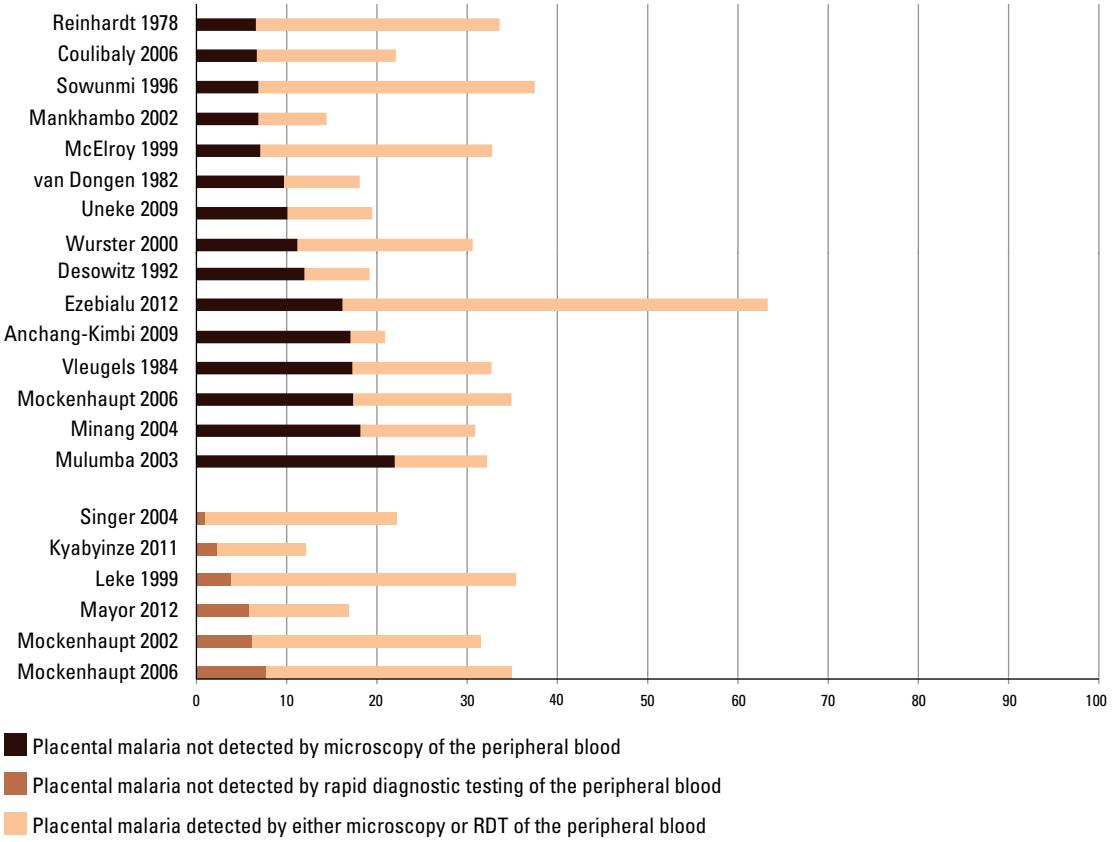
The sensitivity and specificity of RDTs for diagnosing malaria in pregnant women may be suboptimal because of the haemodilution that occurs in pregnancy and the shift of the biomass of the malaria infection to the placenta.[93] In other words, RDTs may be falsely negative during pregnancy because parasites are less concentrated in the blood due to dilution or redistribution to the placenta. Sensitivity and specificity to detect malaria in pregnancy ranged from 15%–97% and 67%–98% respectively when comparing an RDT with peripheral microscopy (six African studies), and 78%–95% and 61%–95% when comparing peripheral RDT with placental microscopy (four African studies).[93]

Figure 7

Placental malaria detected by peripheral maternal blood tests at the time of delivery, sub-Saharan Africa, 1915–2012

From 51 studies using microscopy of the peripheral blood[94] on a minimum sample size of 50, it has been estimated that placental malaria can be missed in about one in 20–25 pregnant women. Based on six studies using RDTs of the peripheral blood from 1999 to 2012, this has been estimated to be about one in 33 women. In other words, the prevalence of placental malaria not detected ranged from 1%–8% using RDTs and 0.2%–22% using microscopy.





Note: RDTs used were detecting HRP-2. For Kyabyinze 2011 and Mayor 2012, active placental infection by histology was used as reference for detecting placental malaria. In all other studies placental smears were used as reference.

Source: Adapted from Kattenberg JH et al. Systematic review and meta-analysis: rapid diagnostic tests versus placental histology, microscopy and PCR for malaria in pregnant women. *Malaria Journal*, 2011, 10:321, updated with additional sources from the malaria in pregnancy library.

Treatment

The range of antimalarial drugs available for treating malaria in pregnancy is more restricted than for non-pregnant adults as these drugs must first be proven to be safe and efficacious for both the mother and fetus, and yet pregnant women are systematically excluded from clinical trials. This is primarily due to the risks, costs and complexities of undertaking clinical trials in pregnant women.

The gold standard for the clinical evaluation of the efficacy of an antimalarial drug in pregnancy is the WHO 42- to 63-day follow-up protocol, whereby women are followed throughout pregnancy and at delivery, and, ideally, the infant is followed throughout the first year of life, to fully evaluate safety and clinical outcomes in both mother and infant.

Since pregnancy can alter the pharmacokinetics (or disposition) of a drug, additional pharmacokinetic

studies are needed to determine optimal dosing to achieve comparable cure rates to those achieved in non-pregnant adults.

Over the past 20 years, clinical trials to assess the efficacy and safety of antimalarial drugs and pharmacokinetic studies in pregnant women have been conducted separately, and the *artemisinin derivatives* have been the subject of disproportionately more studies than all other drugs used previously.[92,95,96]

Although artemisinin derivatives have been implicated in fetal abnormalities in animal studies, specifically in the early stages of fetal development,[95,96] this has not been observed among infants of women with first trimester exposure.[97]

However, the number of well documented first trimester artemisinin exposures has been relatively few, and at present insufficient data are available to fully assess safety. Therefore, use of artemisinins in the first trimester of pregnancy is contraindicated, and these drugs or their combinations are currently recommended only for treatment in the second and third trimesters.

Malaria in pregnancy itself causes substantial morbidity and mortality in the mother and infant. Therefore, if no other treatment alternatives are available, or where other drugs have failed, artemisinins may be used following a risk–benefit analysis that considers the potential risks of fetal damage following artemisinin use in the first trimester against the risks of maternal death due to malaria.

Post-marketing surveillance or pharmacovigilance is needed to monitor potential harmful effects of using arteminisins in the first trimester, whether for treatment or inadvertent first trimester exposure.[98]

Over the past decade, treatment policies for uncomplicated malaria adopted in sub-Saharan Africa have moved to artemisinin combination therapies to reduce the development of resistance of *P. falciparum*. The artemisinin derivatives are commonly used alongside lumefantrine, *amodiaquine*, *piperaquine* or SP as one of two components in these combination therapies.

Possible interactions between antiretroviral treatments, malaria and antimalarials have been described among HIV-infected persons, but it is not yet clear if these have clinical consequences.[99] Neviparine-based antiretroviral *therapy* may affect the pharmacokinetics of quinine in pregnant women,[100] and an effect of the same regimen on amodiaquine pharmacokinetics has been described in adults.[101]

The practical issues regarding the implementation of case management are discussed in Chapter VI.

c. Prevention interventions are highly efficacious and cost effective

IPTp and ITNs represent some of the most inexpensive and highly cost-effective tools available for improving health outcomes in pregnant women and their infants. Intermittent preventive treatment of malaria in pregnancy consists of the administration of full, curative-treatment doses of an effective antimalarial drug at predefined intervals during pregnancy, regardless of whether or not a woman is infected with malaria parasites.

Systematic reviews of randomized control trials have shown that successful prevention of maternal malaria infections with IPTp or ITNs in sub-Saharan Africa improves pregnancy outcomes for both the mother and fetus. Cochrane reviews indicated that ITN use in pregnancy reduced the risk of spontaneous *abortions* and stillbirths by 33%,[102] and IPTp diminished severe maternal anaemia by 38%, low birth weight (LBW) by 43%, and perinatal mortality by 27% among women in the first or second pregnancies.[35] A more recent randomized placebo-controlled trial to evaluate the efficacy of two-dose intermittent preventive treatment of malaria in pregnancy with sulphadoxine-pyrimethamine (IPTp-SP) in Mozambique, that followed about 1000 newborns until 12 months of age, found that IPTp reduced neonatal mortality by 61% (UI: 7%–83%).[103]

Estimates of the cost–effectiveness of IPTp and ITNs are relatively old, and revised estimates are needed. In 2001, the incremental cost of adding IPTp with SP to an existing ANC service during first pregnancies was estimated to be US$ 1.10 per pregnancy in low-income countries, increasing to US$ 2.20 when adding service overheads.[104]

The cost of providing IPTp to all mothers regardless of their previous number of pregnancies substantially increases the total cost but represents a relatively minor addition to existing government health expenditure and is easier to implement than targeting.[104]

When extended to include benefits to the mother as well as infants using modelling of trial data in 2006, the incremental cost–effectiveness ratio (ICER) for two to three doses of SP during pregnancy delivered to women in their first pregnancy in a low-income sub-Saharan African setting, allowing for the probability of attending each visit, the level of drug resistance and compliance ranged between US$ 9 and US$ 21 per disability-adjusted life year (DALY) averted (mean US$ 13). DALY is a measure of the number of years lost due to ill-health, disability or early death.[104] The ICER is an equation used to provide a practical approach to decision-making regarding health interventions. It is the ratio of the change in costs to incremental benefits of a therapeutic intervention or treatment.

A more recent analysis of the cost–effectiveness of IPTp-SP on maternal clinical malaria and newborn survival was estimated in the context of a trial of malaria intermittent preventive treatment during pregnancy with SP in Mozambique, where both intervention groups received an LLIN through ANC. In 2007, the ICER for the prevention of maternal malaria was US$ 41 (UI: US$ 21–US$ 97) per DALY averted, and for the reduction in neonatal mortality was US$ 1 (UI: US$ 0.50–US$ 3.50).[105] The ICER, including both the effect on the mother and on the newborn, was US$ 1 (UI: US$ 0.40–US$ 3.20) per DALY averted.

Previous estimates from 1999 of the cost–effectiveness of delivering free ITNs to the whole population for reducing all-cause child mortality ranged from US$ 19–US$ 85 per DALY, reducing to US$ 4–US$ 10 per DALY in areas where there is a moderately high level of pre-existing ITN coverage, as in several parts of Africa today.[106] As a matter of comparison, in these same areas, cost-effective public health interventions such as immunization were estimated at US$ 3 to US$ 7 per DALY.

A Ugandan study from 2010 found that the cost of the ITN campaign, compared with the cost of ANC delivery of ITNs, was similar in the same location but differed between locations, and that the cost of delivery through ANC facilities was comparatively higher due partially to the relatively short time this system had been in existence.[107] A major benefit of delivering LLINs through ANC is that this has been observed to increase pregnant women's attendance at ANC,[108] which is an important platform through which women receive other essential ANC services, such as prevention of mother-to-child

transmission, management of anaemia, syphilis, and other conditions, and birth planning. In addition, ANC provides an opportunity to educate and encourage women to use ITNs. Costs for LLINs, regardless of the method of delivery, need to take into consideration distance, human resources, warehousing and *monitoring and evaluation* costs, which are relatively similar regardless of campaign and routine methods.

In programmatic settings, however, these two interventions are delivered together and not in isolation, presumably leading to increased cost–effectiveness.

d. Effectiveness under routine programme settings

The use of IPTp and ITNs under routine malaria control programme conditions across sub-Saharan Africa has been associated with substantial reductions in neonatal mortality and LBW.

A review of national survey data from 32 national cross-sectional datasets (25 countries), performed in 2012, showed that IPTp or ITN use among women in their first or second pregnancies was significantly associated with a decreased risk of neonatal mortality (protective efficacy [PE] 18%, UI: 4%–30%) and reduced odds of LBW (PE 21%, UI: 14%–27%), compared with newborn babies of mothers with no protection, after matching and controlling for potential confounding factors.[109]

Indoor residual spraying

Although not used specifically for pregnant women, and rarely evaluated among pregnant women, IRS has been shown to decrease parasitaemia[110] and improve birthweights outside of Africa.[111] IRS is often used in combination with other prevention methods. Although there have been concerns about possible toxic effects of chemicals used for IRS on the health of the fetus and prospective parents,[112] the benefits of reducing malaria seem to outweigh the possible risks.

Malaria prevention in HIV-infected women

Malaria prevention is extremely important for this vulnerable group because of the increased risk of contracting malaria among HIV-infected pregnant women and the synergistic adverse effects of coinfection on maternal and fetal health. Intermittent preventive treatment with two doses of SP was less effective in HIV-infected compared with non-infected women and initially an additional dose for HIV-infected women was recommended in areas with an HIV-prevalence of >10%.[113,114] Co-trimoxazole is now recommended for routine use to prevent opportunistic diseases among HIV-infected persons, and has been shown to reduce malaria as well. In HIV-infected pregnant women on daily co-trimoxazole, IPTp with SP is not indicated, as it may be associated with overlapping toxicities. The effectiveness of co-trimoxazole appeared to be similar to that of IPTp with SP or mefloquine in HIV-infected women with regards to preventing malaria parasitaemia,[115–117] although effects on maternal anaemia may differ.[117,118] A study in Uganda did not see an effect of several antiretroviral regimens on the prevalence of malaria in pregnancy in a multivariate analysis.[119]

Box 1: A malaria in pregnancy case study, Zambia

In 2005, Zambia developed its first national malaria strategic plan (NMSP) outlining a package of interventions aimed at achieving a "malaria-free Zambia". An essential element in the strategy was that **at least 80% of pregnant women have access to the package of MiP prevention interventions (IPTp and ITN) by December 2008.**

To this end, the Ministry of Health (MoH) focused its efforts on:

- Improving access to IPTp with SP at least three times during the second and third trimesters.
- Improving access to and use of ITNs by pregnant women.
- Reducing maternal anaemia through the two methods above, as well as with micronutrients and improved nutrition.
- Improving diagnosis and treatment for pregnant women with clinical malaria (MoH 2006).

All malaria services, including MiP, were included in the "Basic Health Package" as per the National Health Strategic Plan.

Policy development

Prior to 2002, policy stipulated that pregnant women should be routinely given malaria *prophylaxis* with chloroquine, though this policy was not well implemented at the service delivery level, as many health-care providers were unaware of the policy, and stocks of chloroquine were inadequate, among other contributing factors (Jhpiego 2004). Implementation of IPTp began in earnest from 2000–2003 when there was regional rallying around MiP after the Abuja Summit, and Zambia revised its IPTp drug policy. This policy called for pregnant women to receive *i*) three doses of SP as directly observed therapy (DOT), beginning at 16 weeks of pregnancy and repeated one month apart, and *ii*) education/promotion on ITNs within the context of at least four focused antenatal care (FANC) visits (MoH 2002; National Malaria Control Centre [NMCC] 2003).

The package of MiP interventions was rolled out promptly under the strong NMCC leadership and in cooperation with RBM partners and other stakeholders who came together under the National Malaria Task Force (Sipilanyambe et al. 2008). The development and implementation of this policy were also facilitated by Zambia's participation in the Malaria in Pregnancy East and Southern Africa Coalition (MIPESA), which includes government and international/nongovernmental partners from Zambia, Kenya, Malawi, Tanzania and Uganda.

MiP intervention coverage and output indicators

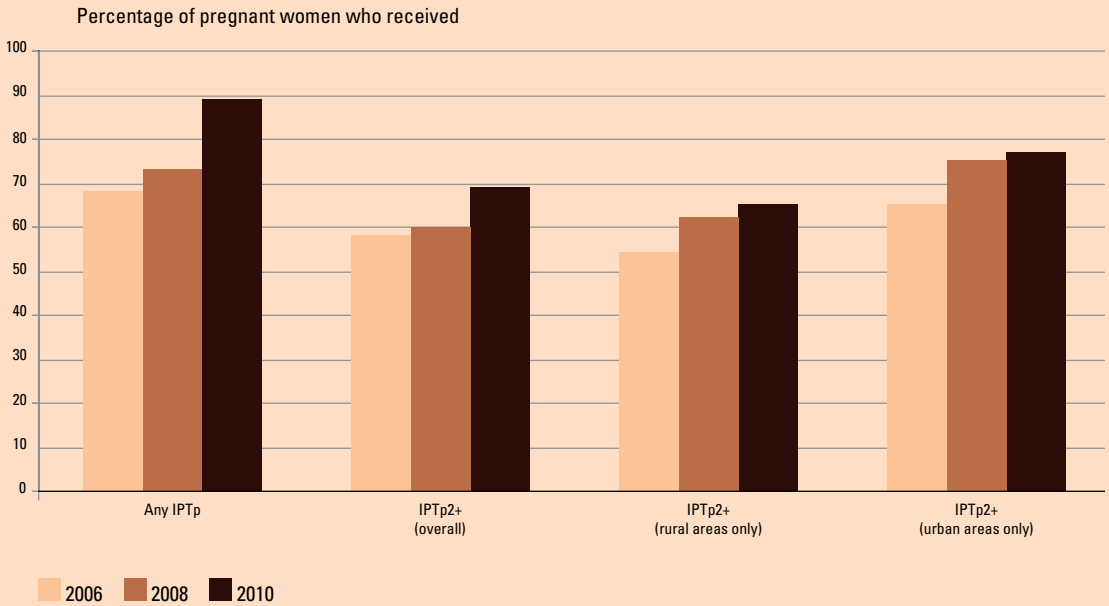
The proportion of pregnant women receiving at least one dose of IPTp during an antenatal visit then increased from 69% in 2006 to 73% in 2008 to peak at 89% in 2010 (malaria indicator survey [MIS] data, see Figure 8).

The indicator for receipt of at least two doses of IPTp (IPTp2+) followed a similar trend, from 59% in 2006 to 60% to reach 69% in 2010 (although Zambia's IPTp goal is three doses of IPTp, this indicator is not included in the MIS or Demographic Health Survey [DHS]).

Figure 8

Proportion of last live births in the previous two years where the mother received IPTp,* overall and based on rural and urban residence, Zambia, 2006–2010

Between 2006 and 2010, IPTp2+ coverage indicators increased by about 10 percentage points among pregnant women, although disparities in coverage exist between rural and urban women.



*Note: *IPTp is defined as receiving any antimalarial during pregnancy; IPTp2+ is defined as receiving at least two doses of SP, with at least one at an antenatal care visit.*

Source: 2006 MIS, 2008 MIS, 2010 MIS.

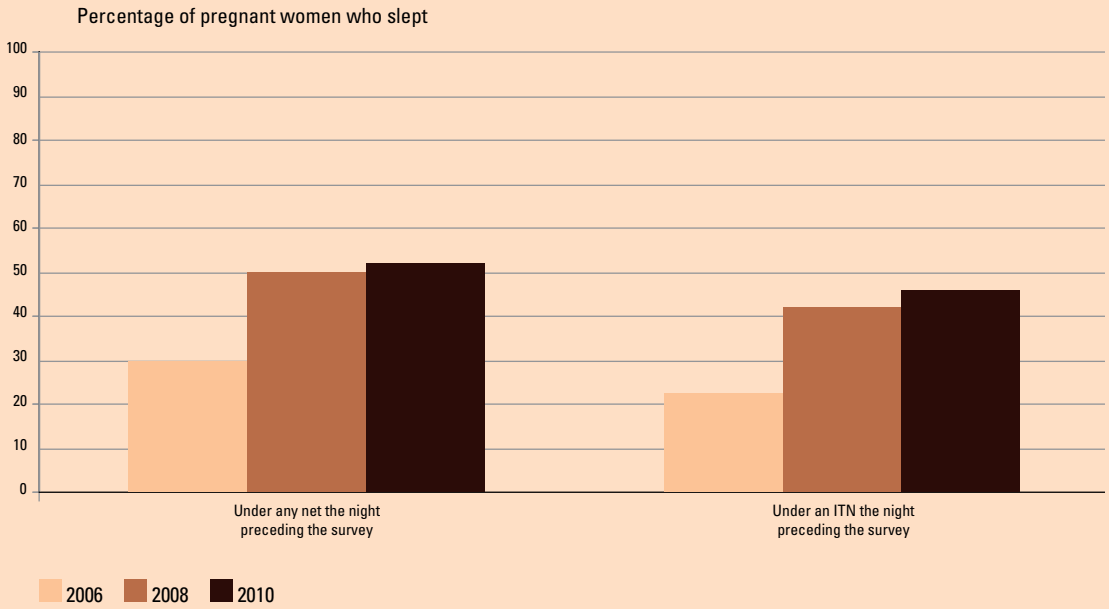
In 2010, there was a substantial difference between urban and rural populations, with 77% of urban women receiving IPTp2+ compared with only 65% of rural women. These disparities were also observed between the provinces, with Copperbelt Province having a high rate of uptake of IPTp2+ at 82% while Western Province had a lower uptake at 65% (MoH 2010). Several interviewees said these significant differences in IPTp uptake between provinces could result from issues of accessibility and education levels. Copperbelt is a largely urban province with relatively good roads and extra, private support for health systems provided by the mining companies. Western Province is one of the most rural in Zambia, with large distances between many villages and health centres, some of which are accessible only by boat during the rainy season. Across Zambia, those in higher wealth quintiles and with more education were also more likely to receive IPTp. This is reflected in individual provinces, with 77% of the population of Western Province in the lowest two wealth quintiles, and 84% of Copperbelt Province in the highest two quintiles (Central Statistics Office 2009).

The 2010 MIS indicated that 52% of pregnant women reported sleeping under any net the night preceding the survey and 46% reported sleeping under an ITN (see Figure 9).

Figure 9

Mosquito net use among pregnant women, Zambia, 2006–2010

The proportion of pregnant women sleeping under any net the night preceding the survey increased from 30% in 2006 to 50% in 2008 to peak at 53% in 2010. ITN use increased even more, doubling over the same time period (22%, 43% and 46% for 2006, 2008 and 2010 respectively).



Source: 2006 MIS, 2008 MIS, 2010 MIS.

That about half of pregnant women are still not sleeping under an ITN should, however, be examined in light of the fact that 62% of households own an ITN (MoH 2010). None of the major surveys conducted in Zambia capture ITN ownership among pregnant women, but when asked about bottlenecks in ITN distribution to pregnant women, interviewees almost universally cited that there are not enough nets procured to meet demand, with health centres often out of stock. Distribution of ITNs through ANC is complemented by yearly mass distribution campaigns, but according to partners, these campaigns do not meet the needs of the entire population due to poor quantification.

One ITN partner reported that if the goal for Zambia is three ITNs per household, with current donor commitments the country has a shortage of three million nets for areas not covered by indoor residual spraying (IRS) and a shortage of seven million ITNs for all areas.

It should be noted, however, that several of the partner and government interviewees cast doubt on the reliability of ITN usage data. Many felt that respondents were not honest about their ITN usage because they feared being reprimanded and/or that it would prevent them from receiving a free ITN in the future.

On **ANC attendance**, the most recent DHS, in 2007, found that 94% of women made at least one antenatal visit, with 60% of women making four or more visits. Taking into account frequent stock-outs of SP, increasing the number of women who attend four or more antenatal visits is essential to increasing IPTp uptake and ITN use. Several actions have been recommended by the NMCC to improve MiP interventions, namely:

- reduce SP and ITN stock-outs;
- encourage earlier initiation of ANC attendance at facilities that offer the full range of focused antenatal care (FANC) services;
- provide FANC mentoring to all 'qualified' providers in both public and private sectors;
- improve coordination between the NMCC and reproductive health (RH) and maternal and child health programmes.

National and international guidelines stipulate that women should attend ANC as soon as they know they are pregnant. While IPTp cannot be given until 16 weeks of pregnancy or *quickening*, ITNs can be given at any time, and are most effective the earlier they are provided (and used).

Pregnant women can increase their benefit from this intervention if they attend ANC prior to 16 weeks of gestation. In 2007, however, the majority of women began ANC in the second trimester, with 53% making their first visit between four and five months, and 23% of women between six and seven months. Given that ITNs should be distributed to pregnant women by the health centre at the first ANC visit, starting ANC after the first trimester may delay the use of this prevention method during the period when the woman is not yet eligible for IPTp, increasing the likelihood of malaria infection.

Successes and best practices

Despite many challenges, from 2006 to 2010 there were increases in IPTp uptake and in the proportion of pregnant women sleeping under an ITN, signifying the effectiveness of MiP programming in Zambia. Several of Zambia's innovations in programme development and implementation, which can serve as models for and be adapted to other country situations, stand out, including:

- development of a clear IPTp policy;
- MoH/NMCC/partner collaboration in policy development and implementation;
- integration of the MiP programme into the MoH Reproductive Health Unit;
- roll-out of MiP through FANC package;
- ITN distribution through ANC;
- integration of FANC/IPTp into the prevention of mother-to-child transmission in-service curriculum;
- FANC mentoring teams;
- community involvement.

GLOBAL AND NATIONAL POLICIES

Malaria prevention and treatment policies at a glance

- The 2012 updated IPTp policy includes more frequent dosing of SP at each ANC visit at least one month apart during the second and third trimesters of pregnancy until the time of delivery.
- ITNs are to be delivered to all pregnant women, using both routine ANC systems and campaigns to ensure continuous delivery.
- Treatment guidelines outline appropriate regimens for treatment during first, second and third trimesters.

WHO recommends a three-pronged approach for controlling malaria in pregnancy in areas of moderate to high transmission in sub-Saharan Africa, including intermittent preventive treatment, long-lasting insecticidal nets (LLINs) and case management.[120]

In regions outside of Africa but with 'Africa-like malaria' (high transmission intensity across large populations, e.g. Papua New Guinea), it is also recommended that WHO's policy guidance is implemented. In other regions where transmission intensity is lower and health systems can support good diagnostics for malaria detection, prevention with ITNs and passive case detection and management is recommended.[121]

a. Intermittent preventive treatment during pregnancy (IPTp) policy

WHO introduced the IPTp strategy in 2000,[91] and it was first adopted as regional policy in the WHO African Region in 2004.[113]

The majority of countries with ongoing *Plasmodium falciparum* transmission in sub-Saharan Africa (39 out of 43) have adopted IPTp as policy, the earliest being Malawi in 1993, the most recent the Central African Republic in 2004.

Sulphadoxine-pyrimethamine is the only drug recommended for IPTp for all areas of moderate to high transmission, based on its efficacy and safety profile. IPTp is not recommended for HIV-positive women taking co-trimoxazole, due to redundant mechanisms of action and potential drug interactions between two sulphur-containing drugs. If a woman presents to an ANC clinic with symptoms of malaria, these symptoms should be investigated before the administration of IPTp-SP. If the woman tests positive for malaria, by either microscopy or RDT, she should be treated following national case management guidelines. If she is negative, she should receive IPTp-SP.

In September 2012, following a WHO Evidence Review Group (ERG) meeting in July 2012, WHO issued an updated policy recommendation that promotes increasing the uptake of IPTp-SP among pregnant women in all areas of Africa with moderate to high transmission of *P. falciparum* malaria.[122]

The update reinforces the importance of delivering IPTp as part of routine antenatal care services and is based on WHO's review of recent evidence on the dosing regimen (ERG on IPTp). More frequent dosing is recommended, revising the previous guidance of providing IPTp with SP from at least two doses to at each scheduled ANC visit at least one month apart, starting early in the second trimester of pregnancy.[122] As per the previous policy, HIV-infected women receiving co-trimoxazole should not receive IPTp-SP. It also outlines a number of recommendations for administration (see Box 2). The accompanying policy brief provides the evidence base for the updated policy and practical guidance for implementation.[123]

Kenya, Madagascar and Zimbabwe only implement IPTp in high malaria transmission regions of the country. Rwanda and Namibia have recently withdrawn the IPTp-SP policy and Zanzibar is considering withdrawing it on the grounds that transmission levels have fallen substantially in recent years due to improved malaria control. WHO has, however, cautioned countries not to withdraw the policy until alternative prevention strategies are available, in case transmission levels increase once more, putting all their populations, and in particular pregnant women, at considerable risk.

A second WHO ERG on IPTp met in July 2013 to assess the results of multicentre clinical trials on mefloquine as a potential alternative drug to SP for IPTp, and to review the evidence on the effectiveness of IPTp-SP in relation to *P. falciparum* antifolate resistance and decreasing malaria transmission.

The Malaria Policy Advisory Committee (MPAC) reviewed the ERG recommendations,[124] and agreed that mefloquine at the 15 mg/kg dose regimen should not be recommended for IPTp, given its adverse events and poor tolerability.

In relation to SP resistance, MPAC recognized that in many areas where parasites with quintuple mutations conferring antifolate resistance have been identified, IPTp with SP still confers benefit for pregnancy outcomes.

In a small number of discrete, limited areas in eastern and southern Africa, resistance of *P. falciparum* to SP has reached a level at which IPTp-SP may no longer be effective in preventing low birth weight (LBW). These are areas where there are *P. falciparum* parasites carrying six resistance mutations. On balance, MPAC concluded that there are insufficient data to determine at what level of resistance IPTp-SP should be discontinued in the absence of an established and effective alternative.

Similarly, MPAC concluded that there are insufficient data to define the level of *P. falciparum* transmission at which IPTp-SP may cease to be cost effective from a public health point of view. Furthermore, natural fluctuations in malaria incidence from year to year, and the low cost of the intervention as delivered through the Maternal and Child Health system, call for significant caution before discontinuing IPTp-SP.

More data are needed and will be reviewed when available. Until that time, MPAC strongly recommended that countries continue to implement the current WHO policy that women who live in moderate to high malaria transmission areas should receive IPTp-SP as early as possible in the second trimester, and at each scheduled ANC visit thereafter, provided that each SP dose is given at least one month apart.[124]

b. ITN policy

Since 2000, WHO has recommended ITN use for pregnant women across all transmission settings. All malaria-endemic countries in sub-Saharan Africa provide ITNs to pregnant women, with Niger and Senegal the first to introduce the policy in 1998, and the most recent the Central African Republic and Equatorial Guinea in 2007.

In 2007, WHO changed the focus of its global ITN policy, from targeting vulnerable populations such as children under five and pregnant women, to covering 100% of all populations at risk of malaria in Africa (which was set forth in the *Global Malaria Action Plan* [GMAP] objectives by the end of 2015).[125]

Of 43 countries with ongoing *Plasmodium falciparum* transmission in the African region, 34 (79%, data from *World malaria report 2013*) distribute nets to all age groups, providing LLINs through both population-wide distribution schemes for rapid 'catch-up', and routine distribution to pregnant women through antenatal clinics to maintain coverage between campaigns, particularly for women who fall pregnant between campaigns and for infants born outside of campaign years.[126,127] This combined approach provides additional LLINs, and a lower person-net ratio.

c. Case management policy

WHO guidelines for the treatment of malaria recommend that, for safety reasons, pregnant women in the first trimester with uncomplicated *P. falciparum* malaria be treated with quinine plus clindamycin for seven days, and quinine monotherapy if clindamycin is not available.[128] Artesunate plus clindamycin for seven days is indicated if this treatment fails.

Artemisinin-based combination therapies (*ACTs*) are recommended to treat uncomplicated *P. falciparum* malaria in the second and third trimesters of pregnancy. Alternatively, artesunate plus clindamycin (or quinine plus clindamycin) can be given for seven days during this period. Pregnant women who are HIV positive should be treated for malaria according to the same WHO guidelines.

All countries in sub-Saharan Africa have adopted ACTs to manage malaria in the second and third trimesters of pregnancy, and quinine for treatment in the first trimester.

Parenteral antimalarials (i.e. rectal, intramuscular or intravenous administration) should be given to pregnant women with severe malaria in full doses without delay. Parenteral artesunate is preferred over quinine in the second and third trimesters, because quinine is known to reduce blood sugar level (hypoglycaemia). In the first trimester, the risk of hypoglycaemia is lower and the uncertainties over the safety of the artemisinin derivatives are greater. However, weighing these risks against the evidence that artesunate reduces the risk of death from severe malaria, both artesunate and quinine may be considered as options until more evidence becomes available.

d. Linking interventions to service delivery systems

Both IPTp and ITNs are commonly delivered to pregnant women through routine ANC services, with malaria and reproductive health programmes working together. Public sector ANC facilities predominantly provide IPTp free of charge, and ITNs are provided either free or subsidized, through the use of vouchers, for example, whereas private sector providers almost always charge fees for both.

Some countries have supplemented the delivery of ITNs to pregnant women through ANC, with periodic campaigns targeting all households in efforts to achieve universal access, or households with special risk groups such as children under five years, alongside de-worming, immunization or other child health interventions. The relative merit of these alternative approaches to delivering ITNs have long been debated,[129,130] though consensus among RBM partners is for complementary approaches that use both routine systems and campaigns to ensure universal, continuous delivery.[131]

Box 2: WHO Updated Policy Recommendation on IPTp-SP (October 2012)

"All possible efforts should be made to increase access to IPTp with SP in all areas with moderate-to-high transmission in Africa, as part of antenatal care services."

- In areas of moderate-to-high malaria transmission, IPTp with SP is recommended for all pregnant women **at each scheduled antenatal care visit**. WHO recommends a schedule of four antenatal care visits.
  - The first IPTp-SP dose should be administered as early as possible during the second trimester of gestation.
  - Each SP dose should be given at least one month apart.
  - The last dose of IPTp with SP can be administered up to the time of delivery, without safety concerns.
  - IPTp should ideally be administered as directly observed therapy (DOT).
  - SP can be given either on an empty stomach or with food.
  - Folic acid at a daily dose equal to or above 5 mg should not be given together with SP as this counteracts its efficacy as an antimalarial.
  - SP should not be administered to women receiving co-trimoxazole prophylaxis.
- In some countries where IPTp with SP is being implemented, transmission of malaria has been reduced substantially. In the absence of information on the level of malaria transmission below which IPTp-SP is no longer cost effective, such countries should not stop IPTp-SP.
- There is insufficient evidence to support a general recommendation for the use of IPTp-SP outside Africa.
- Monitoring of IPTp-SP effectiveness and safety of multiple doses is essential and should continue. Research is ongoing to define the best methodology for such monitoring; this will be shared when available.

Source: WHO Updated Policy Recommendation on IPTp-SP (October 2012)[122] and WHO Policy Brief for the implementation of intermittent preventive treatment of malaria in pregnancy using sulfadoxine-pyrimethamine (IPTp-SP).[123]

CHAPTER V

PROGRESS IN ACHIEVING UNIVERSAL COVERAGE OF PREVENTION INTERVENTIONS

Coverage of malaria prevention at a glance

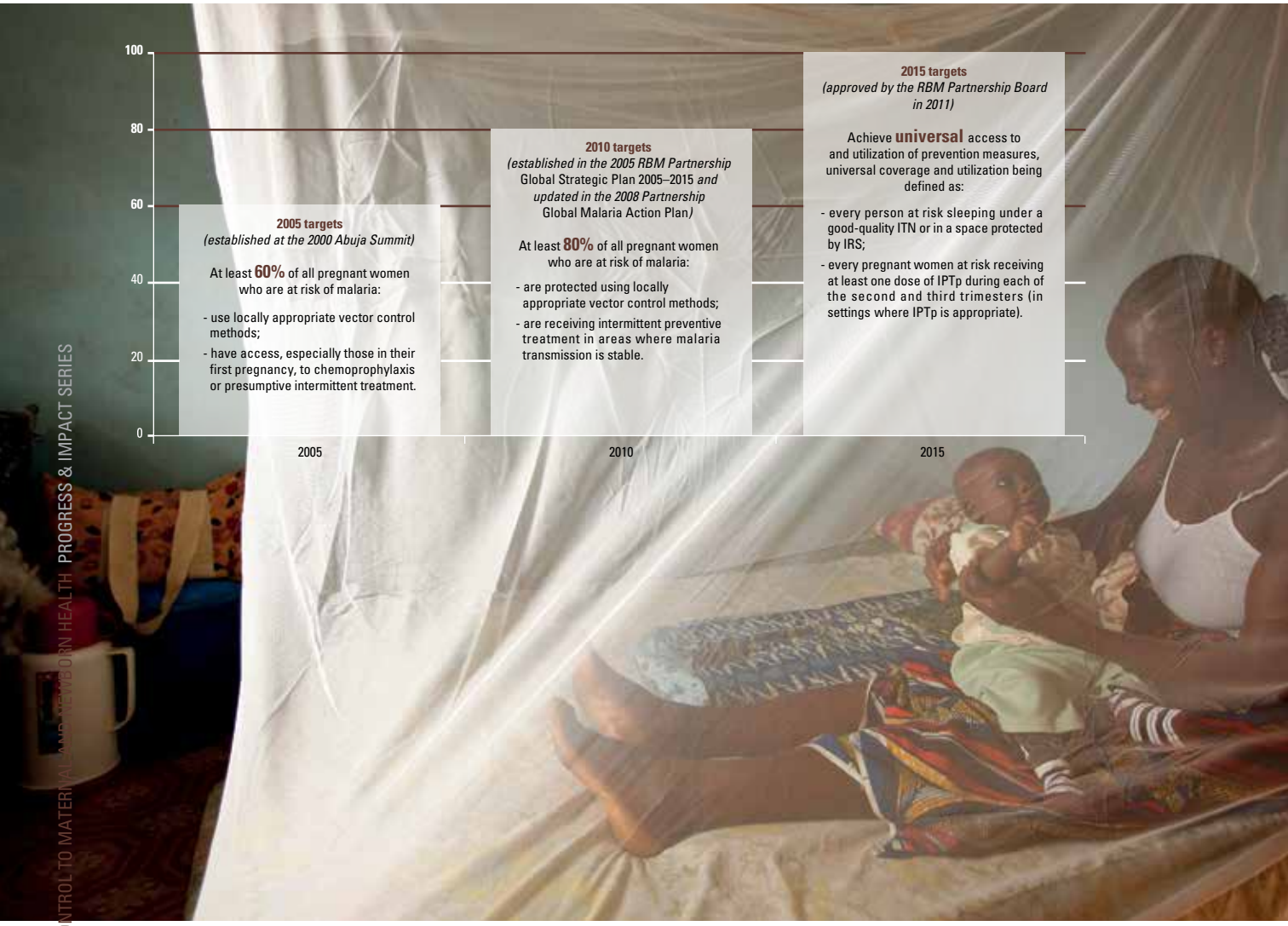
- Progress in coverage of prevention interventions among pregnant women has been modest.
- IPTp coverage with at least two doses rose from 14% in 2004–2008 to 22% in 2009–2012.
- ITN use among pregnant women more than doubled in the same evaluation periods, from 17% to 39%.
- These achievements are fragile and inequities in coverage persist.
- About 94 000 deaths among newborns were averted between 2009 and 2012 thanks to the scale-up of prevention of malaria in pregnancy interventions in 45 African countries. Had an 80% coverage of these interventions been achieved, about 300 000 neonatal deaths could have been averted.

Over the past decade, the RBM Partnership has set increasingly ambitious targets for IPTp coverage and ITN use among pregnant women in sub-Saharan Africa (see Figure 10).

Figure 10

Global targets set for 2005, 2010 and 2015 for malaria prevention interventions among pregnant women in sub-Saharan Africa

The original Abuja target was of 60% for ITNs and IPTp by 2005. This was updated to 80% by 2010 and, most recently, to 100% by 2015.



Source: Abuja Declaration (2000), *Global Malaria Action Plan* (2008) and RBM Partnership Board (2011).

Progress for IPTp coverage and ITN use among pregnant women in sub-Saharan Africa, evaluated in two sequential reviews of data for the periods 2004–2008 and 2009–2012, are summarized in Figures 11–12 and 13–14 respectively.[132,133]

Figure 11

IPTp coverage in sub-Saharan Africa, 2004–2012

Progress in most countries has been modest, with an overall increase in IPTp coverage from about 14% in 2004–2008 to 22% in 2009–2012.

IPTp2+ (at least two doses)	Evaluation period	
	2004–2008	2009–2012
Coverage (number of countries assessed)	14% (19)	22% (27)
Number of countries with coverage of at least 60%*	1	3
Number of countries with coverage of at least 80%*		0

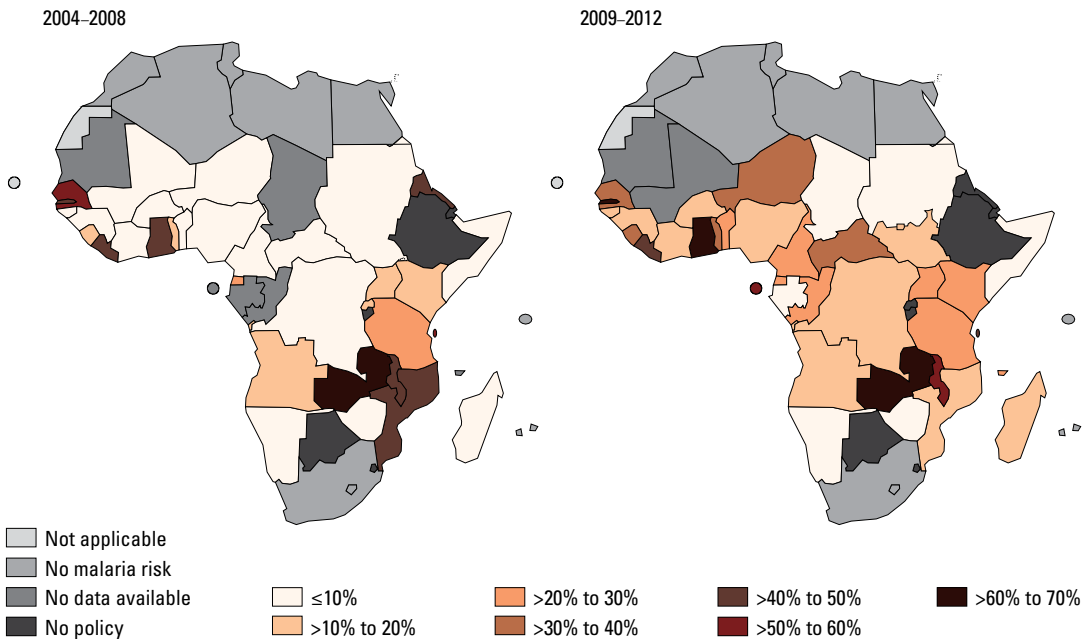
*60% and 80% targets were set by the Roll Back Malaria Partnership for 2005 and for 2010, respectively.

Only a handful of countries have reached coverage that exceeded the original Abuja target of more than 60% for IPTp (the Gambia, Ghana and Zambia; Sao Tome and Principe falling slightly short of the target) and no country has attained the 2010 target of 80% (see Figure 12). Constraints to achieving coverage are discussed in Chapter VI.

Figure 12

IPTp coverage in sub-Saharan Africa, comparison between surveys from 2004–2008 and 2009–2012

Coverage achieved for IPTp is fragile, and additional efforts are needed if it is to be increased or even sustained. Three countries had an absolute decrease in coverage since the previous survey, with considerable decline in Senegal and Mozambique (13 and 24 percentage points, respectively).



Source: National cluster sampled household surveys such as DHSs, multiple indicator cluster surveys (MICSs), MISs and other national surveys undertaken between 2004 and 2012.

Only five countries (Benin, Madagascar, Mali, Niger and Rwanda) increased their use of ITNs during pregnancy above the 60% mark, and none attained the 2010 target of 80% (see Figure 13).

Figure 13

ITN use during pregnancy in sub-Saharan Africa, 2004–2012

ITN use increased more than twofold, from 17% in 2004–2008 to 39% in 2009–2012 but is still low overall.

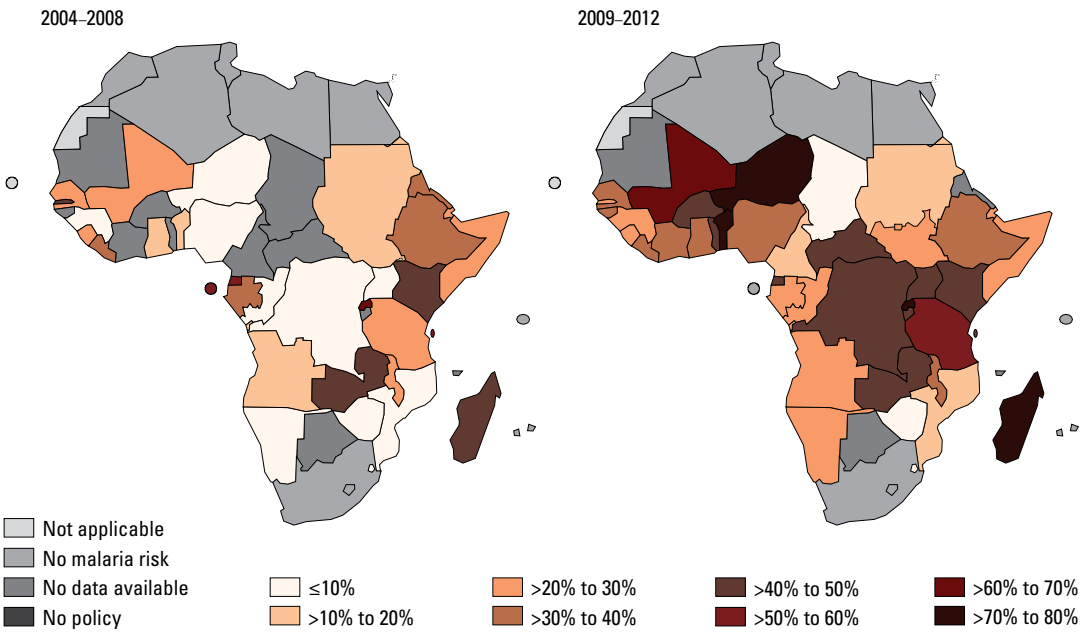
Percentage of pregnant women who slept under an ITN the night preceding the survey	Evaluation period	
	2004–2008	2009–2012
ITN use (number of countries assessed)	17% (32)	39% (37)
Number of countries with coverage of at least 60%*	1	5
Number of countries with coverage of at least 80%*		0

*60% and 80% targets were set by the Roll Back Malaria Partnership for 2005 and for 2010, respectively.

Figure 14

ITN use during pregnancy in sub-Saharan Africa, comparison between surveys from 2004–2008 and 2009–2012

Further efforts are required to improve or maintain ITN use among pregnant women. Seven countries showed an absolute decrease in the use of ITNs since the previous survey, with a remarkable drop in Kenya (-8 percentage points), in Equatorial Guinea (-15 percentage points) and even more in the Gambia (-19 percentage points).



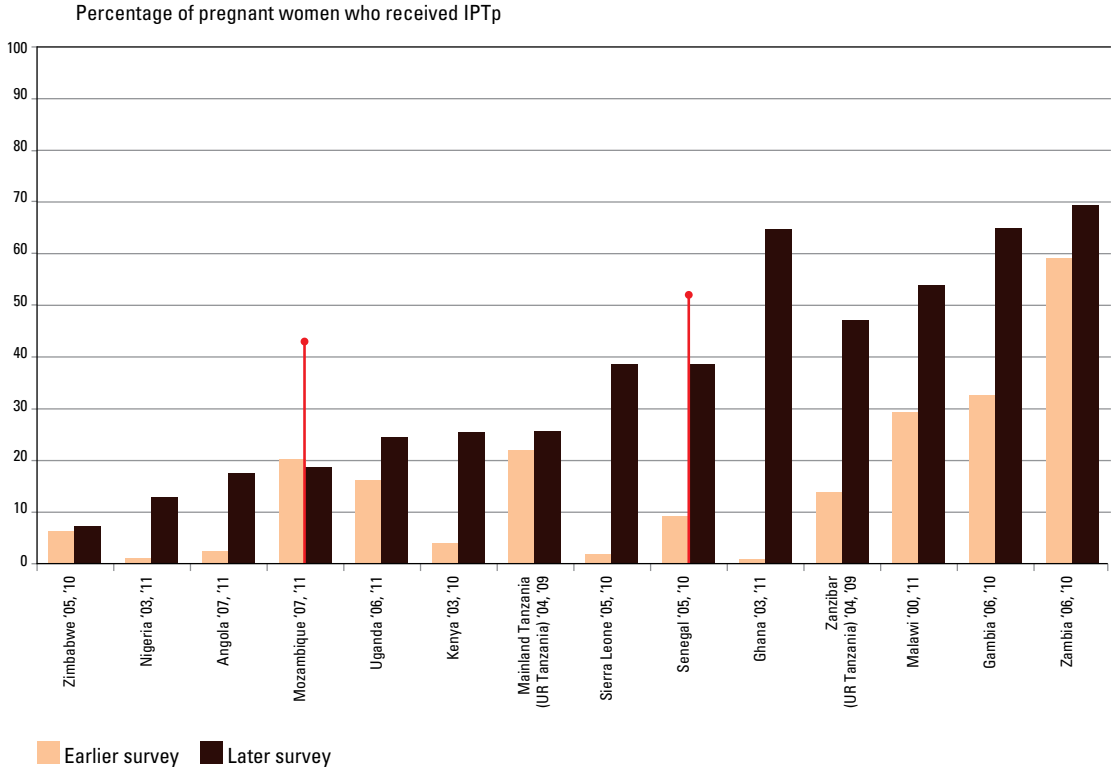
Source: National cluster sampled household surveys such as DHSs, MICSs, MISs and other national surveys undertaken between 2004 and 2012.

Figures 15 and 16 illustrate the trends in coverage over the past decade among countries with data from three or more national surveys for IPTp (13 countries) and ITNs (12 countries) respectively.

Figure 15

IPTp coverage in 13 sub-Saharan countries with national information from three or more surveys, 2000–2011

Overall, IPTp coverage has progressed modestly since 2004–2005. However, it increased notably between the earlier and later surveys in all countries having conducted at least three national surveys over the 2000–2011 period except for Mozambique. In this country as well as in Senegal, the later survey showed a considerable decline in coverage compared with the previous one (represented by a red vertical line). This highlights the challenge of sustaining IPTp coverage gains over the years.

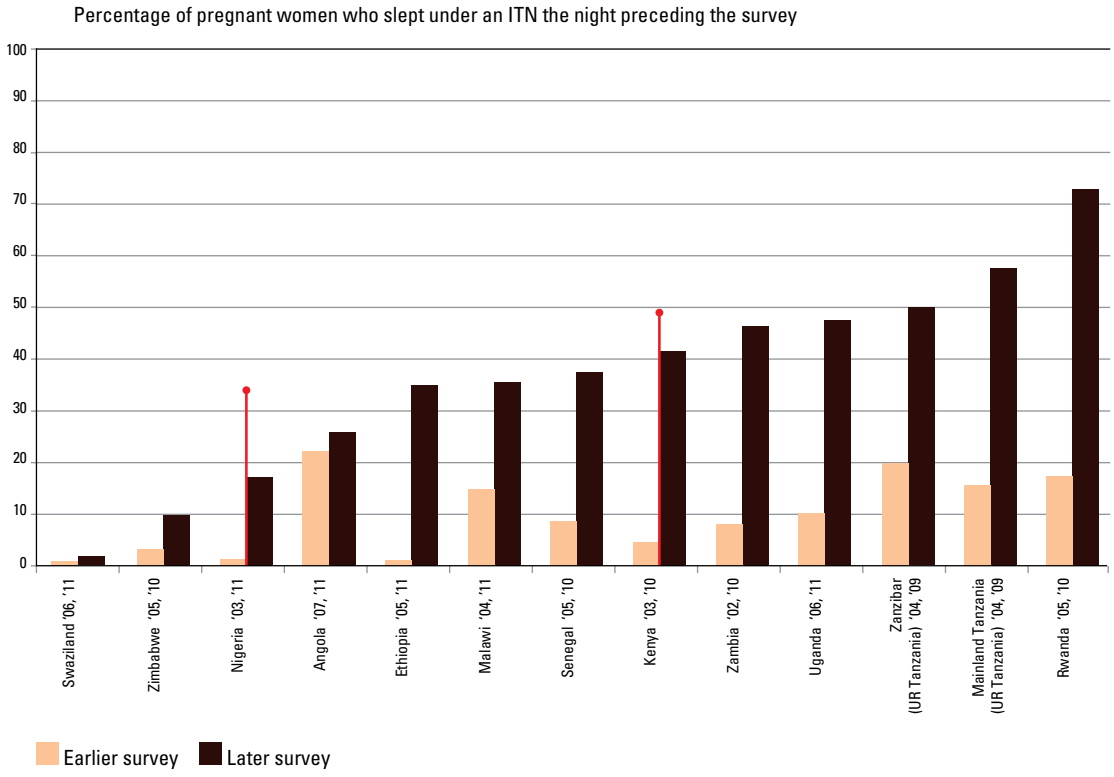


Source: National cluster sampled household surveys such as DHSs, MICSs, MISs and other national surveys undertaken between 2000 and 2011.

Figure 16

Reported ITN use by pregnant women in 12 sub-Saharan countries with national information from three or more surveys, 2002–2011

Overall, ITN use among pregnant women is still low. Yet, it grew substantially between the earlier and later surveys in almost all countries having conducted at least three national surveys over the 2002–2011 period. In Nigeria and Kenya, the later survey showed a noteworthy decrease in coverage compared with the previous one (red vertical line). Again, this highlights the challenge of maintaining higher ITN use over time.



Source: National cluster sampled household surveys such as DHSs, MICSs, MISs and other national surveys undertaken between 2000 and 2011.

Key indicators and trends for ITNs, IPTp and ANC by sub-Saharan African country are provided in Annex C.

In spite of the efforts made in the past decade, IPTp coverage and ITN use continue to be inversely related to malaria transmission intensity,[132] suggesting that preventive interventions are still not reaching the most at risk populations who need them most.

Overall, there are inequities in access, for IPTp in particular, with richer, educated, urban women more likely to receive treatment than their poorer, uneducated, rural counterparts.[133] There were also inequities by age, with young women, a biologically vulnerable group at higher risk of malaria infection, less likely to use IPTp or ITNs compared with older women.[133]

Coverage of IPTp was positively associated with 'time since policy adoption' by national governments, indicating that implementing the IPTp policy has incurred greater challenges than ITNs, and that time was needed to create demand, educate providers and strengthen the health system to increase coverage levels.

Disbursement of funds for malaria control was positively associated with increased coverage of both IPTp and ITNs. Such a positive correlation clearly shows the importance of securing funding for the scale-up of these interventions.

Also, high total fertility rates were associated with high ITN use, while high per capita gross domestic product was associated with lower ITN use.

In contrast to the low coverage rates in most countries, in 22 countries with data, 75% of pregnant women reported making at least two ANC visits during their most recent pregnancy, indicating substantial missed opportunities to provide women with IPTp and ITNs (see Figure 18 and corresponding section).

Modelling the impact/number of malaria cases and/or maternal deaths averted

The LiST model (Lives Saved Tool) has been used to estimate the number of child deaths prevented from child survival intervention scale-up, based on changes in intervention coverage, intervention efficacy at preventing deaths and the number of annual deaths expected in a particular country over a given period of time. An approach similar to LiST was used to estimate the number of neonatal deaths avoided due to scale-up of malaria prevention in pregnancy in 45 African countries with a policy for IPTp between a baseline period of 2005–2008 to a follow-up period of 2009–2012. Estimates of changes in malaria prevention in pregnancy, including ITN use the night preceding the survey or two doses of IPTp-SP at ANC, whichever was greater, were taken from nationally representative household surveys as recently reported by van Eijk et al.[133] The protective effectiveness of malaria prevention in pregnancy against neonatal mortality was obtained from a recent meta-analysis that showed an 18% (UI: 4%–30%) protective association between malaria prevention in pregnancy and neonatal deaths from household surveys in Africa.[109] A more conservative estimate for protective effectiveness of 11% (UI: 4%–18%) was chosen for this analysis because of the noted threat to confounding that the authors reported. The number of neonatal deaths in each country for the baseline year 2005 in the analysis was obtained from the Child Health Epidemiology Reference Group.[134]

According to this model, approximately 94 000 deaths (UI: 19 000–251 000) among newborns (1–28 days of age) were averted in 45 African countries studied between 2009 and 2012 thanks to the scale-up of prevention of malaria in pregnancy interventions (defined as pregnant women sleeping under an ITN the night preceding the survey or receiving at least two doses of SP during their pregnancy). Had an 80% coverage of prevention of malaria in pregnancy interventions been achieved over these three years in the 45 countries studied, about 300 000 neonatal deaths could have been averted.

Box 3: Obstacles to malaria in pregnancy interventions in eight key programme areas in Malawi, Senegal and Zambia

- **Integration** – Integrating MiP programming requires effective partnerships between national reproductive health, malaria control and HIV and tuberculosis programmes to effectively harmonize national level policies and documents and coordinate implementation. Across each of the three countries reviewed, human resources constraints and lack of emphasis on programme integration by MoH leadership was an obstacle affecting MiP programming.

- **Policy** – National level MiP policies, guidelines and training materials are the foundation documents that support the provision of quality care by programme managers and front-line providers in the form of appropriate services to clients. Harmonization of these policies between national reproductive health (RH) and malaria control programmes is critical to ensure consistent information is disseminated to health-care staff. In Malawi, inconsistencies between RH and malaria control guidelines were found, indicating the need for MoH RH units and national malaria control programmes/centres to harmonize MiP policies in order to ensure standardized care.

- **Commodities** – Stock-outs of SP and ITNs were common across all three countries, including low to no level of stocks at central level and poor distribution systems affecting availability of SP at the facility level.

- **Quality assurance** – Quality assurance focuses on both support supervision and adherence to performance standards among health-care providers. Due to lack of funding and competing responsibilities among MoH staff tasked with conducting supervision and assessment, comprehensive quality assurance systems were not functioning in any of the three countries.

- **Capacity development** – While all three countries have prioritized in-service training, there is a need to harmonize efforts further between RH and malaria control to avoid redundancies in trainings and to emphasize the new guidelines for IPTp, which have not been fully rolled out yet. For example, at the time the case study was conducted, in Malawi the Reproductive Health Unit and the National Malaria Control Programme were implementing parallel trainings.

- **Community engagement** – All three countries are actively supporting community involvement to enhance and engender education and mobilization, including behaviour change and communication. However, these efforts were typically on a smaller scale and not being conducted at national scale.

- **Monitoring and evaluation** – Effective monitoring and evaluation of key MiP indicators is critical to understand programme effectiveness and future planning. The case studies revealed that each of the three countries did not include in national level data: the percentage of ANC staff trained in the past 12 months or the percentage of screened pregnant women with severe anaemia in the third trimester of pregnancy. Also, ITN distribution through ANC is absent from national data collection tools in Zambia and Malawi; rather, it is collected on parallel, programme-specific reporting forms.

- **Finance** – While each of the three countries contributes funding support to MiP through the national country budget, in each of them there is a continued heavy reliance on donor support to cover MiP programming.

Figure 17

State of coverage of malaria in pregnancy interventions in the three countries surveyed: Malawi, Senegal and Zambia

The information reported below is the most recent available at the end of 2010.

Indicator	Malawi	Senegal	Zambia
Pregnant women receiving two or more doses of IPTp for malaria prevention, %	60 [a]	52 [c]	69 [a]
Pregnant women sleeping under an ITN, %	49 [a]	28 [c]	46 [a]
Households with at least 1 ITN, %	57 [a]	63 [c]	64 [a]
Pregnant women attending at least 1 ANC visit, %	96 [b]	87 [d]	94 [e]
Pregnant women attending more than 1 ANC visit, %	95 [b]	87 [d]	94 [e]

Note: [a] 2010 MIS; [b] 2010 DHS; [c] 2008 MIS; [d] 2005 DHS; and [e] 2007 DHS.

Source: Global Health: Science and Practice,[135] data from MISs and DHSs carried out between 2005 and 2010.

OBSTACLES TO PROGRESS IN COVERAGE OF MALARIA PREVENTION IN PREGNANCY

Bottlenecks at a glance

- There has been health-care provider confusion about IPTp policy and guidance for treatment schedule and dosage. Greater clarity needs to be imparted to countries.
- Obstacles to higher uptake of prevention interventions include poor health–care systems, the socioeconomic costs of visiting antenatal care clinics and pregnant women's lack of knowledge and understanding of IPTp and acquisition and use of ITNs.
- Intervention coverage improves when countries simplify IPTp policy and guidance, earmark funding for SP and ITN procurement, improve ANC fee structures and launch targeted promotional campaigns.

The delivery of malaria in pregnancy prevention strategies is seemingly straightforward. Clear data on the efficacy and cost–effectiveness of the interventions exist, and the required delivery methods are relatively simple: a high proportion of pregnant women should regularly attend antenatal clinics, and IPTp-SP by directly observed therapy (DOT) should be given at every ANC visit in the second and third trimesters (which requires that the procurement and supply chain work effectively), and an LLIN at the first interaction with the health services (for example, at ANC visit, delivery, immunization clinic).

However, the low prevention coverage data suggest that the challenges faced by national malaria and reproductive health programmes in delivering the interventions have been underestimated.

a. Evidence from research

Why do IPTp coverage and ITN use lag for pregnant women?

A recent systematic review of 98 studies undertaken in sub-Saharan Africa between 1990 and 2013 points to a number of obstacles countries face in effectively increasing IPTp coverage and ITN use, both in service delivery and uptake.[136]

Barriers to the delivery of IPTp and ITNs through antenatal care were found at all levels of implementation, including the performance of health-care providers, health facility organization, and problems related to higher levels of the health system, as summarized in Annex A (Obstacles to IPTp coverage) and Annex B (Obstacles to ITN use).

There has been confusion among health-care providers about when and how to administer the previous policy of two doses of IPTp, and whether IPTp could be given on an empty stomach. In addition, several studies reported conflicting national policies on the provision of IPTp for managing HIV and other diseases or conditions, and when to give IPTp if women had been treated for malaria. This confusion stemmed from a combination of unclear policy and guidance, inadequate training and supervision, and lack of information and job aids on IPTp. Some studies found health-care providers expressed uncertainty over the effectiveness of SP for IPTp due to increasing resistance to SP.

Other problems reflected broader weaknesses in the health–care system leading to poor care generally, such as lack of privacy and confidentiality during consultation, restricted hours for ANC services, high client-to-staff ratios, long waiting times, and short consultation times.

These poor quality services, combined with user fees for SP or ITNs, and the costs associated with visiting antenatal clinics, were significant barriers to women accessing IPTp and ITNs. Pregnant women's lack of knowledge and understanding of IPTp and ITNs was consistently reported across studies as a key factor preventing uptake and use, with women predominantly perceived as passive recipients who received little or no information about services provided at antenatal clinics. Those women with a low social position and/or less educated, along with adolescents, were most vulnerable. Delivery of ITNs through antenatal clinics presented fewer problems than delivery of IPTp, the main obstacles being stock-outs, user fees and poor access.

What has been tried and what can be done to improve intervention coverage?

Of the 98 studies included in the review, 20 evaluated interventions to promote scale-up of IPTp and/or ITNs.[136] Only one evaluated a training intervention to improve the way ANCs delivered IPTp. Five studies looked at women's knowledge or access, using community-based distribution or promotion of IPTp to improve uptake; this distribution strategy appears to be an effective boost to coverage in areas where there is already a successful community-based programme but may undermine women's attendance at ANCs in areas where ANC attendance is fragile. One study on community-based promotion, on the other hand, increased uptake of IPTp as well as ANC access by giving women information about the importance and benefits of IPTp as well as reinforcing the message that they should obtain antenatal care from the clinics. While 13 studies were identified that evaluated how successful alternative delivery strategies were in increasing ITN coverage among pregnant women, the study objectives and designs were heterogeneous and not comparable.

Poor quality case management practices

Diagnosis of malaria in pregnancy in the clinical setting is challenging and diagnosis in resource-constrained health systems and the private sector is often restricted to clinical symptoms, which results in misdiagnosis and unnecessary use of antimalarials.[137] Even where microscopy or alternative diagnostic tests such as RDTs are available, studies report that some health providers choose to ignore negative test results and prescribe antimalarials when malaria is suspected.

Health providers across a variety of cadres in both the private and public sectors, as well as in the formal and informal sectors, demonstrate poor knowledge of, and adherence to, national treatment policy guidelines.[138–140] There is general confusion about the safety of different drugs and when they can be used safely at different stages of pregnancy, the efficacy of drugs, and perceptions of the side effects of certain drugs. Few health providers appear to ask women of childbearing age about the possibility of their being pregnant before prescribing or selling antimalarials, or prescribe incorrect drugs in the first trimester. There is also continued use of monotherapies, bringing with it the potential threat of drug resistance, and old therapeutic drugs which are no longer effective, such as chloroquine.

Programme effectiveness

According to the *Countdown to 2015* reports released in 2010 and 2012, coverage of interventions across the continuum of care showed that in 20 and 21 countries with data, respectively, IPTp has the lowest coverage among all the interventions delivered to pregnant women through ANC, together with access to first-line malaria treatment and ITN use among children.[141,142] Studies have attempted to measure how effective clinics are at delivering IPTp and ITNs using health facility[143,144] and household data,[145] and how/why opportunities are missed. Study findings have been used to develop tools to measure the effectiveness of programmes, so managers can achieve the best value for money by concentrating on what to target to improve uptake.

b. Evidence from programme evaluations

A recent synthesis of malaria in pregnancy system challenges, based on documentation of malaria in pregnancy (MiP) programmes in Malawi, Senegal and Zambia, points to a number of missed opportunities that must be addressed to achieve optimal coverage for pregnant women.

With support from the United States President's Malaria Initiative (US-PMI), the Maternal and Child Health Integrated Programme (MCHIP) conducted three country case studies from 2009 to 2011 to gain a more detailed understanding of MiP programming, including the obstacles to achieving IPTp uptake and the use of long-lasting insecticidal nets among pregnant women.

The case studies were conducted in Malawi, Senegal and Zambia since they were considered higher performing due to better IPTp uptake and ITN use compared with other countries in the region. Each study examined programme implementation across eight key health system areas.[146–148]

a) integration
b) policy
c) commodities
d) quality assurance
e) capacity development
f) community engagement
g) monitoring and evaluation
h) finance

The MiP obstacles, documented by each of the eight key areas of MiP programming, are highlighted in Box 3.

Household surveys in Africa point to missed opportunities for the delivery of IPTp. Among nine countries with available surveys during 2010–2012, approximately 95% of pregnant women attended ANC at least once, 92% at least twice, and 80% and 51% made three and four visits respectively (see Figure 18). The proportion who received one IPTp dose was 48%, two doses 27%, three doses 11% and four doses 1%. The lower proportion of pregnant women getting IPTp compared with those attending ANC represents a missed opportunity.

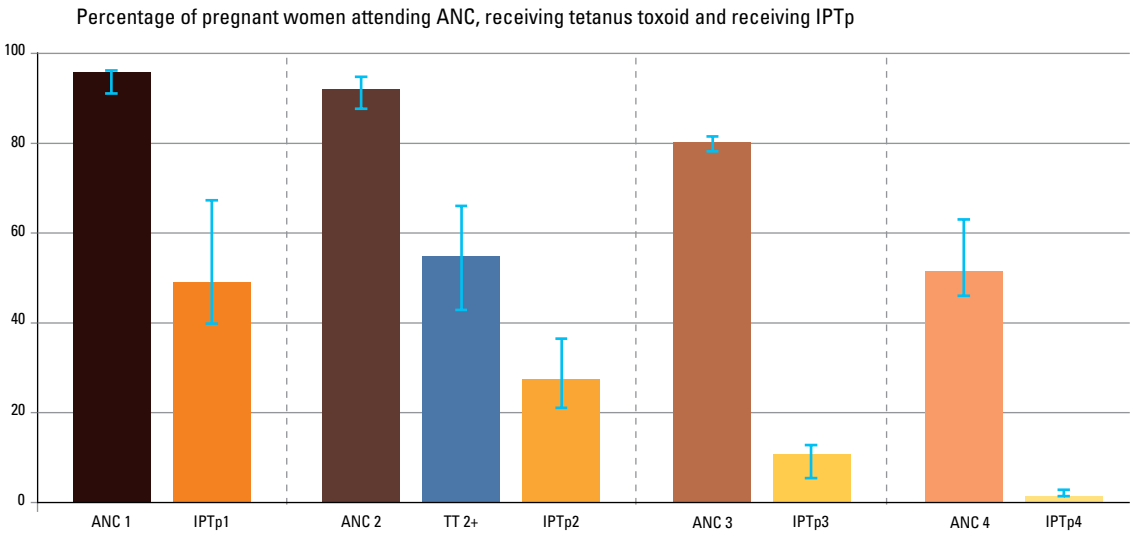
Even making the conservative assumption that all initial ANC visits occurred in the first trimester (when IPTp is not given), the number of ANC visits representing missed opportunities for IPTp is large. In the nine recently surveyed countries, a median of 72% of ANC visits represented missed opportunities to deliver IPTp (*World malaria report 2013*).

To understand the potential for improving delivery of IPTp, it is helpful to compare delivery of SP for IPTp with another service delivered through ANC during pregnancy such as administering tetanus toxoid (see Figures 18 and 19).

Figure 18

Proportion of pregnant women attending antenatal clinics, receiving at least two doses of tetanus toxoid and receiving IPTp, by number of ANC visits and IPTp dose, nine African countries, 2010–2012

Even when comparing the proportion of pregnant women attending ANC four times with that of pregnant women receiving IPTp2, missed opportunities prove to be significant (51% against 27%). This is also clear in light of the coverage in at least two doses of tetanus toxoid (TT 2+) delivered through ANC.



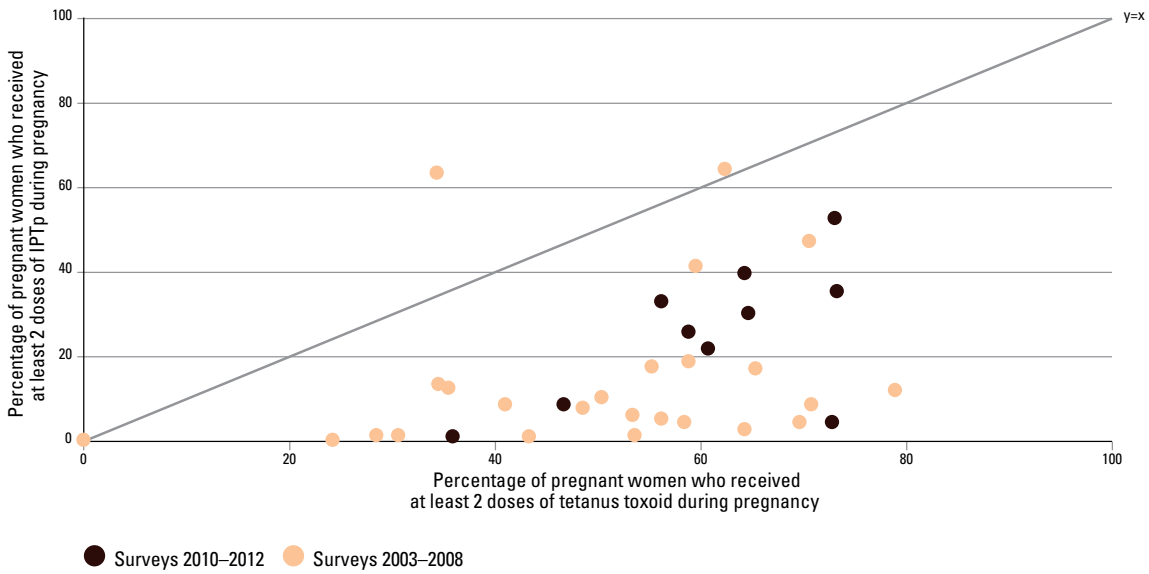
Source: World malaria report 2013, household surveys in Benin, Cameroon, Gabon, Malawi, Mozambique, Senegal, Tanzania, Uganda, Zimbabwe.

In most countries surveyed in 2000–2012 with information on both IPTp and receipt of tetanus toxoid, a substantially higher proportion of pregnant women received at least two doses of tetanus toxoid (median 56%, UI: 43%–64%) than at least two doses of IPTp (median 10%, UI: 4%–28%).

Figure 19

Proportion of pregnant women who received at least two doses of tetanus toxoid and the proportion who received at least two doses of IPTp during pregnancy, 2003–2012

Only two surveys showed similar or superior administration of IPTp2+ compared with TT 2+ among pregnant women (orange dots above the y=x diagonal). All other surveys demonstrate much higher uptake of TT 2+ than of IPTp2+ between 2003 and 2012.



Source: World malaria report 2013, household surveys.

Overall, it appears that the ability to administer certain preventive services during ANC is high in most ANC clinics, and that obstacles to delivering SP for IPTp can be overcome (*World malaria report 2013*).

FUTURE OPPORTUNITIES

Future opportunities at a glance

- Research will help tailor interventions to control malaria in pregnancy according to malaria transmission intensity.
- Service delivery systems need to be optimized by strengthening ties between reproductive health, malaria control and perinatal HIV programmes; addressing the three prongs of malaria control in pregnancy (IPTp, ITN and case management) comprehensively; and improving care through eight key areas of programming.

Many countries continue to experience high malaria infection rates and have a clear need to raise the coverage of their malaria prevention and control interventions.

a. Research

There has been much success in malaria control in recent years and some countries are witnessing marked reductions in malaria transmission. But the gains are not universal, and other countries continue to experience high infection rates and clearly need to raise the coverage of their interventions. Scaling up programmes to achieve high coverage and elucidating best methods to do this will be critical.

In other settings with reduced transmission comes recognition that fewer pregnant women are infected, and the repeated use of malaria drugs may seem unnecessary. However, some countries have witnessed progress followed by a return to higher transmission, and stopping then restarting a malaria in pregnancy prevention programme is a challenge for all involved.

In this context of increasingly stratified malaria transmission, from high to low, there remains much to be learned about how to tailor the intervention to the transmission setting, and how to design interventions to be efficacious while remaining safe for the mother, fetus and newborn. As new diagnostics, drugs, vector control measures and potential vaccines become available, the benefits and safety of each of these malaria in pregnancy interventions need to be assessed.

Such work has been modestly supported by the research community. Examples include the Malaria in Pregnancy Consortium, which is undertaking a coordinated research strategy to identify alternative drugs and strategies for the treatment and prevention of malaria in pregnancy; dedicated funding bodies for malaria (and other) research, such as the European and Developing Countries Clinical Trials Partnership Programme (EDCTP), the Bill & Melinda Gates Foundation, the National Institutes for Health (NIH), and the Wellcome Trust.

The potential benefits of malaria in pregnancy interventions as a powerful maternal, neonatal and child health tool call for continued attention and resources for malaria in pregnancy research (both operational and applied) alongside *elimination* research, which for most countries in sub-Saharan Africa is still a distant dream.

b. Service delivery systems

Fragmentation across programmes has meant that many important interventions delivered during pregnancy or in the postnatal period are 'owned' by different management units within technical agencies and health ministries, often with their own funding streams and sometimes in competition with other programmes. This disjointedness trickles down to the service provider level. The trend has rendered ANC to what has been described as a programmatic 'no-man's land', a relatively neglected services delivery channel.[149] More coherent programming is needed, which cuts across different programmes and their separate funding streams, and enables managers at national and local levels to track progress and improve quality. Research to improve the effectiveness of antenatal clinics to deliver malaria as well as other important interventions in pregnancy is also needed.

Strengthening the partnership between reproductive health and malaria control

Underpinning the MiP programme is the partnership with the national reproductive health and national malaria control programmes, which support all maternal and newborn health efforts, play a vital role in the management of MiP programme implementation, and provide technical oversight throughout implementation.

There is a particular need for reproductive health and malaria control programmes, as well as HIV programmes, to work together to solve bottlenecks preventing: *i*) good IPTp uptake (e.g. inconsistency in guidelines, misunderstanding of guidelines among health workers, lack of supplies and SP stock-outs); and *ii*) high ITN coverage (e.g. lack of distribution points and stock-outs).

Through these partnerships, the early identification of 'champions of change' who are empowered to lead efforts as well as to establish or to reinvigorate national technical working groups focused on MiP is an opportunity to increase momentum among all stakeholders, address obstacles and coordinate implementation.

Addressing the three prongs of malaria in pregnancy comprehensively

The WHO three-pronged approach—IPTp, ITNs and effective case management—are the building blocks of every MiP programme in stable malaria transmission countries. Recognizing that the majority of pregnant women attend ANC at least once and often multiple times during pregnancy, ANC becomes an opportune platform to deliver these preventive and control approaches.

Early and repeated ANC visits permit early ITN use as well as full uptake of IPTp. Targeting women early in pregnancy, through facility-level care and community engagement including behaviour change communication, to sleep under an ITN during and after pregnancy, take IPTp at every scheduled ANC visit and seek effective case management throughout pregnancy will require resources, support and prioritization across the eight key areas of MiP programming.

Improving care through eight key areas of MiP programming

The recent WHO policy update on IPTp-SP provides an opportunity for countries to not only review, update and harmonize national level documents, but also the chance to address health system obstacles and improve health services for women and their newborns. These opportunities are in the following areas:

- **Integration**: the partnership between reproductive health programmes and malaria control programmes is the cornerstone of MiP programming.

- **Policy**: countries can ensure policies, guidelines and training materials are consistent between malaria control programmes and other disease control programmes as well as Health Management Information Systems (HMISs).

- **Commodities:** national-level working groups need to ensure consistent stocks of SP and ITNs at ANC clinics.

- **Quality assurance**: strong quality assurance systems are needed to optimize MiP programme components. Greater collaboration between quality assurance units across health sectors helps to leverage funding.

- **Capacity development**: capacity-building strategies need to be promoted, including strengthened pre-service education, on-the-job training, mentoring and supervision, and in-service training. For all training models, e-learning technologies can supplement training by external mentors.

- **Community engagement**: increased support for community initiatives to overcome barriers to care-seeking is necessary to ensure pregnant women receive comprehensive care throughout pregnancy. There is an urgent need to bring services closer to the household and strengthen the link between communities and facilities. Community health extension workers can help programmes overcome simple barriers to implementing malaria prevention strategies.

- **Monitoring and evaluation**: increased resources and efforts dedicated to strengthening monitoring and evaluation systems should lead to: *i*) improving facility-level data collection and reporting; *ii*) building district-level skills in using data for decision-making; and *iii*) incorporating WHO-recommended indicators into the HMIS and/or household surveys.

- **Finance**: increased commitment from countries to dedicate resources to comprehensive care for pregnant women, including MiP prevention and control, will help improve health outcomes for pregnant women and their newborns.


DOSAGE OF ANTI-TB DRUGS

THE WAY FORWARD

The way forward at a glance

The unsatisfactory status of preventive interventions to control malaria in pregnancy in sub-Saharan Africa calls for countries and their partners to continue evaluation and research and take action to:

- simplify national policies and guidance to align them with updated WHO IPTp policy[122] and ensure effective dissemination to front-line health-care providers through training and job aids;
- earmark funding for procuring SP and ITNs for pregnant women;
- review antenatal care fee structures;
- launch campaigns to reach high-risk populations of pregnant women.

It is essential that key interventions to optimize the delivery of malaria in pregnancy programmes be reinforced in order to prevent adverse maternal and newborn outcomes.[1]

In addition to continuing evaluation and research, the following actions could be taken to increase IPTp and ITN coverage in the short term:

- Simplify country malaria and reproductive health (RH) policies and guidance to align the updated WHO IPTp policy with the WHO Regional Office for Africa (WHO/AFRO) recommendations for focused antenatal care, consisting of a booking visit in the first trimester to secure early entry into care, four visits in the second and third trimesters, and ensuring effective dissemination to front-line health-care providers through capacity development (training and pre-service education), supervision and job aids.
- Earmark funding for procurement of SP and ITNs delivered through ANC.
- Review ANC fee structures.
- Launch targeted promotional campaigns and community engagement initiatives coordinated by health facilities to increase ANC utilization among high-risk populations of pregnant women, according to local settings (for example, rural, poor, adolescent women).

In the medium to long term, actions to improve the overall quality of antenatal services and to encourage the habit of ANC use early and throughout

pregnancy are needed. This will require new, multifaceted interventions to be evaluated, such as quality improvement initiatives that link better delivery of IPTp and ITNs to other core ANC services, management tools for facility-level decision-making, and innovations, such as use of mobile phones for defaulter tracing, supply chain/stock control, reporting health management information systems data on coverage, and surveillance. Continued evaluation and research to find innovative ways to increase coverage of malaria interventions in pregnancy is also needed.

a. Streamlining malaria and reproductive health policies and guidelines

The WHO policy on IPTp[122] provides countries with an opportunity to update existing malaria in pregnancy (MiP) policies, review programme implementation and build on what is working and address what is not.

The updated IPTp policy promotes the delivery of SP at every ANC visit, starting as early as possible in the second trimester and until the time of delivery, and should facilitate streamlining of malaria and reproductive health policies and guidelines at country level. A WHO policy brief which accompanies the updated IPTp recommendations provides guidance on areas of uncertainty, specifically on the timing, frequency and safety of taking SP on an empty stomach, management of side-effects and the continued effectiveness of IPTp with SP.[123]

The RBM Malaria in Pregnancy Working Group recently issued a consensus statement[1] promoting MiP programming and the need to harness momentum among country leaders, programme managers and supporting partners[1] so that targets can be achieved and missed opportunities at ANC eliminated.

b. Funding for malaria prevention in pregnancy

Donor funding for maternal and newborn health tends to be disbursed in separate streams for different programmes (for example, malaria, HIV/AIDS, nutrition). Financing MiP interventions has traditionally been the responsibility of national malaria control programmes to ensure the availability of malaria diagnostics and antimalarial drugs, including SP for IPTp, and ITNs, all of which are affordable and cost effective. These have been obtained largely with the support of the Global Fund to Fight AIDS, Tuberculosis and Malaria, and bilateral donors.

The majority of these funding streams have not, however, addressed the cost of strengthening the general reproductive health system that provides the service delivery platform for pregnant women, namely antenatal clinics. Integrated mechanisms are needed to budget for and support malaria-specific and general health systems costs as part of the focused antenatal care package, and to establish funding sources holistically, from both internal country investment and external donor assistance. This will require improved budget planning and coordinated procurement by malaria and reproductive health departments. In addition,

donors would be encouraged to support malaria control more broadly, beyond the provision of commodities to include other elements of the health system through which commodities are delivered: health service delivery, workforces, information systems, research, financing, as well as governance and leadership.

c. Review of antenatal care fee structures

User fees are routinely applied to ANC registration, consultations, laboratory tests and drugs as identified in a review of factors affecting how antenatal care is used in developing countries;[150] for example, where women have to buy SP, pay for drinking water to take it and contribute top-up fees for LLINs (e.g. where vouchers or subsidized nets are provided). User fees preclude women with limited resources from benefiting from these important interventions as demonstrated by inequitable coverage of both IPTp and ITNs. This situation calls for a review of fee policies for IPTp and ITNs across national programmes, and of user fees and charges at antenatal clinics more generally.

d. Targeted education and communication

Ministries of health need to educate women and families, and promote IPTp and ITN use among pregnant women and new mothers. New ways of communicating messages, such as mobile phone messaging, are needed since traditional health education is not always offered at all facilities or is not effective. Educating women about their rights and about the ANC services available to them may empower them to demand better services.

CHAPTER IX

CONCLUSION

This report highlights the significant contribution of malaria prevention and control to improvements in maternal and newborn health. Considerable gains in mother and child mortality can be achieved using simple interventions that have been available for more than a decade. However, there are still wide discrepancies between ANC access and coverage of MiP interventions, which demands substantial improvements in service delivery.

Partners from the RBM Malaria in Pregnancy Working Group recently called for increased commitment, momentum and partnership from both reproductive health and malaria control programmes. Together, we urgently need to: *i*) **reprioritize** malaria in pregnancy as a core component of focused antenatal care; *ii*) **advocate** for harmonized policy-making and integrated programme implementation; and *iii*) **reinforce** key interventions to optimize the delivery of malaria in pregnancy programmes, to prevent adverse maternal and newborn outcomes.[1]

ANNEX A: OBSTACLES TO IPTp COVERAGE

Level	Receipt by women	Delivery by health providers
Individual	• Lack of knowledge among pregnant women: unaware of benefits of IPTp, value of SP and number of doses, timing and dose of SP required. • Confusion over what drugs were safe to take in pregnancy. • Fear of perceived side effects. • Fear SP could lead to abortion. • Not returning to ANC for a second visit. • Illness or shyness. • Low social position leading to delayed ANC attendance.	• Health-care providers' knowledge and perceptions: - Poor knowledge of IPTp strategy. - Confusion over the timing and dosing of SP in relation to gestational age. - Could not name the side-effects or contraindications of SP. - Imprecise estimation of gestational age leading to missed SP doses. - SP being given to women regardless of guidelines for gestational age. - Provision of SP and iron tablets to women without any explanations or instructions, or without instructions being given in local language. • Health-care providers blaming pregnant women for poor IPTp uptake: - Women did not want to take SP on an empty stomach. - Late ANC attendance. - Women not returning to ANC.
Receipt by women: Household/ Social/Cultural **Delivery by providers: Organizational**	• Economic barriers: need to buy water or SP. • Barriers to ANC attendance: - Early stage in pregnancy (when farming duties, or employment or childcare take precedence). - Delay seeking ANC due to lack of money for transport. - Needing consent/support of husband to attend ANC.	• Staff too busy to prescribe SP. • Cups or drinking water not available. • Variation across facilities in the delivery of IPTp and in the information provided to pregnant women.

Level	Receipt by women	Delivery by health providers
Health system	• Women who could not pay fees may be denied service. • Barriers to receiving SP by DOT: - Women may have to buy SP outside of ANC. - Women take at home to eat first. - Told by nurse to take at home. - Asked to share cups. • SP not offered by ANC staff. • Frequent periodic shortages of SP. • Fines and penalties imposed by health-care workers for attending ANC late in pregnancy. • Women were taking iron/sulfate and folic acid supplementation.	• Complicated guidelines and conflicting information from different programmes. • Guidelines not available at health facilities. • Lack of effective training and supervision for health-care providers. • Lack of quality assurance of IPTp delivery. • Negative media coverage about SP when transitioning to ACT for first-line treatment. • Poor integration with reproductive, maternal, newborn and child health programming and other diseases, i.e. syphilis, anaemia and HIV. • Stock-outs of SP. • Practices in private facilities differ from those in government health facilities, leading to inconsistencies in programmes: - Private facilities are more likely not to adhere to national guidelines on IPTp delivery, to charge user fees for IPTp, or to dispense other drugs requested by pregnant women.

ANNEX B: OBSTACLES TO ITN USE

Level	Receipt by women	Delivery by health providers
Individual	• Pregnant women described feeling hot and uncomfortable under the net. • Inconvenience of putting it up and taking it down. • Belief that the chemicals used to treat the ITN were harmful to a pregnant woman and her unborn baby. • Lack of understanding that ITNs prevented malaria.	• Health-care providers imposing eligibility criteria for vouchers. • Perception that ITNs cause burning eyes, perspiration and restrained mobility.
Receipt by women: Household/ Social/Cultural **Delivery by providers: Organizational**	• Cost in both urban and rural areas. • Lack of support from husband and/or relying on husband to buy the net. • Community members and pregnant women's perception that women in their first pregnancy and adolescents were at low risk of getting malaria. • Environmental barriers including place of residence, seasonality of use, perceptions there were no mosquitoes in area.	• Poor stock control.
Health system	• Unavailability of ITNs/stock-outs. • Long travel distances to redeem the vouchers, variation in top-up costs, and the negative attitudes of ANC staff when women return without having redeemed their vouchers.	• ITN vouchers not available. • Stock-outs of ITNs. • Cost of ITNs.

ANNEX C: MALARIA IN PREGNANCY COUNTRY PROFILES

Methods for preparing the malaria in pregnancy country profiles

Note

The information compiled in the country profiles can only be considered as a time shot, as information from new surveys continuously becomes available. These country profiles were prepared with information available to the authors in February 2014.

Timeline

Data in the timeline table were obtained from national cluster sampled household surveys, such as DHSs,[151] MICSs,[152] MISs,[153] and other national surveys undertaken in sub-Saharan African countries between 2000 and 2013.[154–156] The first coloured bar (orange) indicates when approximately an ITN policy for pregnant women was started in a country and the second coloured bar (lighter orange) indicates when approximately an IPTp policy was started.[132,157]

ITN use refers to use of an insecticide-treated mosquito net during the previous night by pregnant women as defined by the survey involved.

IPTp2 refers to at least two doses of SP, of which at least one was obtained from the ANC, for the prevention of malaria. If this was not available, but at least two doses of SP from any source was present, this was used instead (applicable to: Benin DHS 2006, Burkina Faso MICS 2006, Central African Republic MICS 2006, Côte d'Ivoire MICS 2006, Equatorial Guinea all MISs, Gambia MICS 2006, Ghana MICS 2006, Guinea-Bissau MICS 2006, Kenya MIS 2007, Malawi DHS 2000 and MICS 2006, Mozambique MIS 2007 and MICS 2008, Nigeria MICS 2007, Sierra Leone MICS 2005, Somalia MICS 2006, Togo MICS 2006, and Zimbabwe MICS 2009). The usual study population for IPTp was women with a birth in the two years before the survey.

Information on the use of any antimalarial during pregnancy for prevention of malaria, number of women attending the antenatal clinic at least once (ANC 1+), the proportion of women vaccinated for tetanus, the proportion of women who received iron supplementation, and the proportion of women who received HIV counselling, testing and the HIV test result were collected from the same surveys (where available).

For tetanus, variable outcomes could be presented, ranging from the receipt of any tetanus injection in pregnancy, to two injections, to "protected". Protected was usually defined as: received two vaccinations in the previous pregnancy or received at least two doses of tetanus toxoid vaccine, the last within the previous three years; or received at least three doses, the last within the previous five years; or received at least four doses, the last within 10 years; or received at least five doses during a person's lifetime (MICS). In the Demographic and Health Surveys, these variations were defined as follows: "Includes mothers with two injections during the pregnancy of her last birth, or two or more injections (the last within three years of the last live birth), or three or more injections (the last within five years of the last birth), or four or more injections (the last within 10 years of the last live birth), or five or more injections prior to the last birth. The study population usually referred to the last pregnancy of a live-born infant in the previous two or five years.

In some surveys a haemoglobin assessment of participating women was conducted using Hemocue, and where available, the anaemia level,

defined as a haemoglobin <11 g/dL among pregnant women, was included in the timetable.

The disbursements in millions indicate the disbursement for malaria control from external funds reported by the Organisation for Economic Co-operation and Development.[158] The sources of these external funds include: UNICEF; the International Development Association of the World Bank; the Global Fund to Fight AIDS, Tuberculosis and Malaria; the United States President's Malaria Initiative; the United States Agency for International Development (USAID); and contributions from individual countries.

The disbursement per capita malaria exposed was obtained by dividing the disbursement for malaria control by the population at malaria risk in a country per year. This information, as well as ITN use and IPTp coverage data, have been plotted over the years in the graph of in the bottom right corner of each country profile. The national population size was obtained from the United Nations Population Division (UNPD), *World population prospects: the 2012 revision*, and was adjusted for malaria exposure risk in a country using information from Gething et al (2010).[159,160]

Factors of interest

The number of malaria exposed births was estimated using the annual number of births (over a five-year period running from 1 July to 30 June of the initial and final years) from the UNPD (*World population prospects: the 2012 revision*), and after adjustements for stillbirths using information from Dellicour et al (2010), and for malaria risk in a country using information from Gething et al (2010).[2,160,161]

The average number of children per woman, also referred to as fertility rate, was obtained from the same UNDP website.[161]

HIV infection among women in the fertile age range was obtained from national surveys where available; if not available, information from the UNAIDS report for 2013 was obtained.[162] This report estimated the number of infected women per country for 2012; to obtain a percentage, this number was divided by the number of women aged 15+ in a country for 2012 as extrapolated from UNPD as our best estimate.[161] However, it should be noted that the tables in the UNAIDS report do not specify the upper age range for women, and including women in the higher age range when they are not fertile may have resulted in an underestimate in countries with a considerable female population over 49 years of age.

The percentage of two or more ANC visits and ANC visits started before six months of gestational age was obtained from national surveys. It should be noted that these last indicators are mainly reported in DHS, and for this reason, information may not be recent. Information on the proportion of pregnant women protected by either an ITN or IRS, or both, was obtained from the national reports where available, as was information on the proportion of women who received anthelmintic treatment during their last pregnancy in the previous five years.

Graphs by wealth, residence and level of education

Data for ITN use (among pregnant women) and IPTp coverage by wealth, residence and level of education, were obtained from the national surveys reported above. For comparison, we added to the graphs information on ITN use by pregnant women in a household with an ITN (ITN pw in HH with ITN), as well as on ANC (at least one visit, [ANC 1+]). Where data from a previous survey were available, these were plotted as well, to allow comparison over time.

Angola

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)								22	18			26		
IPTp2 ANC (%)								2	16			17		
Any antimalarial (%)*		NA						59	NA			36		
ANC (1+ visit, %)		66						80	68			NA		
Tetanus (%)†		62						NA	NA			NA		
Iron suppl. (%)		NA						NA	NA			NA		
PW Hb <11 g/dL (%)		NA						NA	NA			NA		
ANC HIV testing (%)		NA						NA	NA			NA		
Disbursement (millions)§						20.1	5.3	17.4	29.9	28.6	30.3	17.2	44.3	
Disbursement/capita ($)§						1.2	0.3	1.0	1.7	1.6	1.6	0.9	2.2	

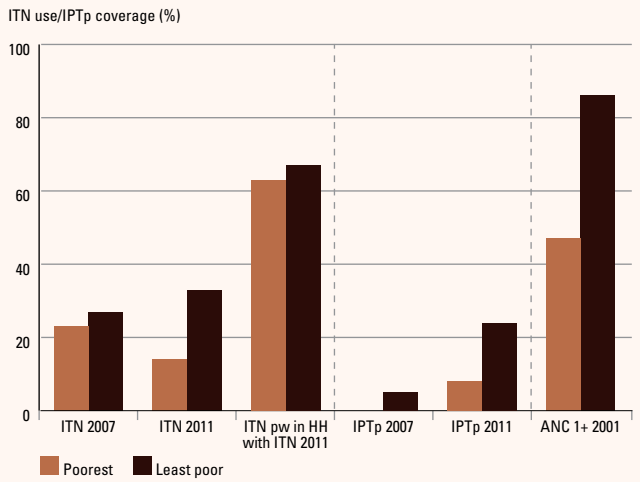
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2001: "Protected"; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

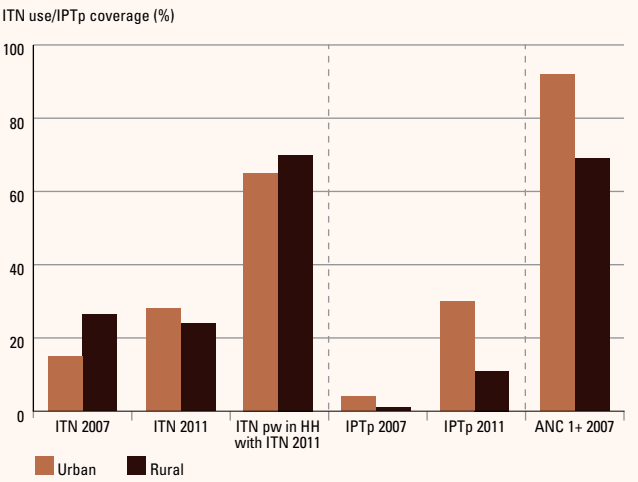
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	953 000	2010–2015
Average no of children/woman	5.9	2010–2015
HIV+ women 15+ years	2%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	NA	
ANC 4+ visits	47%	2008
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

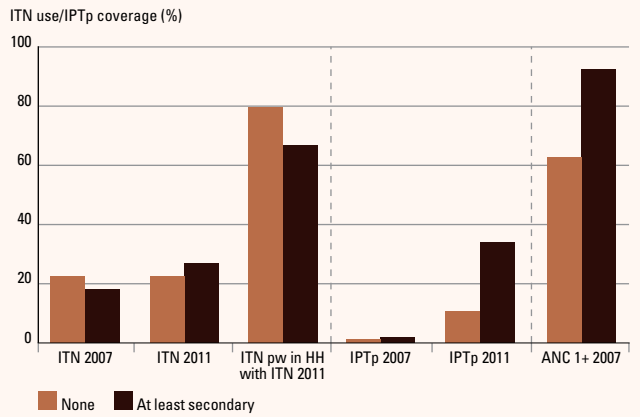
ITN use and IPTp coverage by wealth



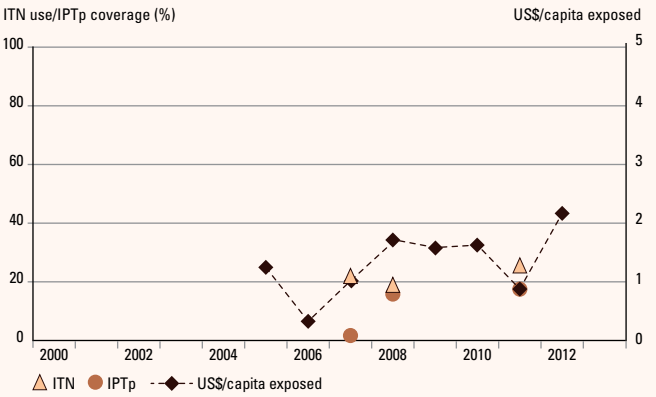
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Benin

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							20						75	
IPTp2 ANC (%)							3						23	
Any antimalarial (%)*		82					82						78	
ANC (1+ visit, %)		87					88						86	
Tetanus (%)†		50					59						70	
Iron suppl. (%)		84					86						NA	
PW Hb <11 g/dL (%)		NA					NA						NA	
ANC HIV testing (%)		NA					NA						NA	
Disbursement (millions)§				1.2	1.7	1.1	1.2	4.8	13.4	15.1	31.5	28.0	20.5	
Disbursement/capita ($)§				0.2	0.2	0.1	0.1	0.6	1.6	1.8	3.6	2.9	2.0	

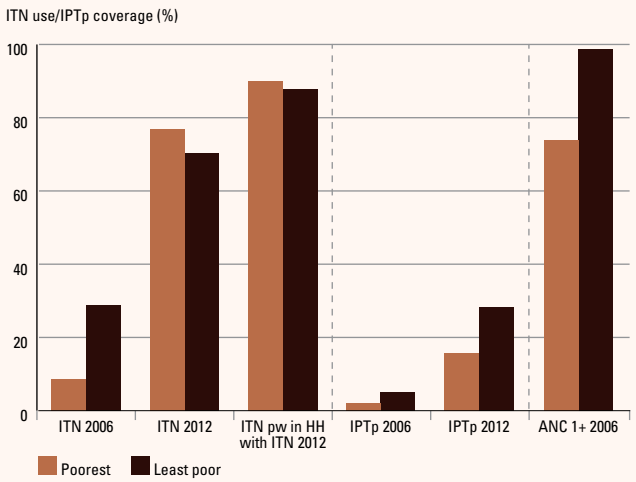
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2001: 2+ doses, 2006 and 2012: "Protected"; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

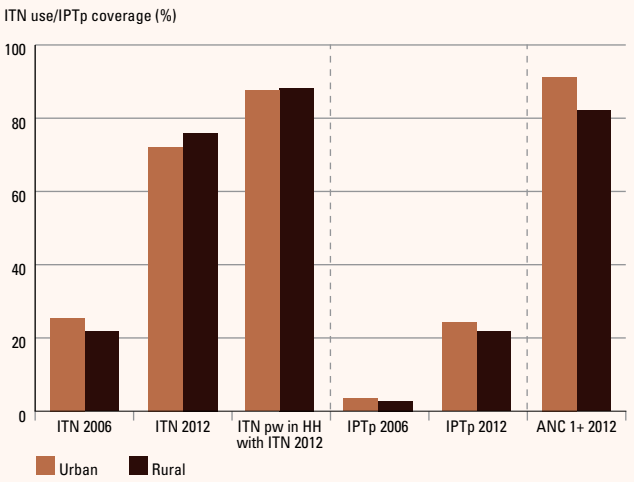
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	386 000	2010–2015
Average no of children/woman	4.9	2010–2015
HIV+ women 15+ years	1%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	83%	2006
ANC 4+ visits	NA	
Start ANC <6 months	72%	2006
Anthelmintics use in PW	NA	

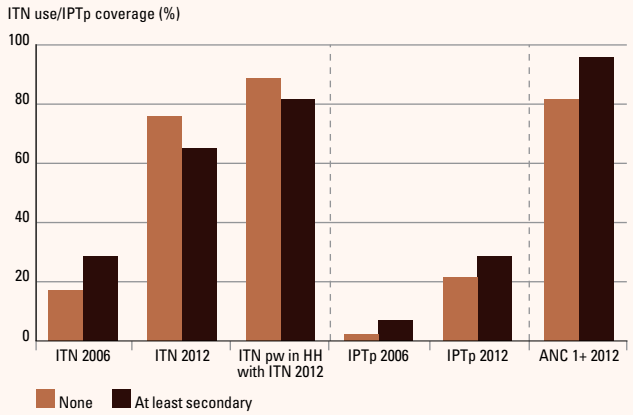
ITN use and IPTp coverage by wealth



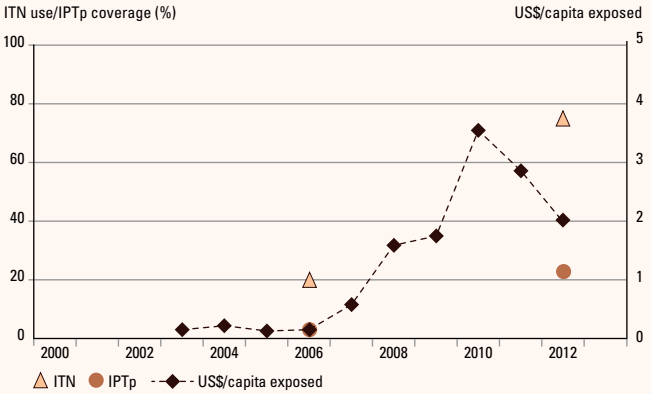
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Burkina Faso

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)				8			NA				45			
IPTp2 ANC (%)							1				11			
Any antimalarial (%)*				64			79				89			
ANC (1+ visit, %)				73			85				95			
Tetanus (%)†				40			75				85			
Iron suppl. (%)				69			NA				93			
PW Hb <11 g/dL (%)				68			NA				58			
ANC HIV testing (%)‡				NA			7				27			
Disbursement (millions)§				0.6	2.3	4.2	0.1	0.8	4.6	21.8	51.3	20.2	48.5	
Disbursement/capita ($)§				0.0	0.2	0.3	0.0	0.1	0.3	1.4	3.1	1.3	2.9	

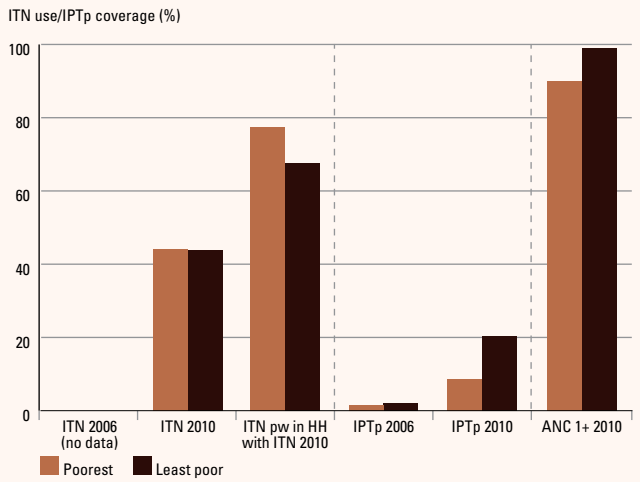
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2003: 2+ doses, 2006 and 2010: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

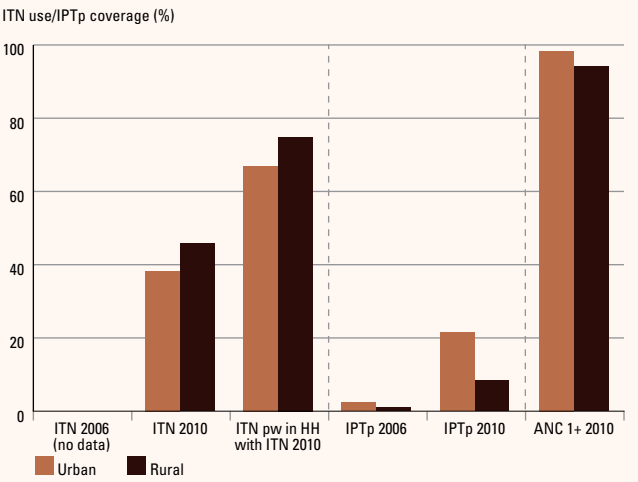
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	706 000	2010–2015
Average no of children/woman	5.7	2010–2015
HIV+ women 15+ years	1%	2010
PW ITN and/or IRS	45%	2010

Factors of interest	No or %	Time period/year
ANC 2+ visits	91%	2010
ANC 4+ visits	34%	2010
Start ANC <6 months	80%	2010
Anthelmintics use in PW	24%	2010

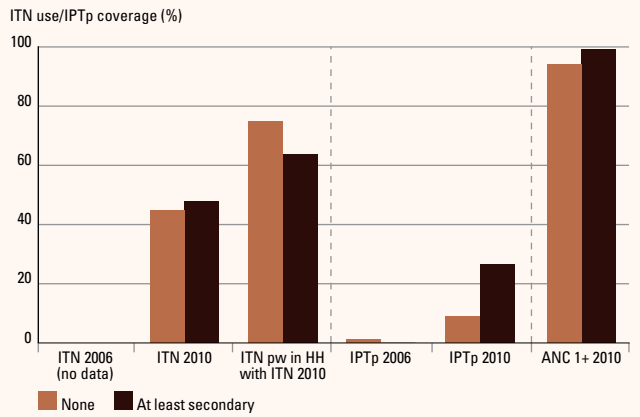
ITN use and IPTp coverage by wealth



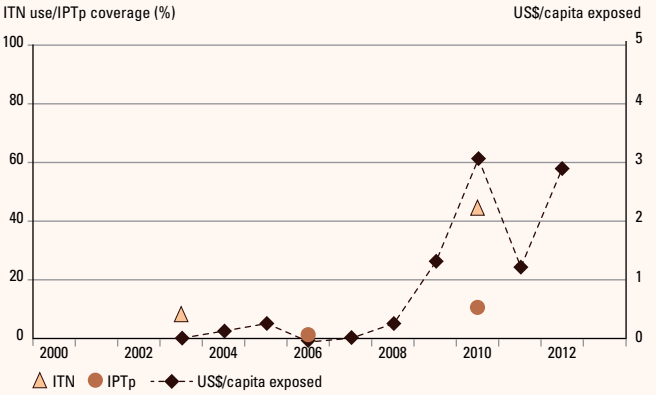
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Burundi

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)						NA					50		56	
IPTp2 ANC (%)														
Any antimalarial (%)*	NA					19					1		NA	
ANC (1+ visit, %)	78					92					99		NA	
Tetanus (%)†	60					76					78		NA	
Iron suppl. (%)	NA					NA					73		NA	
PW Hb <11 g/dL (%)	NA					NA					26		NA	
ANC HIV testing (%)‡	NA					7					26		NA	
Disbursement (millions)§				2.0	4.6	6.3	4.1	3.9	22.5	7.6	22.0	11.1	7.5	
Disbursement/capita ($)§				0.4	0.9	1.2	0.8	0.7	4.0	1.3	3.7	1.6	1.1	

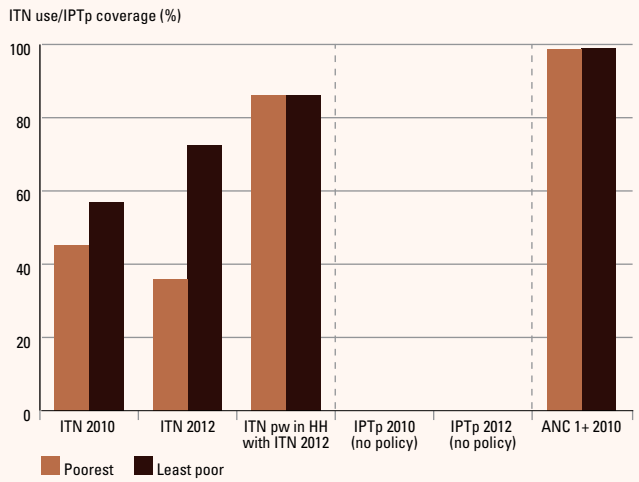
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000, 2005 and 2010: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

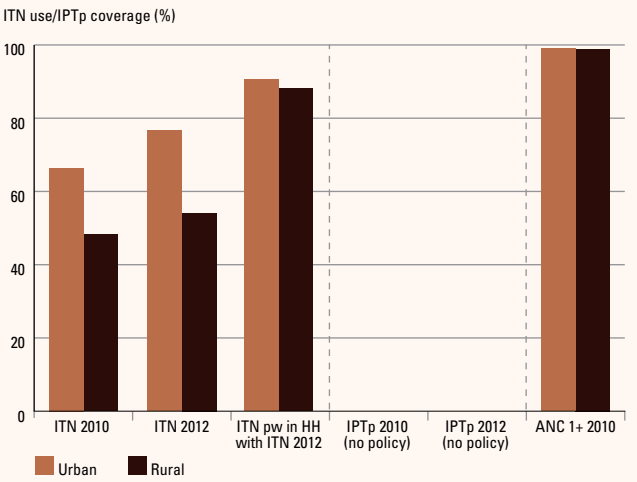
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	329 000	2010–2015
Average no of children/woman	6.1	2010–2015
HIV+ women 15+ years	2%	2010
PW ITN and/or IRS	57%	2012

Factors of interest	No or %	Time period/year
ANC 2+ visits	95%	2010
ANC 4+ visits	33%	2010
Start ANC <6 months	65%	2010
Anthelmintics use in PW	31%	2010

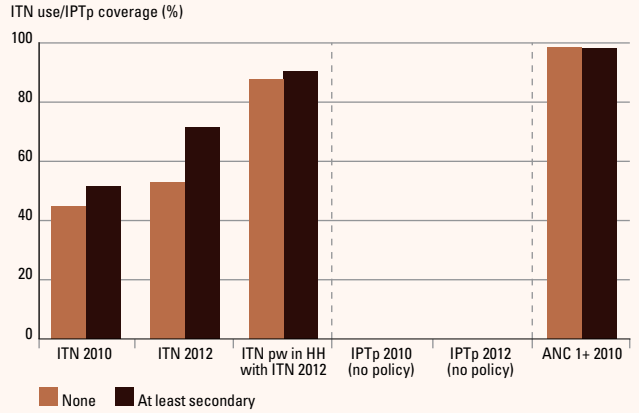
ITN use and IPTp coverage by wealth



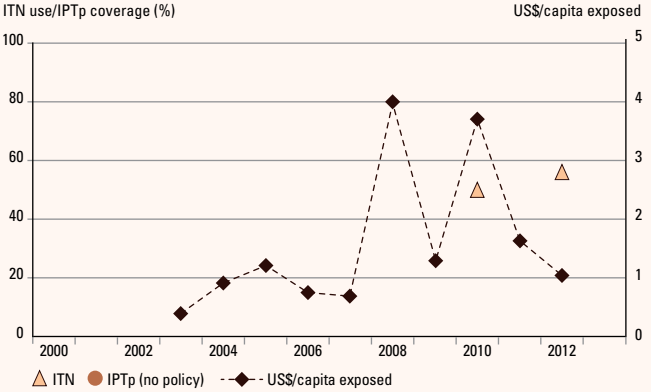
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Cameroon

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)					1		NA					20		
IPTp2 ANC (%)					NA		6					26		
Any antimalarial (%)*	NA				47		65					69		
ANC (1+ visit, %)	75				83		74					85		
Tetanus (%)†	65				53		73					73		
Iron suppl. (%)	NA				73		NA					80		
PW Hb <11 g/dL (%)	NA				51		NA					50		
ANC HIV testing (%)‡	NA				7		36					38		
Disbursement (millions)§					1.9	5.2	8.6	5.3	6.1	9.6	2.1	66.3	2.1	
Disbursement/capita ($)§					0.1	0.3	0.5	0.3	0.3	0.5	0.1	3.2	0.1	

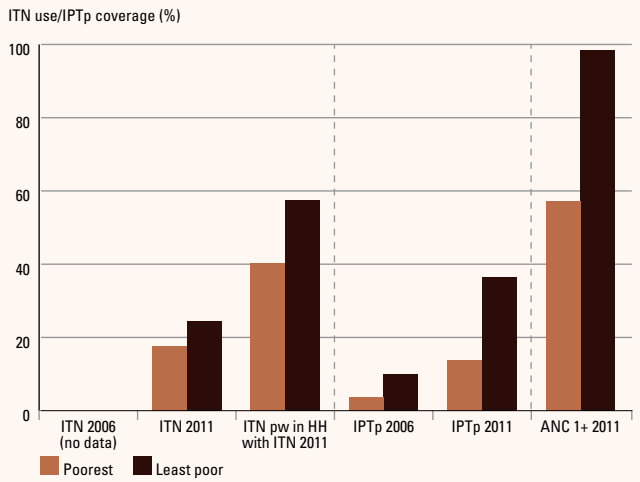
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2004: 2+ doses, 2000, 2006 and 2011: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

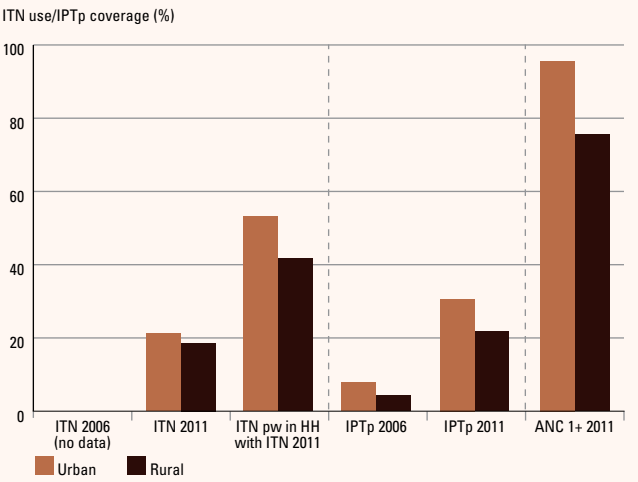
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	833 000	2010–2015
Average no of children/woman	4.8	2010–2015
HIV+ women 15+ years	6%	2011
PW ITN and/or IRS	21%	2011

Factors of interest	No or %	Time period/year
ANC 2+ visits	82%	2011
ANC 4+ visits	62%	2011
Start ANC <6 months	70%	2011
Anthelmintics use in PW	37%	2011

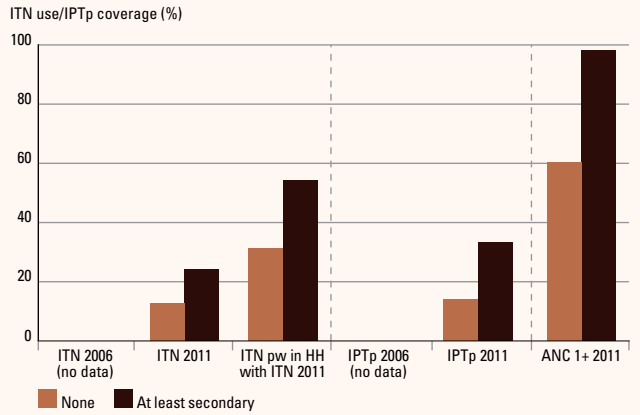
ITN use and IPTp coverage by wealth



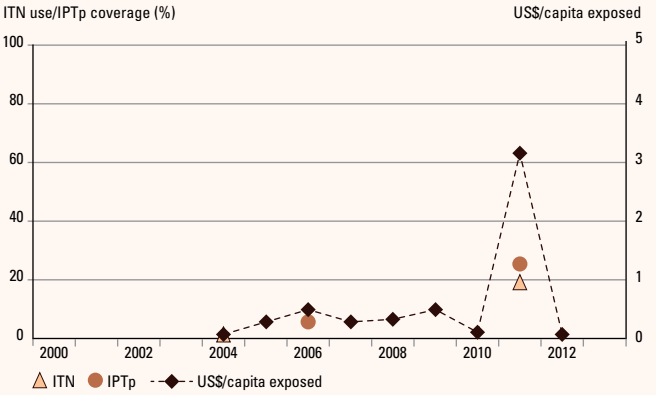
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Central African Republic

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)											40			
IPTp2 ANC (%)							9				24			
Any antimalarial (%)*	NA						61				56			
ANC (1+ visit, %)	62						69				68			
Tetanus (%)†	61						60				65			
Iron suppl. (%)	NA						NA				NA			
PW Hb <11 g/dL (%)	NA						39				NA			
ANC HIV testing (%)‡	NA						20				29			
Disbursement (millions)§						1.9	4.2	4.5	2.7	0.0	1.5	0.7	3.6	
Disbursement/capita ($)§						0.5	1.0	1.1	0.6	0.0	0.3	0.2	0.8	

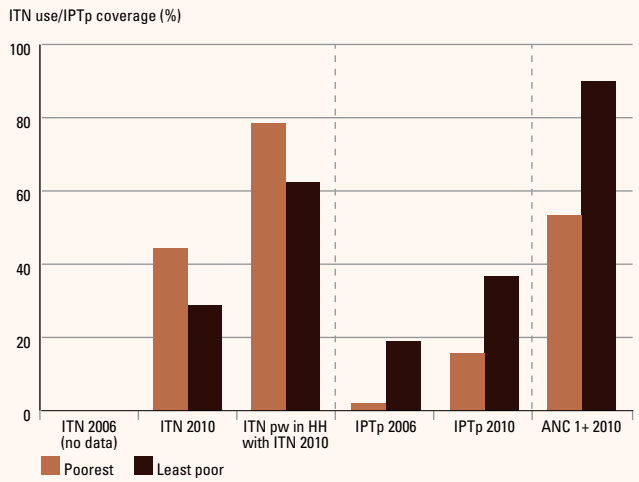
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000, 2006 and 2010: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

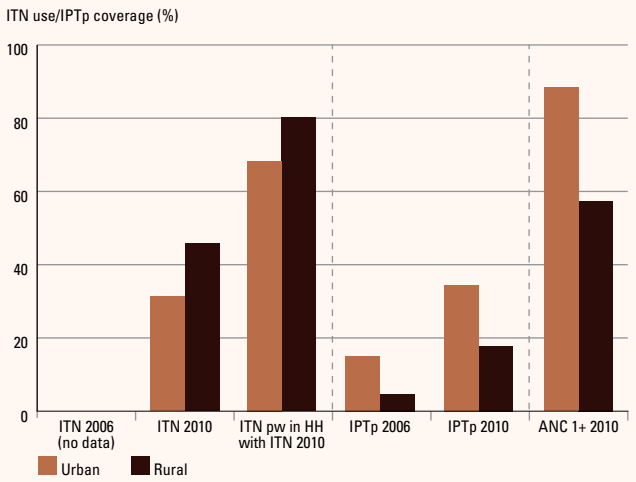
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	162 000	2010–2015
Average no of children/woman	4.4	2010–2015
HIV+ women 15+ years	6%	2010
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	68%	2010
ANC 4+ visits	38%	2010
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

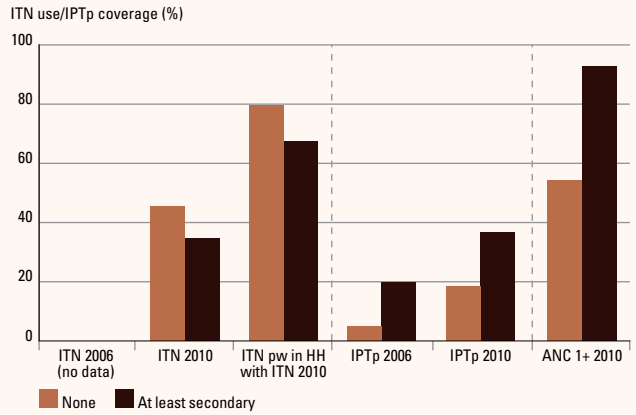
ITN use and IPTp coverage by wealth



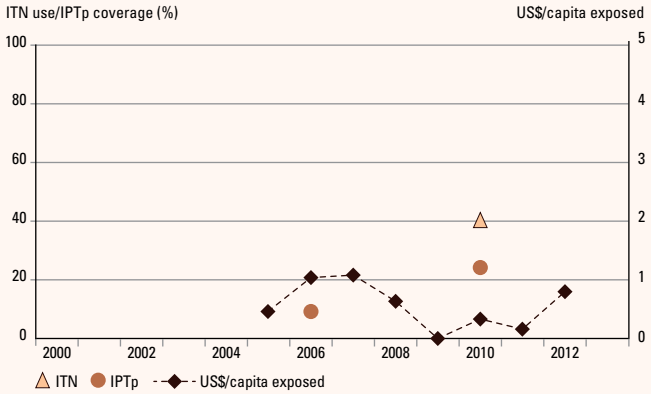
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Chad

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)					NA						10			
IPTp2 ANC (%)					NA						22			
Any antimalarial (%)*	NA				38						31			
ANC (1+ visit, %)	42				43						53			
Tetanus (%)†	38				29						43			
Iron suppl. (%)	NA				29						NA			
PW Hb <11 g/dL (%)	NA				NA						NA			
ANC HIV testing (%)‡	NA				0						5			
Disbursement (millions)§							0.0	0.9	0.8	0.3	22.7	4.3	NA	
Disbursement/capita ($)§							0.0	0.1	0.1	0.0	2.0	0.4	NA	

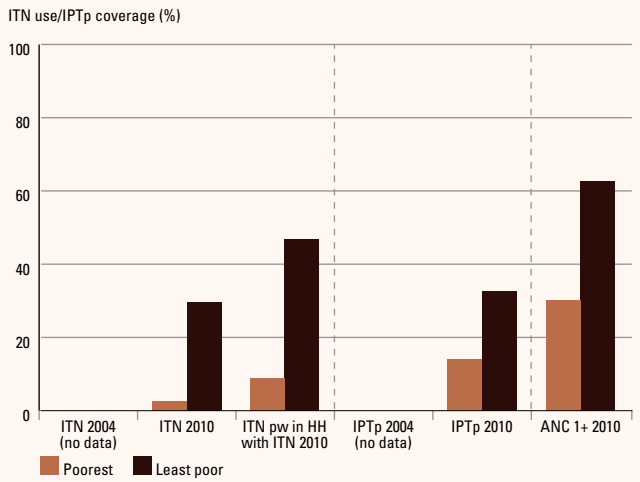
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000 and 2010: "Protected", 2004: 2+ doses; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

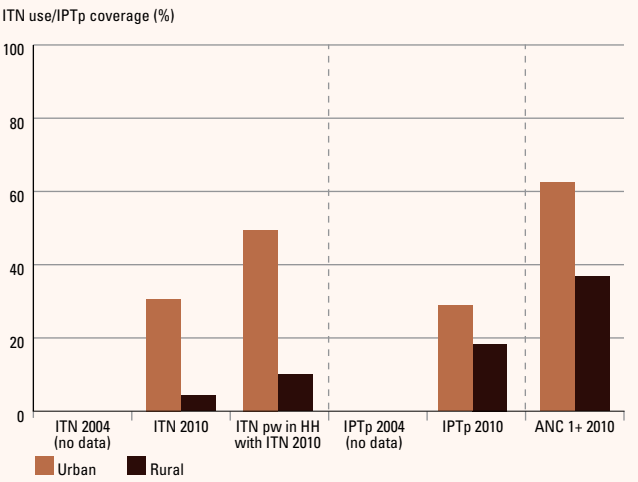
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	604 000	2010–2015
Average no of children/woman	6.3	2010–2015
HIV+ women 15+ years	3%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	50%	2010
ANC 4+ visits	23%	2010
Start ANC <6 months	34%	2004
Anthelmintics use in PW	NA	

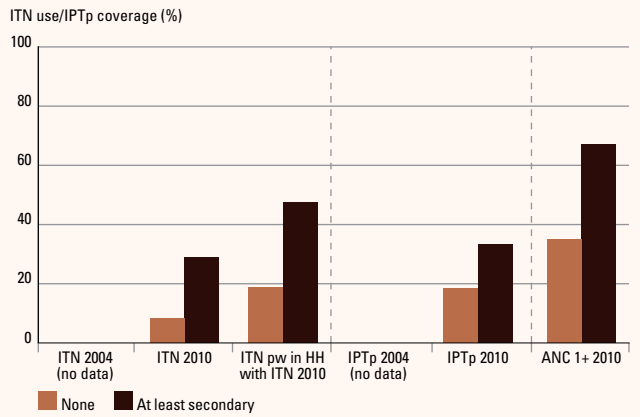
ITN use and IPTp coverage by wealth



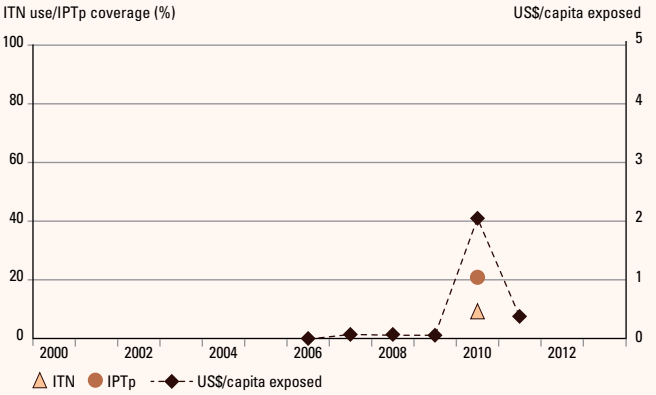
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Congo

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)						4						21		
IPTp2 ANC (%)												22		
Any antimalarial (%)*						65						79		
ANC (1+ visit, %)						88						93		
Tetanus (%)†						46						73		
Iron suppl. (%)						53						84		
PW Hb <11 g/dL (%)						70						58		
ANC HIV testing (%)‡						5				17		28		
Disbursement (millions)§							0.0	2.4	0.1	0.0	12.1	1.3	1.0	
Disbursement/capita ($)§							0.0	0.6	0.0	0.0	3.0	0.3	0.2	

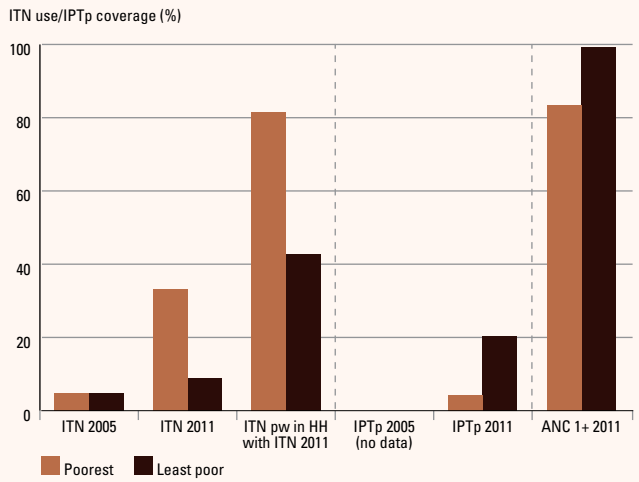
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2005: 2+ doses, 2011: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

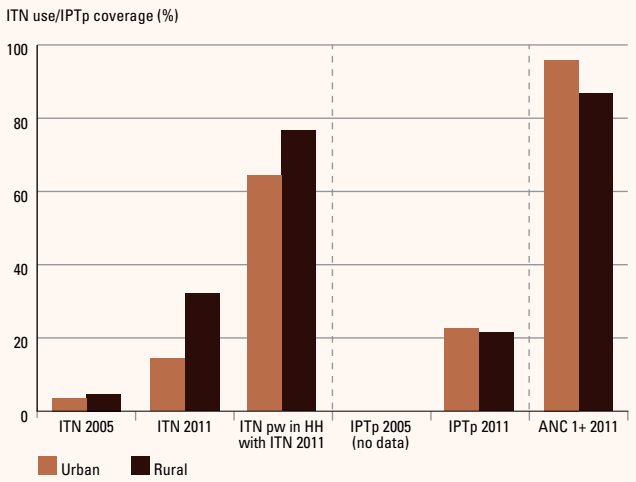
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	171 000	2010–2015
Average no of children/woman	5.0	2010–2015
HIV+ women 15+ years	4%	2009
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	92%	2011
ANC 4+ visits	79%	2011
Start ANC <6 months	84%	2011
Anthelmintics use in PW	86%	2011

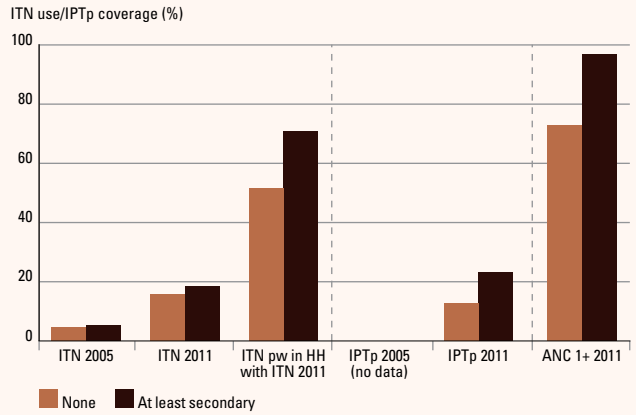
ITN use and IPTp coverage by wealth



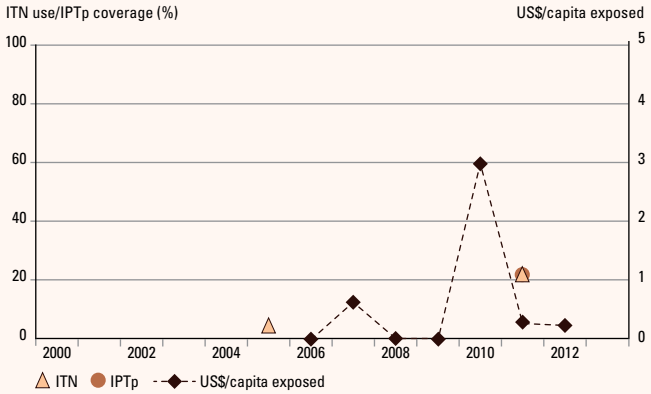
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Côte d'Ivoire

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							NA						40	
IPTp2 ANC (%)							8						18	
Any antimalarial (%)*	NA						75						47	
ANC (1+ visit, %)	88						91						91	
Tetanus (%)†	79						67						67	
Iron suppl. (%)	NA						NA						77	
PW Hb <11 g/dL (%)	NA						NA						64	
ANC HIV testing (%)‡	NA						11						27	
Disbursement (millions)§							0.1	4.3	1.9	16.2	58.4	14.3	17.9	
Disbursement/capita ($)§							0.0	0.2	0.1	0.8	3.0	0.7	0.9	

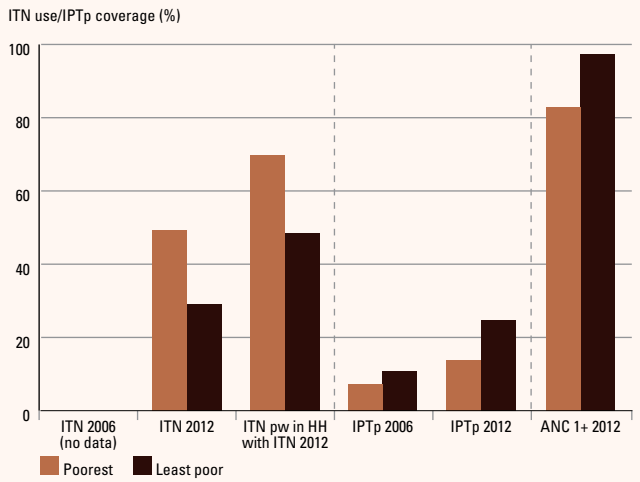
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000, 2006 and 2012: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

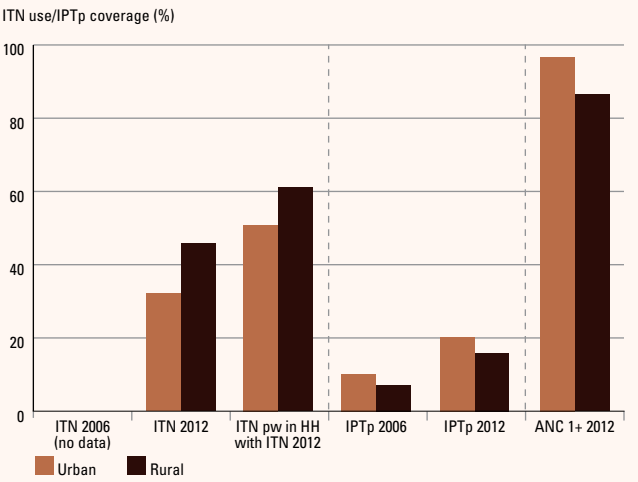
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	769 000	2010–2015
Average no of children/woman	4.9	2010–2015
HIV+ women 15+ years	5%	2012
PW ITN and/or IRS	41%	2012

Factors of interest	No or %	Time period/year
ANC 2+ visits	82%	2012
ANC 4+ visits	44%	2012
Start ANC <6 months	64%	2012
Anthelmintics use in PW	37%	2012

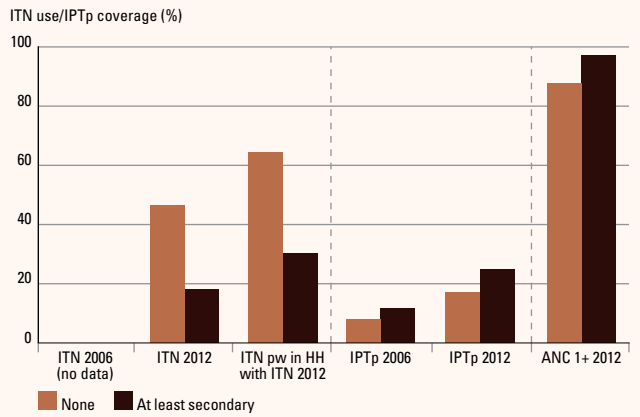
ITN use and IPTp coverage by wealth



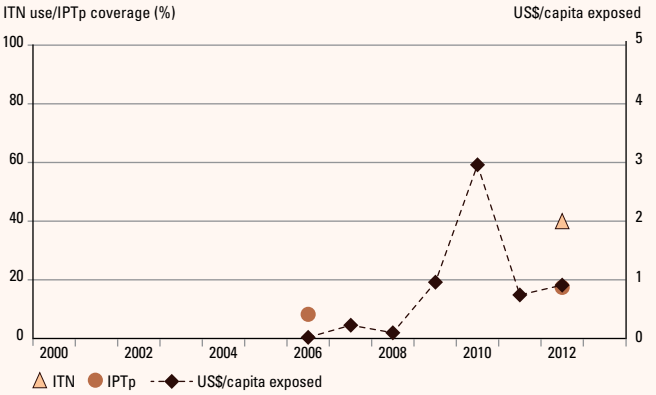
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Democratic Republic of the Congo

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)								7			43			
IPTp2 ANC (%)								5			18			
Any antimalarial (%)*		NA						36			51			
ANC (1+ visit, %)		68						85			87			
Tetanus (%)†		50						39			64			
Iron suppl. (%)		NA						46			NA			
PW Hb <11 g/dL (%)		NA						60			NA			
ANC HIV testing (%)‡		NA						5			16			
Disbursement (millions)§					1.4	18.6	8.3	12.3	36.2	87.5	70.2	63.3	152.1	
Disbursement/capita ($)§					0.0	0.3	0.1	0.2	0.6	1.4	1.1	1.0	2.5	

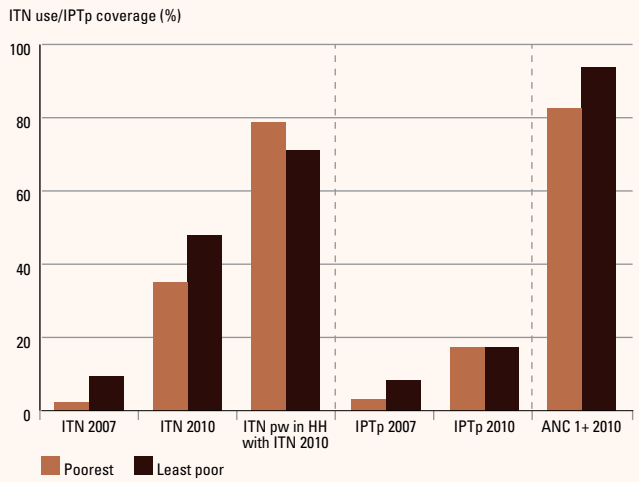
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2001 and 2010: "Protected", 2007: 2+ doses; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

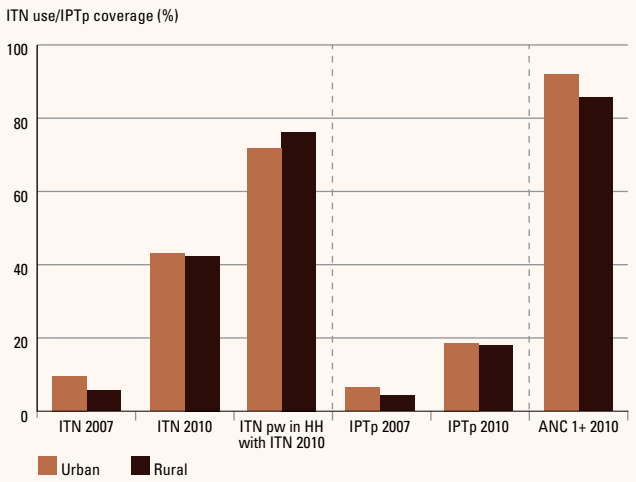
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	2 777 000	2010–2015
Average no of children/woman	6.0	2010–2015
HIV+ women 15+ years	1%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	83%	2010
ANC 4+ visits	44%	2010
Start ANC <6 months	56%	2007
Anthelmintics use in PW	NA	

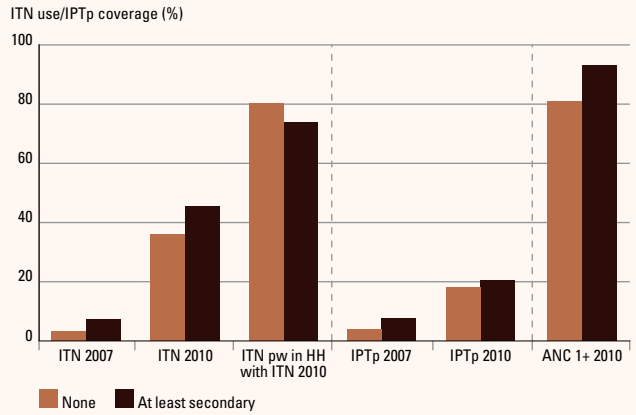
ITN use and IPTp coverage by wealth



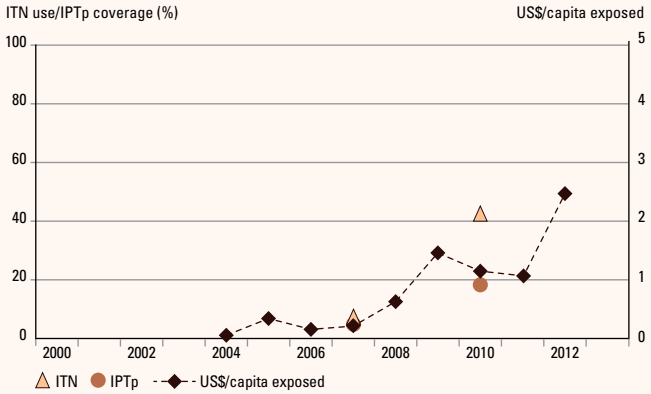
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Djibouti

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							NA			25				
IPTp2 ANC (%)														
Any antimalarial (%)*							NA			NA				
ANC (1+ visit, %)							96			80				
Tetanus (%)†							70			NA				
Iron suppl. (%)							NA			NA				
PW Hb <11 g/dL (%)							NA			NA				
ANC HIV testing (%)‡							48			NA				
Disbursement (millions)§				0.2	0.4	0.5	0.5	1.8	1.5	0.1	0.1	0.1	0.0	
Disbursement/capita ($)§				0.4	0.8	1.0	0.9	3.3	2.7	0.3	0.3	0.2	0.1	

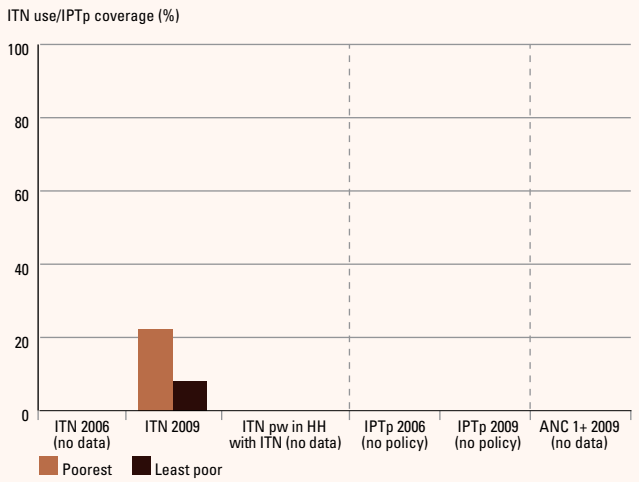
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2006: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

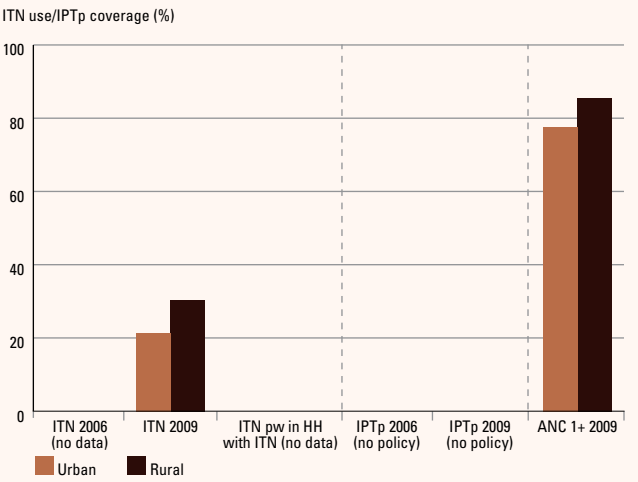
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	16 000	2010–2015
Average no of children/woman	3.4	2010–2015
HIV+ women 15+ years	1%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	NA	
ANC 4+ visits	NA	
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

ITN use and IPTp coverage by wealth



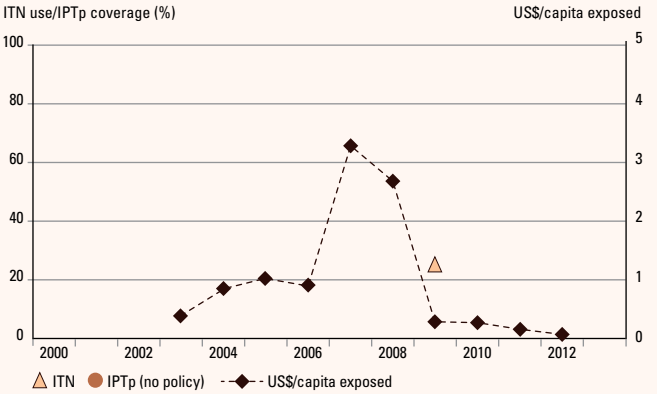
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education

No data

ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Equatorial Guinea

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)								24	51	35		24		
IPTp2 ANC (%)								20	21	30	11	24		
Any antimalarial (%)*								75	66	72		NA		
ANC (1+ visit, %)								98	99	97		91		
Tetanus (%)†								NA	NA	NA		72		
Iron suppl. (%)								NA	79	72		NA		
PW Hb <11 g/dL (%)								NA	NA	NA		NA		
ANC HIV testing (%)‡								NA	NA	NA		42		
Disbursement (millions)§							3.5	1.8	6.3	3.4	5.4	2.6		
Disbursement/capita ($)§							5.6	2.8	9.6	5.1	7.7	3.6		

*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2011: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country; Additional data from Rehman et al, 2013, *Malaria Journal*.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	28 000	2010–2015
Average no of children/woman	4.9	2010–2015
HIV+ women 15+ years	8.3%	2011
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	NA	
ANC 4+ visits	67%	2011
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

ITN use and IPTp coverage by wealth

No data

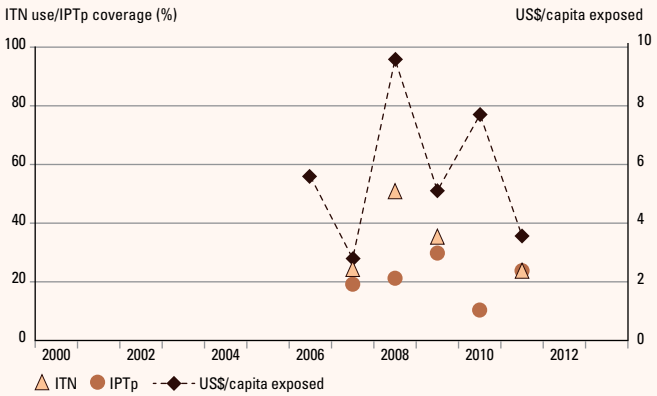
ITN use and IPTp coverage by residence

No data

ITN use and IPTp coverage by level of education

No data

ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Eritrea

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)			3		50						14			
IPTp2 ANC (%)														
Any antimalarial (%)*			4		5									
ANC (1+ visit, %)			70		78						88			
Tetanus (%)†			35		NA									
Iron suppl. (%)			40		NA									
PW Hb <11 g/dL (%)			NA		NA									
ANC HIV testing (%)			NA		NA									
Disbursement (millions)§				0.3	0.8	2.1	1.1	4.0	5.8	0.6	21.6	5.1	8.2	
Disbursement/capita ($)§				0.1	0.2	0.5	0.3	0.9	1.3	0.1	4.6	1.0	1.5	

*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2002: "Protected"; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	211 000	2010–2015
Average no of children/woman	4.7	2010–2015
HIV+ women 15+ years	0%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	NA	
ANC 4+ visits	NA	
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

ITN use and IPTp coverage by wealth

No data

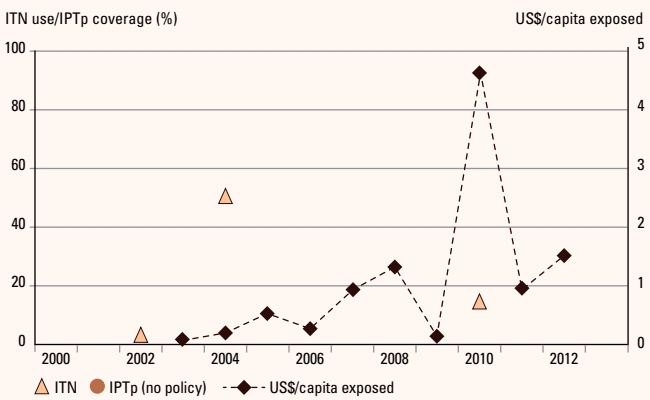
ITN use and IPTp coverage by residence

No data

ITN use and IPTp coverage by level of education

No data

ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Ethiopia

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)						1		35				35		
IPTp2 ANC (%)														
Any antimalarial (%)*	2					4		NA				NA		
ANC (1+ visit, %)	27					28		NA				34		
Tetanus (%)†	17					32		NA				48		
Iron suppl. (%)	NA					10		NA				17		
PW Hb <11 g/dL (%)	NA					31		NA				22		
ANC HIV testing (%)‡	NA					1		NA				11		
Disbursement (millions)§			5.2	22.4	4.5	21.3	81.7	19.9	6.6	137.3	56.1	76.8	57.5	
Disbursement/capita ($)§			0.1	0.5	0.1	0.4	1.7	0.4	0.1	2.7	1.1	1.3	1.0	

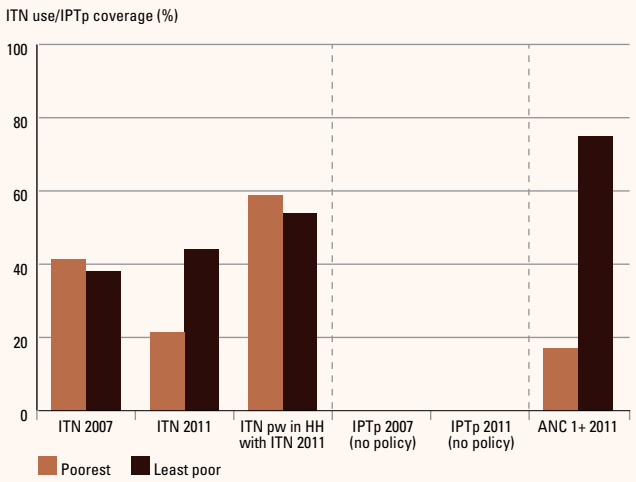
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000: 2+ doses, 2005 and 2011: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

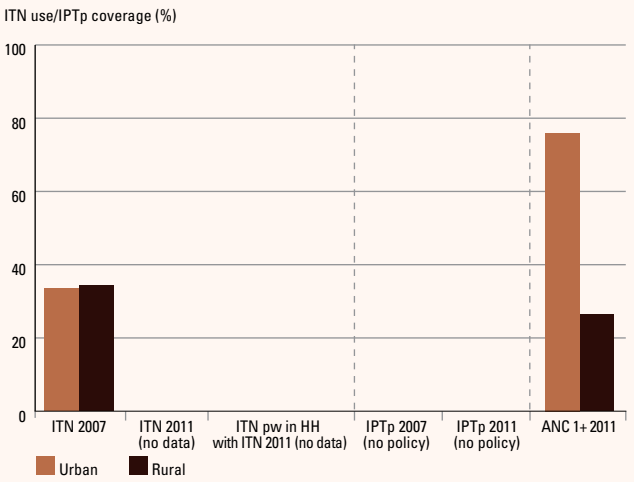
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	2 039 000	2010–2015
Average no of children/woman	4.6	2010–2015
HIV+ women 15+ years	2%	2011
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	38%	2011
ANC 4+ visits	19%	2011
Start ANC <6 months	28%	2011
Anthelmintics use in PW	5%	2011

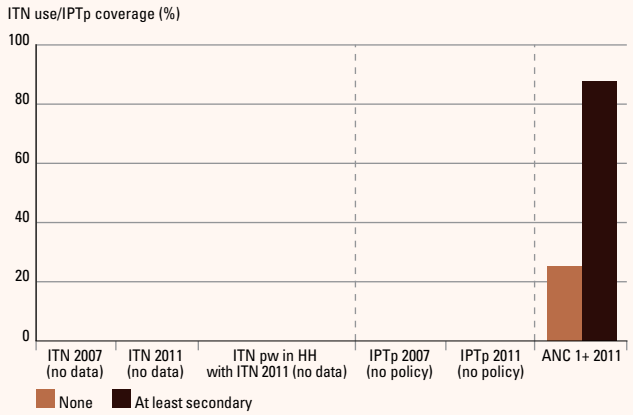
ITN use and IPTp coverage by wealth



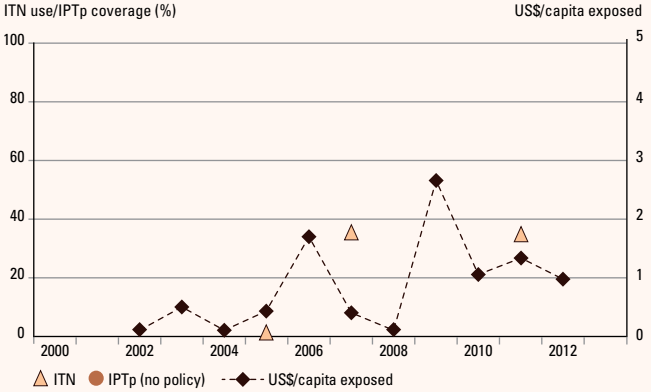
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Gabon

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							20		36				29	
IPTp2 ANC (%)							NA		NA				3	
Any antimalarial (%)*	79						NA		NA				67	
ANC (1+ visit, %)	95						NA		NA				95	
Tetanus (%)†	54						NA		NA				78	
Iron suppl. (%)	60						NA		NA				89	
PW Hb <11 g/dL (%)	NA						NA		NA				58	
ANC HIV testing (%)‡	NA						NA		NA				53	
Disbursement (millions)§					1.2	3.1	4.1	3.1	1.3	3.9	0.9	NA	NA	
Disbursement/capita ($)§					0.9	2.2	2.9	2.1	0.9	2.6	0.6	NA	NA	

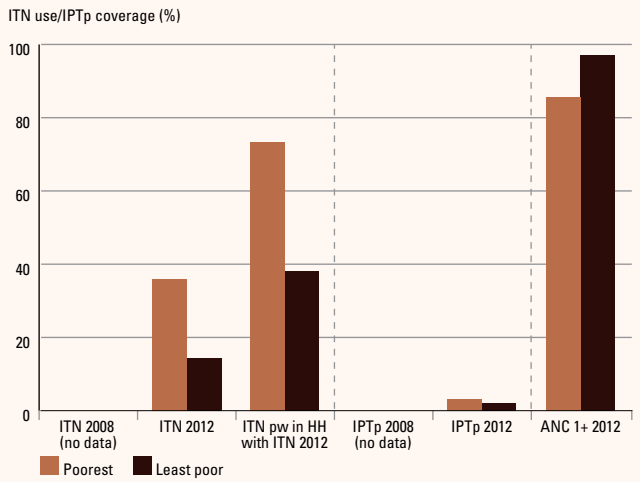
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000: 2+ doses, 2012: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

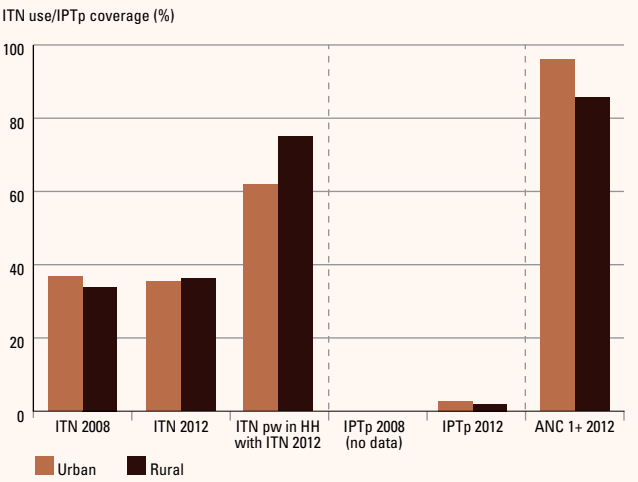
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	54 000	2010–2015
Average no of children/woman	4.1	2010–2015
HIV+ women 15+ years	6%	2012
PW ITN and/or IRS	32%	2012

Factors of interest	No or %	Time period/year
ANC 2+ visits	93%	2012
ANC 4+ visits	78%	2012
Start ANC <6 months	89%	2012
Anthelmintics use in PW	71%	2012

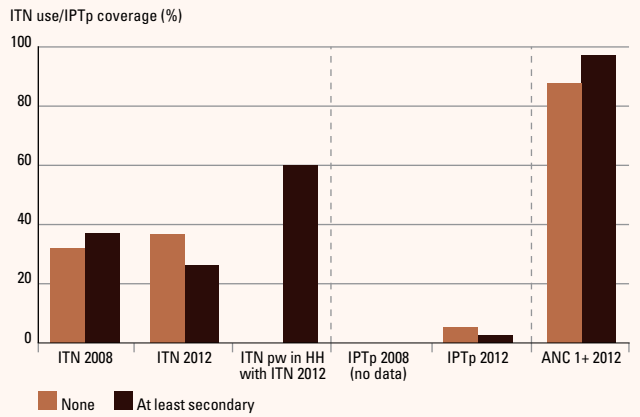
ITN use and IPTp coverage by wealth



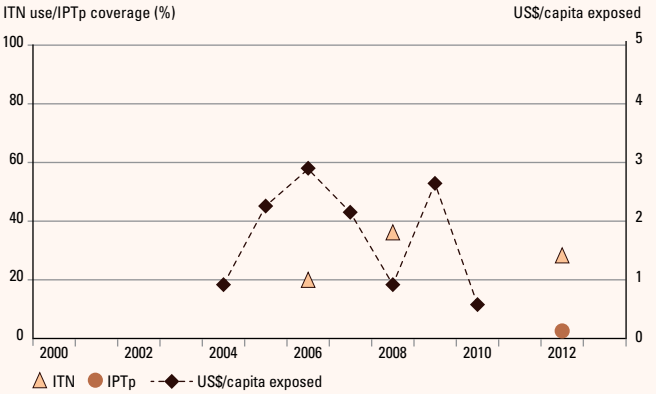
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Gambia

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							NA		45		26			46
IPTp2 ANC (%)							32		49		65			62
Any antimalarial (%)*	NA						59		NA		95			95
ANC (1+ visit, %)	91						98		NA		98			86
Tetanus (%)†	78						76		NA		75			71
Iron suppl. (%)	NA						NA		NA		NA			NA
PW Hb <11 g/dL (%)	NA						NA		NA		NA			NA
ANC HIV testing (%)‡	NA						NA		NA		39			NA
Disbursement (millions)§					1.5	3.8	2.6	6.9	5.7	6.0	9.0	7.5	5.4	NA
Disbursement/capita ($)§					1.0	2.5	1.7	4.3	3.5	3.5	5.2	4.3	3.0	NA

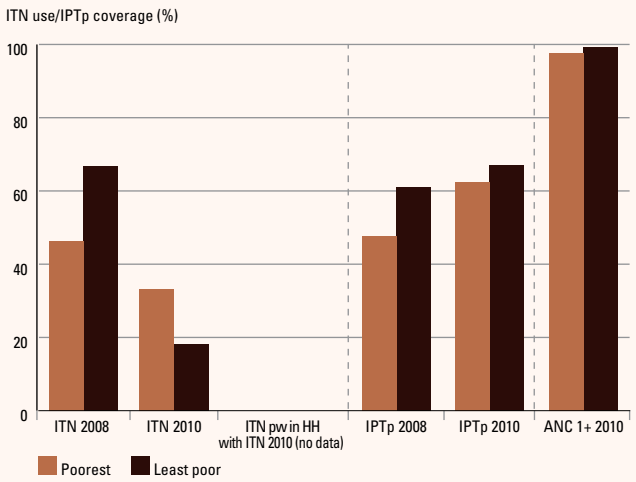
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000, 2006, 2010 and 2013: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

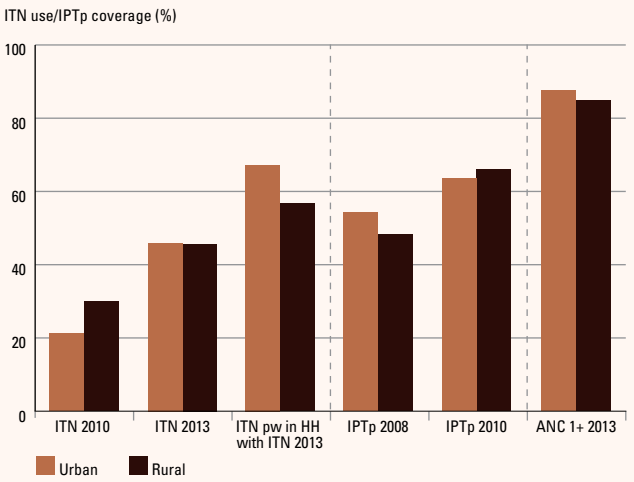
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	80 000	2010–2015
Average no of children/woman	5.8	2010–2015
HIV+ women 15+ years	1%	2012
PW ITN and/or IRS	66%	2013

Factors of interest	No or %	Time period/year
ANC 2+ visits	94%	2010
ANC 4+ visits	72%	2010
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

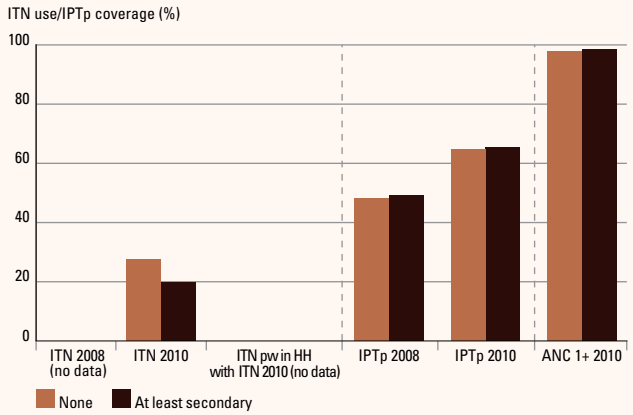
ITN use and IPTp coverage by wealth



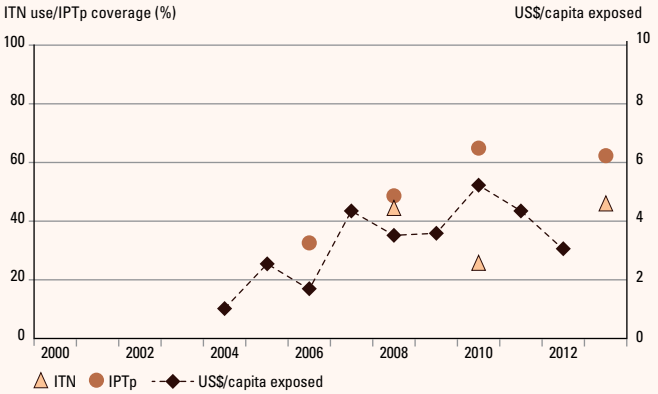
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Ghana

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)				3			NA		20			33		
IPTp2 ANC (%)				1			27		44			65		
Any antimalarial (%)*				58			67		65			84		
ANC (1+ visit, %)				92			92		95			96		
Tetanus (%)†				50			77		72			70		
Iron suppl. (%)				79			NA		86			NA		
PW Hb <11 g/dL (%)				65			NA		70			NA		
ANC HIV testing (%)‡				3			9		24			46		
Disbursement (millions)§			0.0	0.9	2.0	15.4	5.2	19.8	19.8	45.5	71.1	34.6	60.6	
Disbursement/capita ($)§			0.0	0.0	0.1	0.7	0.2	0.9	0.8	1.8	2.9	1.4	2.4	

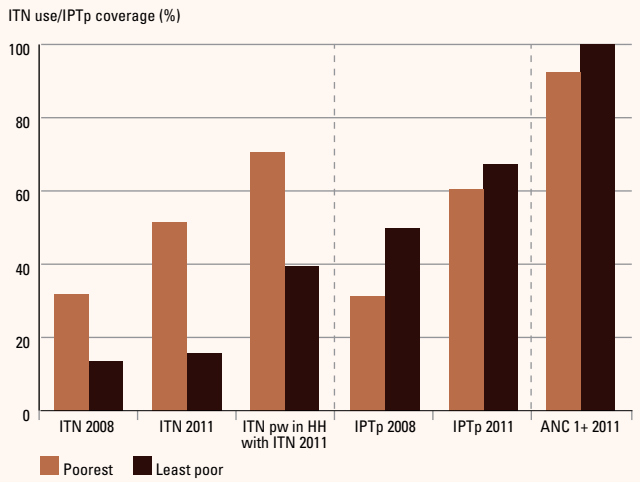
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2003: 2+ doses, 2006, 2008 and 2011: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

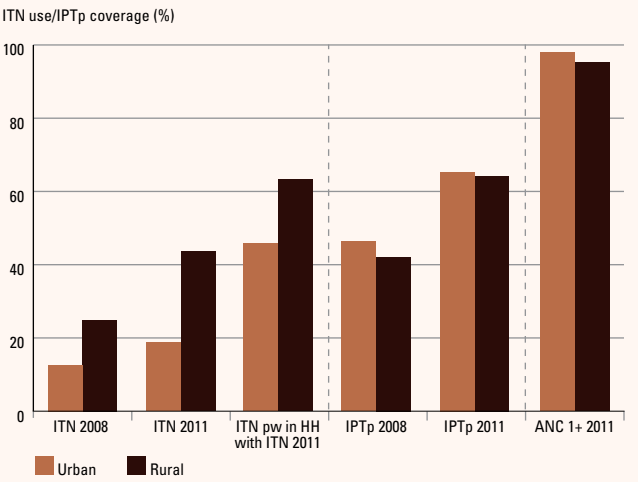
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	816 000	2010–2015
Average no of children/woman	3.9	2010–2015
HIV+ women 15+ years	1%	2012
PW ITN and/or IRS	39%	2011

Factors of interest	No or %	Time period/year
ANC 2+ visits	95%	2011
ANC 4+ visits	87%	2011
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

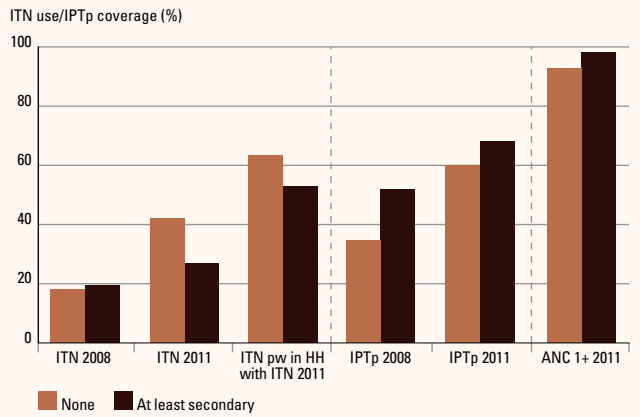
ITN use and IPTp coverage by wealth



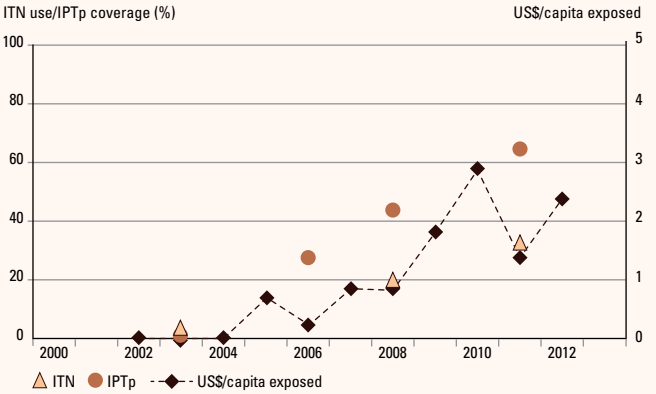
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Guinea

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)						0		3					28	
IPTp2 ANC (%)						3		NA					18	
Any antimalarial (%)*						70		76					NA	
ANC (1+ visit, %)						82		88					85	
Tetanus (%)†						66		69					76	
Iron suppl. (%)						75		81					81	
PW Hb <11 g/dL (%)						69		NA					65	
ANC HIV testing (%)‡						1		NA					5	
Disbursement (millions)§			0.5	0.2	1.2	3.4	0.7	4.6	1.2	0.0	12.5	0.0	21.5	
Disbursement/capita ($)§			0.1	0.0	0.1	0.4	0.1	0.5	0.1	0.0	1.2	0.0	1.9	

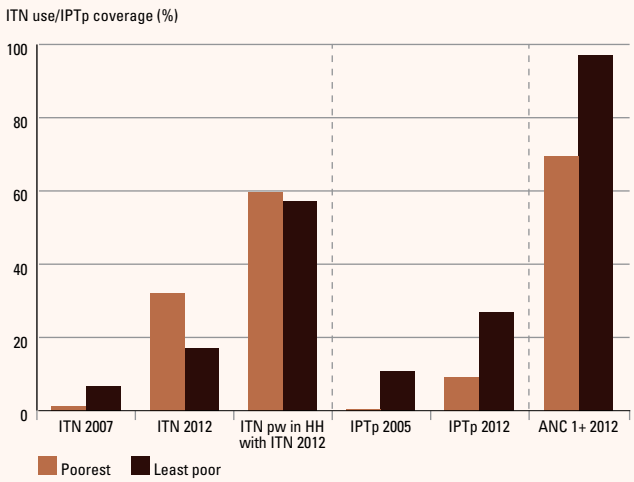
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2005 and 2007: 2+ doses, 2012: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

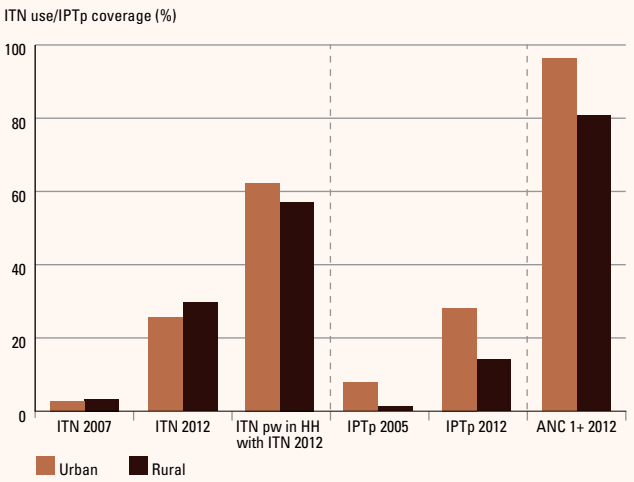
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	443 000	2010–2015
Average no of children/woman	4.9	2010–2015
HIV+ women 15+ years	2%	2012
PW ITN and/or IRS	29%	2012

Factors of interest	No or %	Time period/year
ANC 2+ visits	82%	2012
ANC 4+ visits	57%	2012
Start ANC <6 months	71%	2012
Anthelmintics use in PW	29%	2012

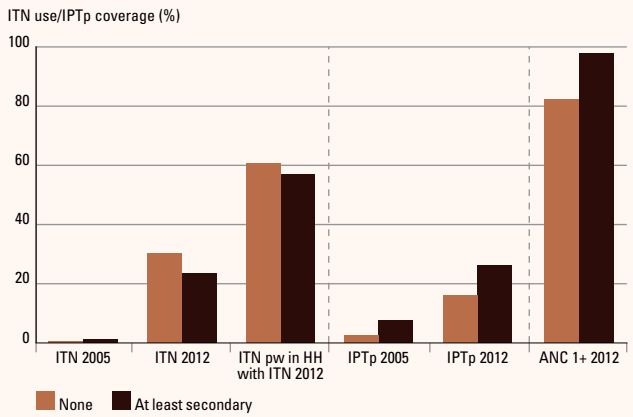
ITN use and IPTp coverage by wealth



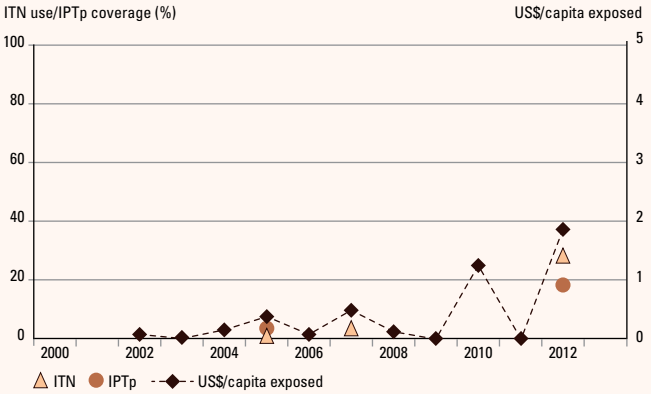
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Guinea-Bissau

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							NA				32			
IPTp2 ANC (%)							7				14			
Any antimalarial (%)*	NA						60				NA			
ANC (1+ visit, %)	62						78				93			
Tetanus (%)†	66						68				70			
Iron suppl. (%)	NA						NA				NA			
PW Hb <11 g/dL (%)	NA						NA				NA			
ANC HIV testing (%)‡	NA						7				17			
Disbursement (millions)§					0.2	1.1	0.4	1.0	1.5	1.6	7.0	2.9	0.3	
Disbursement/capita ($)§					0.1	0.8	0.3	0.7	1.1	1.1	4.6	1.8	0.2	

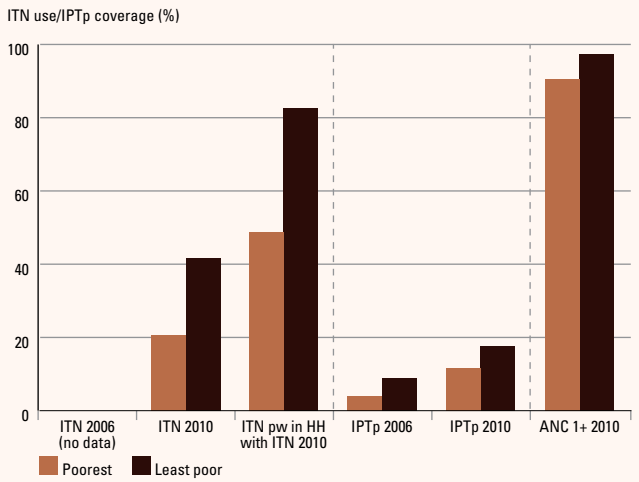
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000, 2006 and 2010: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

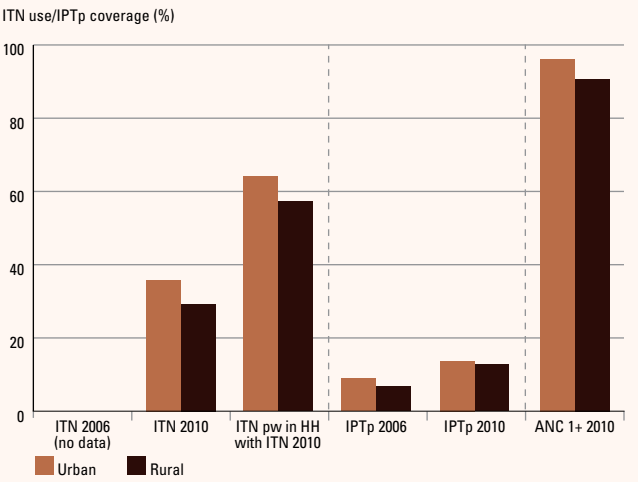
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	66 000	2010–2015
Average no of children/woman	5.0	2010–2015
HIV+ women 15+ years	4%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	89%	2010
ANC 4+ visits	68%	2010
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

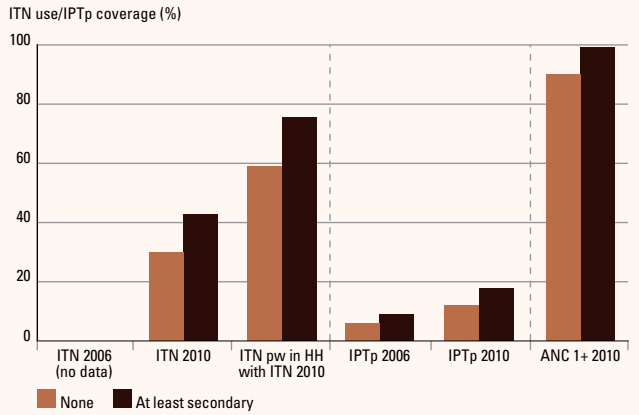
ITN use and IPTp coverage by wealth



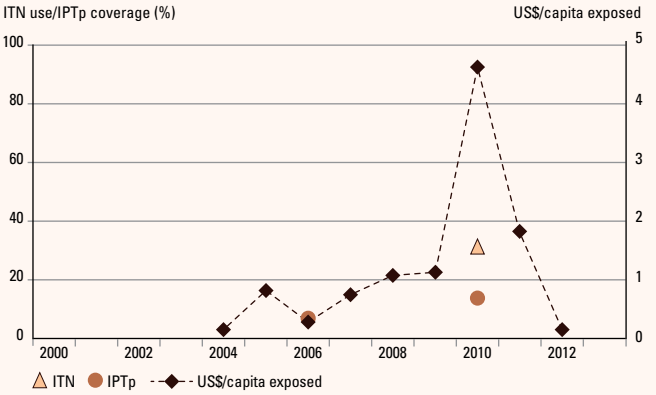
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Kenya

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)				4				40		49	41			
IPTp2 ANC (%)				4				12		14	25			
Any antimalarial (%)*				21				45		41	66			
ANC (1+ visit, %)				88				86		91	86			
Tetanus (%)†				52				NA		72	NA			
Iron suppl. (%)				46				NA		69	NA			
PW Hb <11 g/dL (%)				NA				NA		NA	NA			
ANC HIV testing (%)‡				NA				NA		56	NA			
Disbursement (millions)§				0.9	3.7	0.0	52.2	18.6	39.7	73.5	71.8	63.7	61.1	
Disbursement/capita ($)§				0.0	0.1	0.0	2.0	0.7	1.5	2.6	2.5	2.1	2.0	

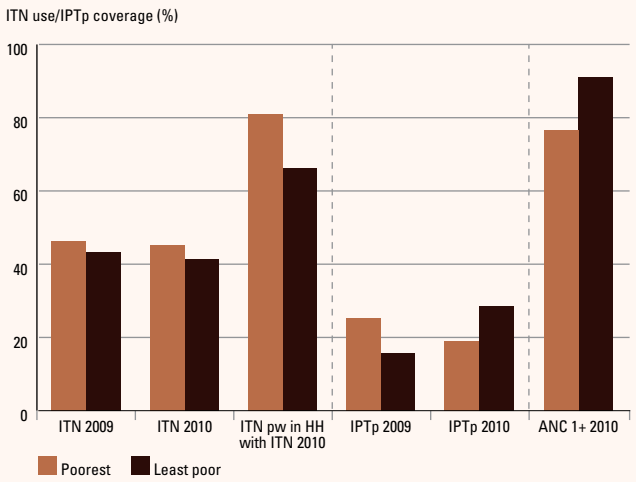
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2003: 2+ doses, 2009: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

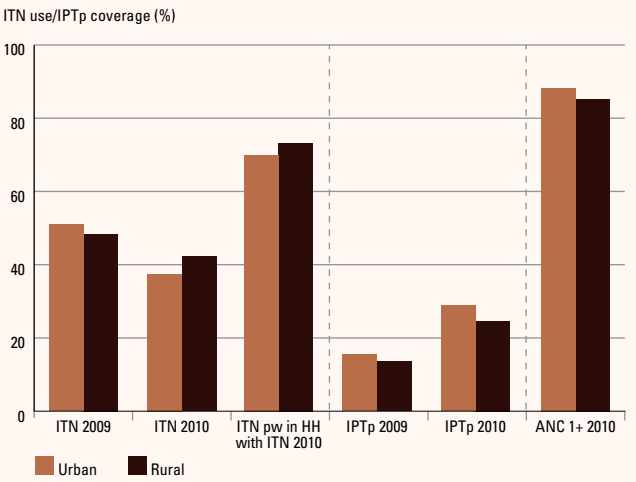
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	1 143 000	2010–2015
Average no of children/woman	4.4	2010–2015
HIV+ women 15+ years	8%	2009
PW ITN and/or IRS	48%	2010

Factors of interest	No or %	Time period/year
ANC 2+ visits	86%	2009
ANC 4+ visits	47%	2009
Start ANC <6 months	52%	2009
Anthelmintics use in PW	17%	2009

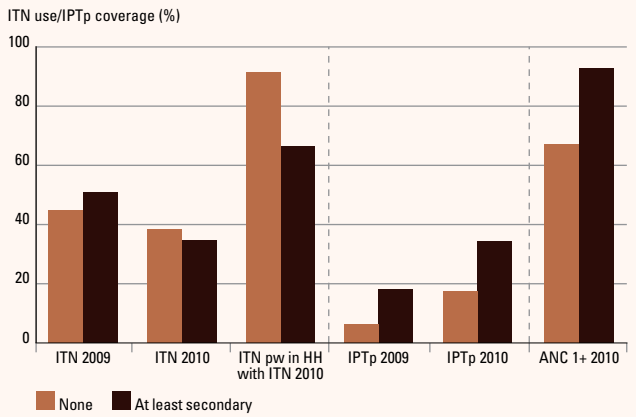
ITN use and IPTp coverage by wealth



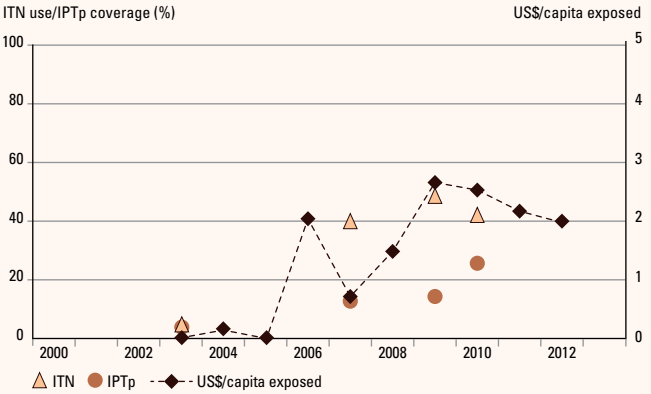
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Liberia

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)								NA		33		39		37
IPTp2 ANC (%)								NA		45		50		48
Any antimalarial (%)*								76		65		74		NA
ANC (1+ visit, %)								79		95		NA		96
Tetanus (%)†								78		NA		NA		88
Iron suppl. (%)								86		NA		NA		NA
PW Hb <11 g/dL (%)								NA		NA		NA		NA
ANC HIV testing (%)								NA		NA		NA		NA
Disbursement (millions)§					2.8	3.4	6.0	0.5	14.1	13.0	21.1	19.6	22.8	NA
Disbursement/capita ($)§					0.9	1.1	1.8	0.1	3.8	3.4	5.3	4.8	5.5	NA

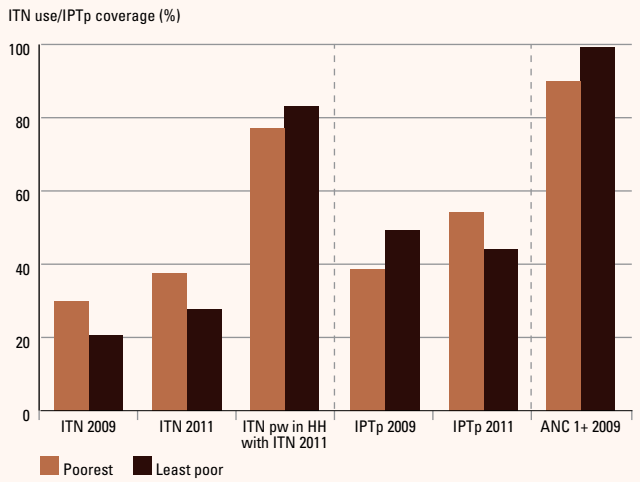
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2007 and 2013: "Protected"; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

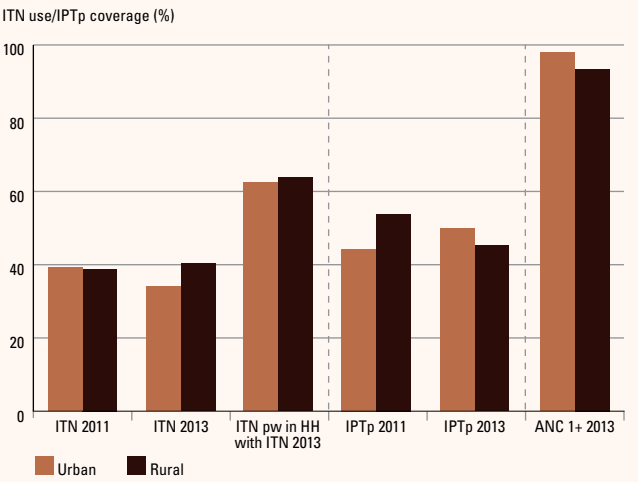
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	156 000	2010–2015
Average no of children/woman	4.8	2010–2015
HIV+ women 15+ years	1%	2012
PW ITN and/or IRS	43%	2013

Factors of interest	No or %	Time period/year
ANC 2+ visits	83%	2007
ANC 4+ visits	66%	2007
Start ANC <6 months	82%	2007
Anthelmintics use in PW	28%	2007

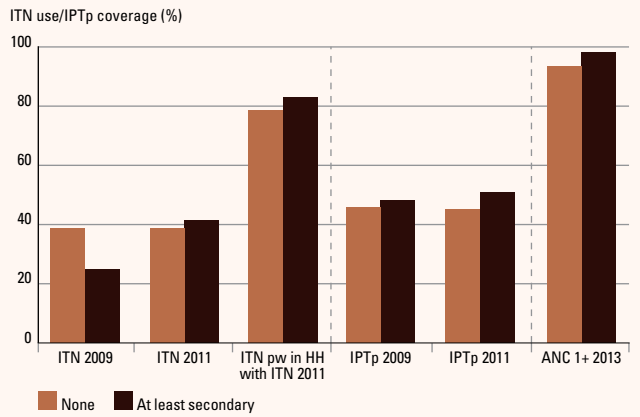
ITN use and IPTp coverage by wealth



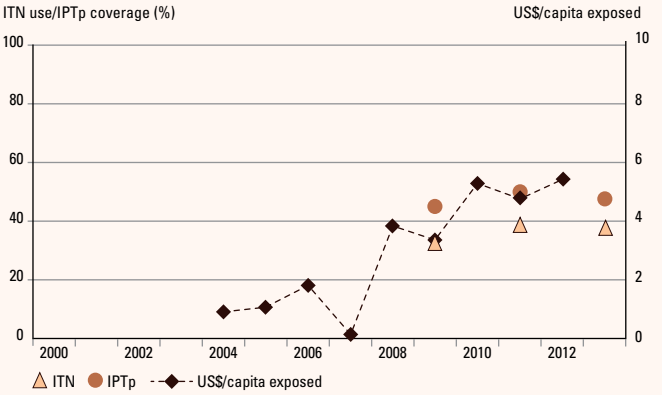
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Madagascar

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)					NA					46		71		61
IPTp2 ANC (%)					NA					6		20		18
Any antimalarial (%)*					58					48		37		32
ANC (1+ visit, %)					80					86		NA		NA
Tetanus (%)†					40					70		NA		NA
Iron suppl. (%)					32					59		NA		NA
PW Hb <11 g/dL (%)					50					38		NA		NA
ANC HIV testing (%)‡					NA					9		NA		NA
Disbursement (millions)§				0.7	3.8	17.6	6.0	23.3	22.7	26.7	86.3	37.8	32.1	NA
Disbursement/capita ($)§				0.0	0.2	1.1	0.4	1.4	1.3	1.5	4.6	1.9	1.6	NA

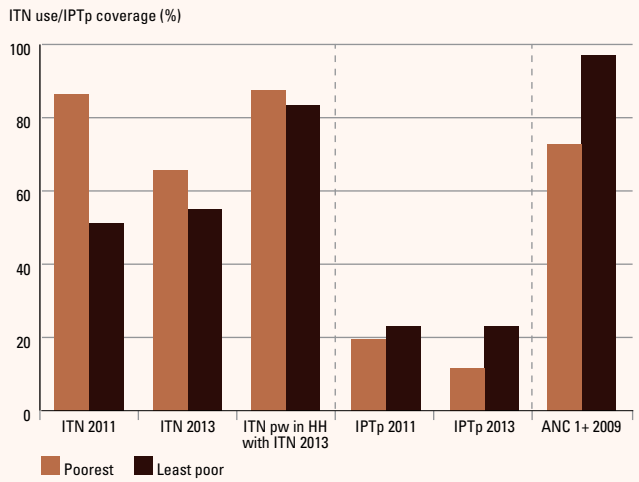
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2004: 2+ doses, 2009: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

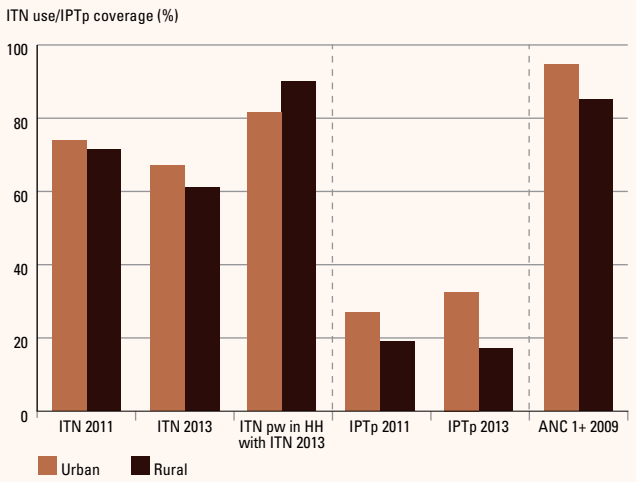
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	734 000	2010–2015
Average no of children/woman	4.5	2010–2015
HIV+ women 15+ years	0%	2012
PW ITN and/or IRS	74%	2013

Factors of interest	No or %	Time period/year
ANC 2+ visits	82%	2009
ANC 4+ visits	49%	2009
Start ANC <6 months	70%	2009
Anthelmintics use in PW	39%	2009

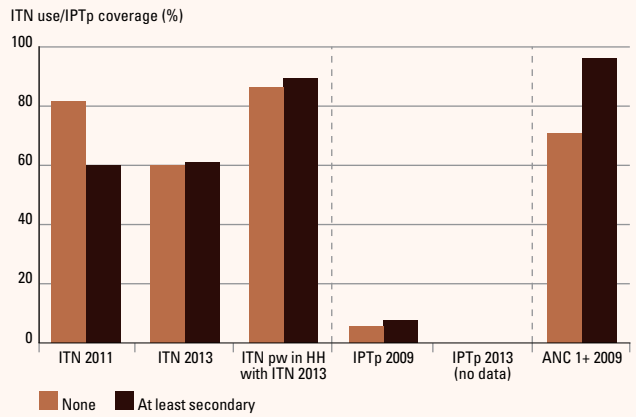
ITN use and IPTp coverage by wealth



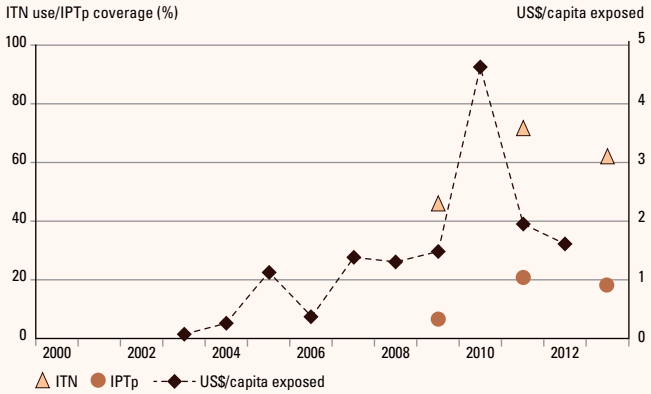
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Malawi

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)					15		NA				49	35	51	
IPTp2 ANC (%)	29				43		47				60	54	53	
Any antimalarial (%)*	68				80		83				83	89	78	
ANC (1+ visit, %)	91				93		92				96	95	NA	
Tetanus (%)†	85				66		88				NA	89	NA	
Iron suppl. (%)	70				79		80				NA	91	NA	
PW Hb <11 g/dL (%)	NA				47		NA				NA	37	NA	
ANC HIV testing (%)‡	NA				3		24				NA	79	NA	
Disbursement (millions)§							6.4	13.4	30.7	20.4	29.4	65.8	26.6	
Disbursement/capita ($)§							0.5	1.0	2.2	1.4	2.0	4.2	1.7	

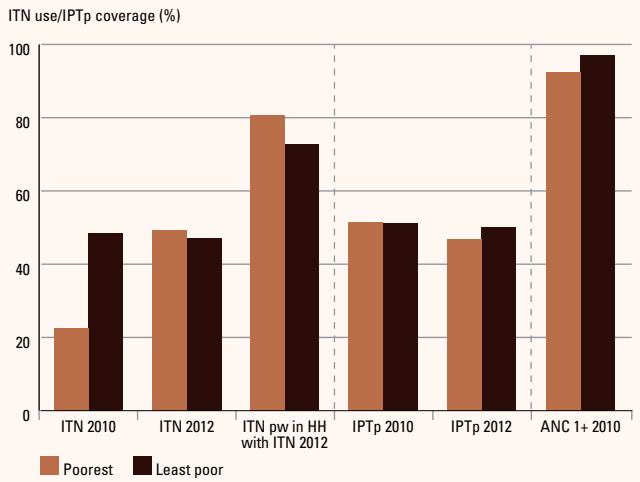
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000 and 2004: 2+ doses, 2006 and 2011: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

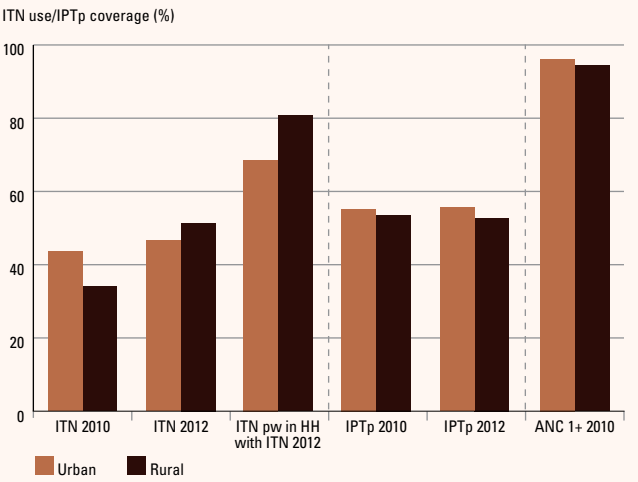
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	672 000	2010–2015
Average no of children/woman	5.4	2010–2015
HIV+ women 15+ years	13%	2010
PW ITN and/or IRS	52%	2012

Factors of interest	No or %	Time period/year
ANC 2+ visits	95%	2010
ANC 4+ visits	45%	2010
Start ANC <6 months	61%	2010
Anthelmintics use in PW	27%	2010

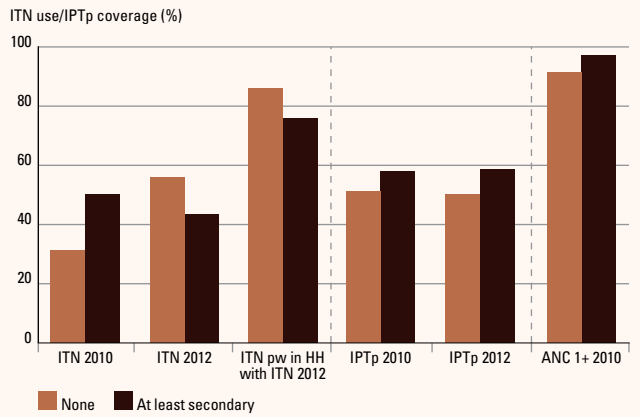
ITN use and IPTp coverage by wealth



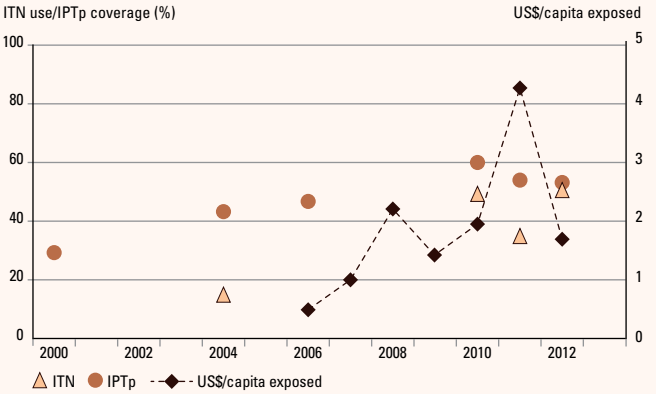
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Mali

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							29						75	
IPTp2 ANC (%)							4						20	
Any antimalarial (%)*		60					59						66	
ANC (1+ visit, %)		57					70						74	
Tetanus (%)†		32					56						47	
Iron suppl. (%)		34					61						NA	
PW Hb <11 g/dL (%)		73					76						NA	
ANC HIV testing (%)‡		NA					4						NA	
Disbursement (millions)§				0.7	0.3	0.7	0.8	4.3	9.6	14.7	17.6	25.2	23.6	
Disbursement/capita ($)§				0.0	0.0	0.1	0.1	0.3	0.7	1.0	1.1	1.7	1.5	

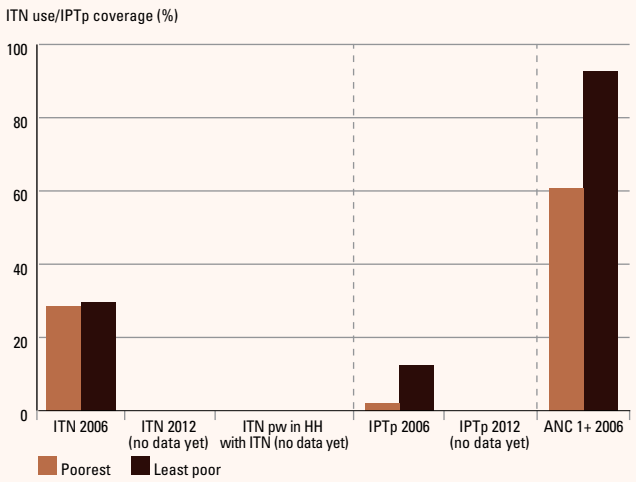
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2001: 2+ doses, 2006 and 2012: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

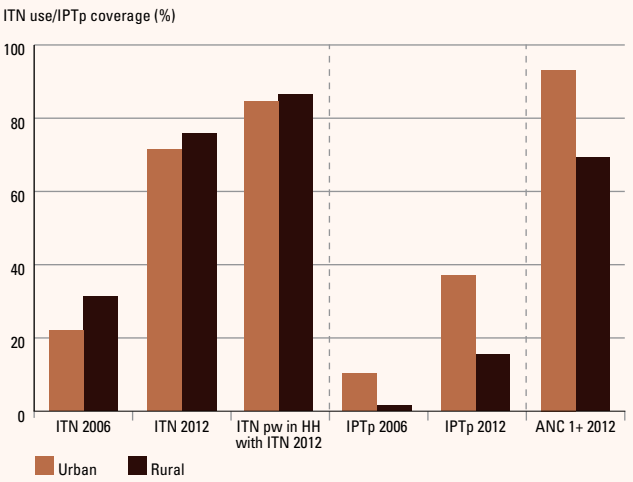
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	732 000	2010–2015
Average no of children/woman	6.9	2010–2015
HIV+ women 15+ years	1%	2012
PW ITN and/or IRS	77%	2012

Factors of interest	No or %	Time period/year
ANC 2+ visits	63%	2006
ANC 4+ visits	35%	2006
Start ANC <6 months	30%	2006
Anthelmintics use in PW	NA	

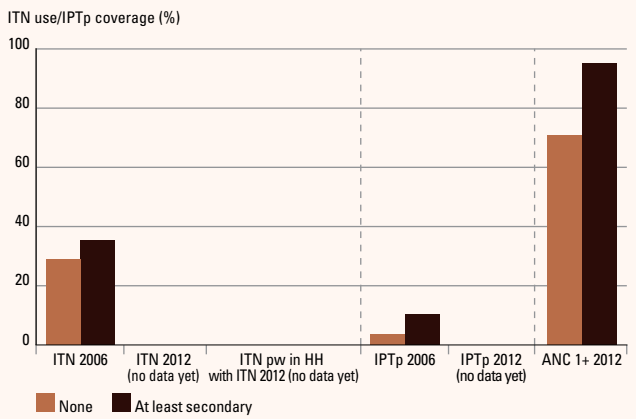
ITN use and IPTp coverage by wealth



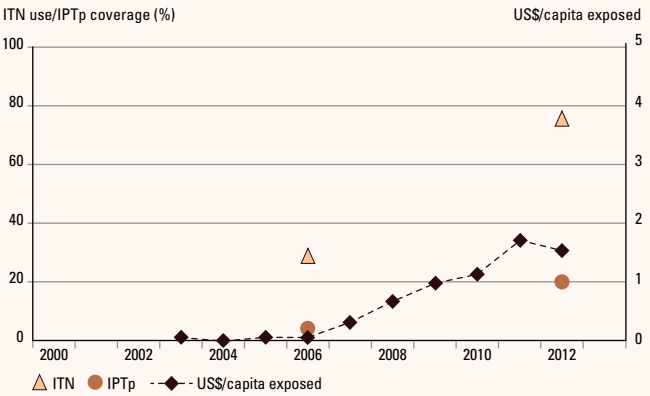
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Mauritania

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)				7				NA						
IPTp2 ANC (%)								NA						
Any antimalarial (%)*	30			43				NA						
ANC (1+ visit, %)	65			NA				75						
Tetanus (%)†	25			NA				53						
Iron suppl. (%)	48			NA				NA						
PW Hb <11 g/dL (%)	NA			NA				NA						
ANC HIV testing (%)‡	NA			NA				6						
Disbursement (millions)§					0.4	0.2	0.6	1.4	1.4	0.0	0.5	0.0	NA	
Disbursement/capita ($)§					0.1	0.1	0.2	0.4	0.4	0.0	0.2	0.0	NA	

*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000: 2+ doses, 2007: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	129 000	2010–2015
Average no of children/woman	4.7	2010–2015
HIV+ women 15+ years	0%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	NA	
ANC 4+ visits	NA	
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

ITN use and IPTp coverage by wealth

No data

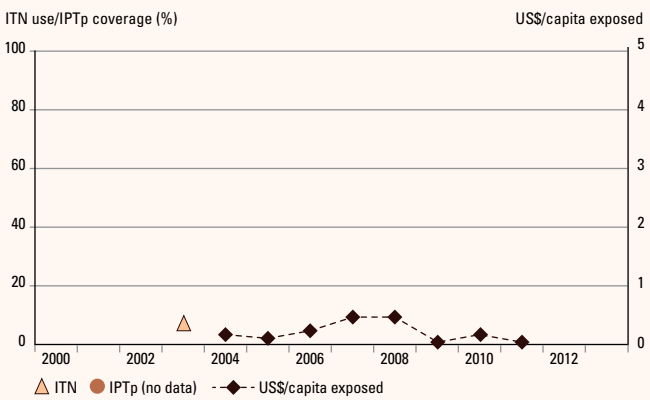
ITN use and IPTp coverage by residence

No data

ITN use and IPTp coverage by level of education

No data

ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Mozambique

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)				NA				7	NA	NA		34		
IPTp2 ANC (%)								20	43	33		19		
Any antimalarial (%)*				NA				NA	67	68		41		
ANC (1+ visit, %)				84				88	92	NA		91		
Tetanus (%)†				57				NA	79	NA		67		
Iron suppl. (%)				60				NA	NA	NA		81		
PW Hb <11 g/dL (%)				NA				48	NA	NA		51		
ANC HIV testing (%)‡				2				NA	43	37		42		
Disbursement (millions)§					6.6	0.0	7.0	21.5	31.5	26.6	47.3	56.9	49.1	
Disbursement/capita ($)§					0.3	0.0	0.3	1.0	1.4	1.2	2.0	2.3	1.9	

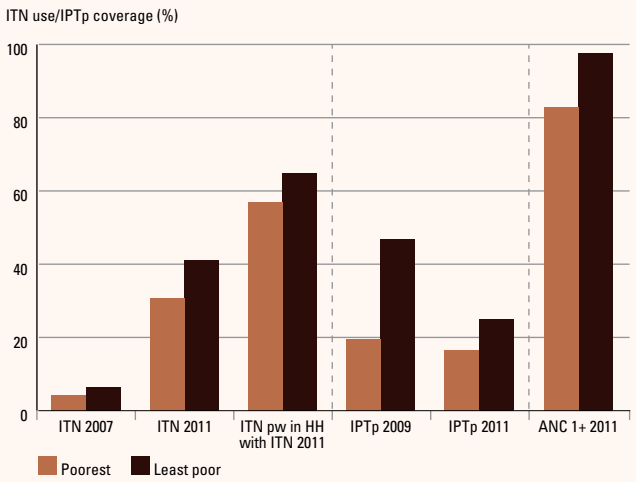
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2003: 2+ doses, 2008 and 2011: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

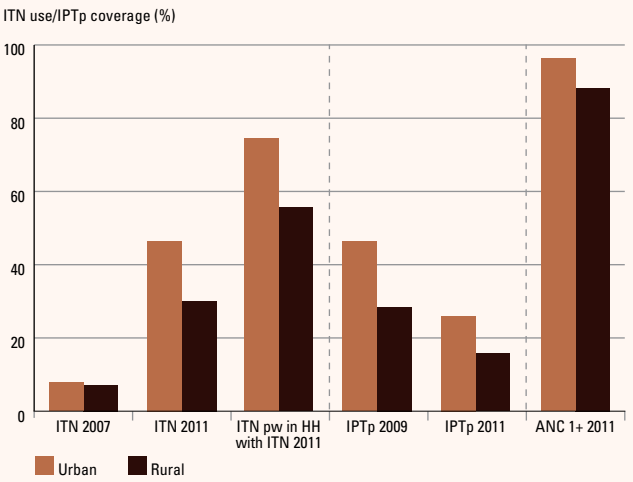
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	1 031 000	2010–2015
Average no of children/woman	5.2	2010–2015
HIV+ women 15+ years	13%	2009
PW ITN and/or IRS	46%	2011

Factors of interest	No or %	Time period/year
ANC 2+ visits	85%	2011
ANC 4+ visits	51%	2011
Start ANC <6 months	60%	2011
Anthelmintics use in PW	28%	2011

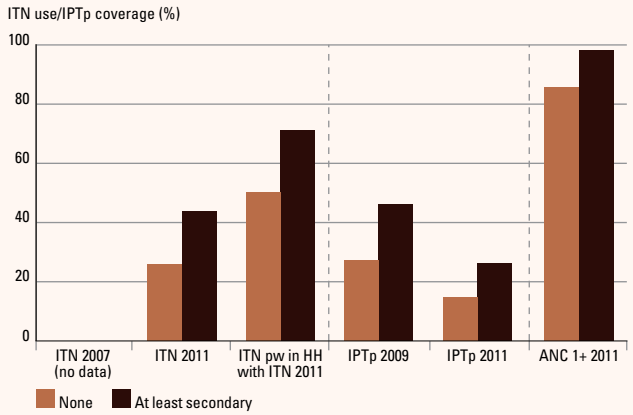
ITN use and IPTp coverage by wealth



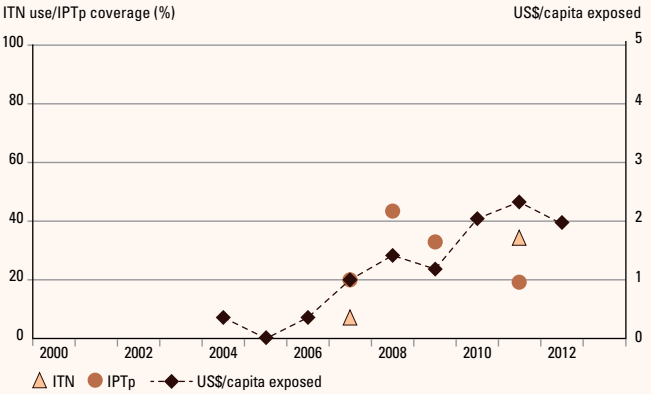
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Namibia

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)								9		26				
IPTp2 ANC (%)								10		5¤				
Any antimalarial (%)*	NA							30		9¤				
ANC (1+ visit, %)	91							95		60¤				
Tetanus (%)†	46							57		NA				
Iron suppl. (%)	NA							80		NA				
PW Hb <11 g/dL (%)	NA							NA		30				
ANC HIV testing (%)‡	NA							57		NA				
Disbursement (millions)§					0.3	1.4	1.9	6.8	0.4	3.8	1.2	1.3	1.2	
Disbursement/capita ($)§					0.2	0.8	1.1	3.8	0.2	2.0	0.6	0.7	0.6	

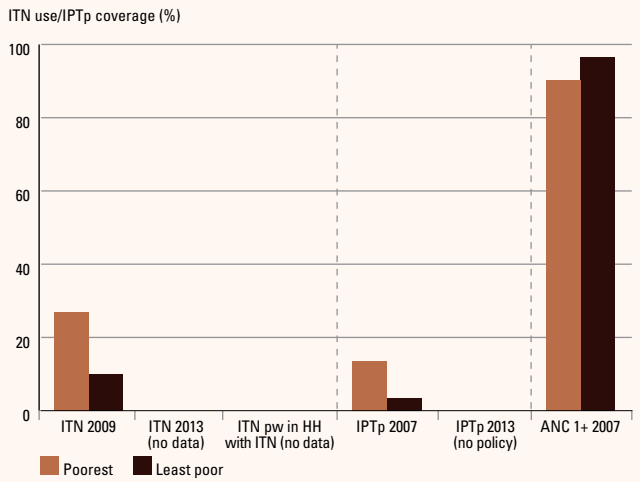
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000: "Given tetanus during pregnancy", 2007: "Protected"; ‡Received HIV counselling, testing and the HIV test result; ¤: Among pregnant women; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

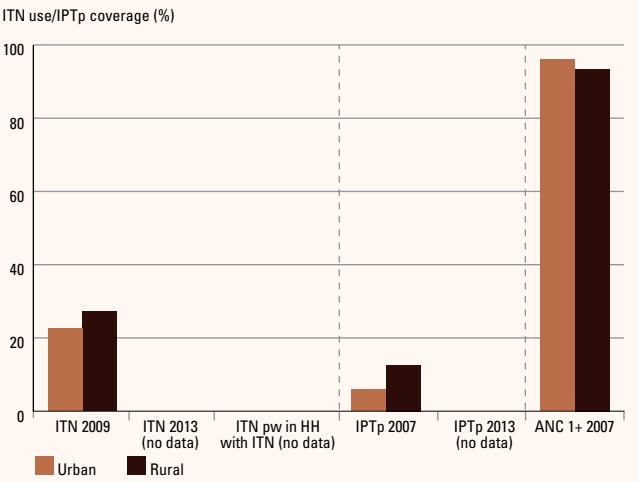
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	52 000	2010–2015
Average no of children/woman	3.1	2010–2015
HIV+ women 15+ years	16%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	84%	2007
ANC 4+ visits	70%	2007
Start ANC <6 months	71%	2007
Anthelmintics use in PW	7%	2007

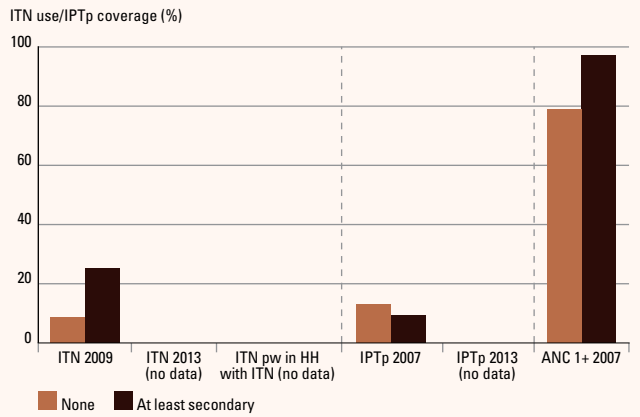
ITN use and IPTp coverage by wealth



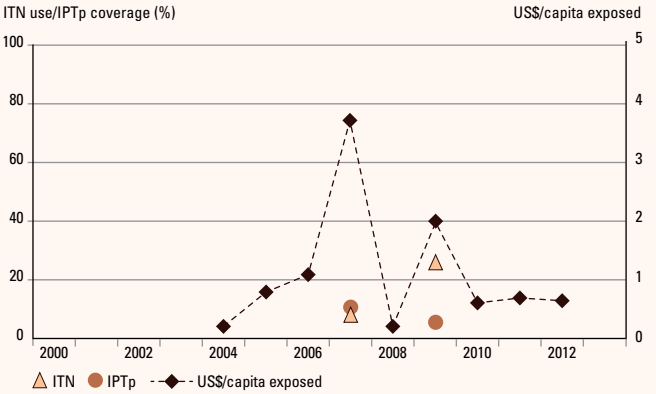
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Niger

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)	NA						7				71		20	
IPTp2 ANC (%)							0				NA		35	
Any antimalarial (%)*	NA						47				NA		NA	
ANC (1+ visit, %)	41						46				NA		83	
Tetanus (%)†	40						23				NA		71	
Iron suppl. (%)	NA						45				NA		81	
PW Hb <11 g/dL (%)	NA						61				NA		59	
ANC HIV testing (%)‡	NA						1				NA		17	
Disbursement (millions)§					2.9	10.2	5.8	3.9	14.7	19.5	9.9	4.4	2.0	
Disbursement/capita ($)§					0.2	0.8	0.4	0.3	1.0	1.3	0.6	0.3	0.1	

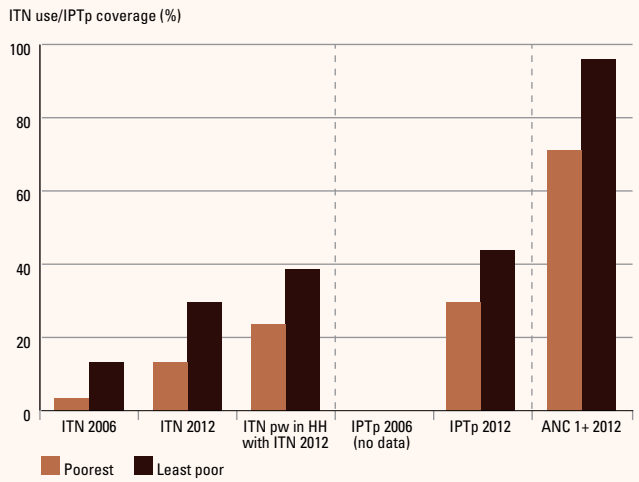
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2006: 2+ doses, 2000 and 2012: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

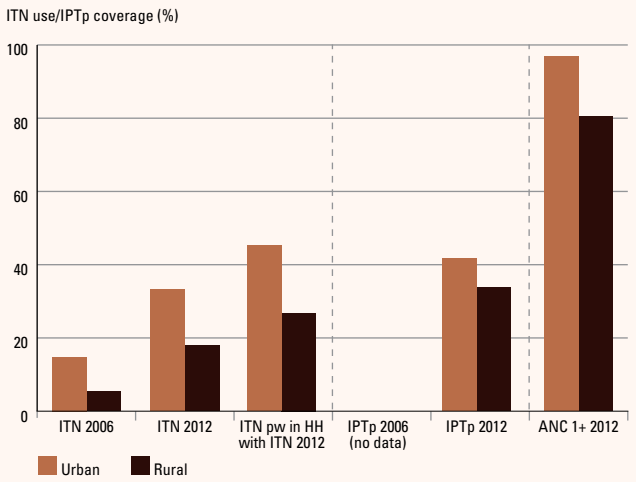
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	910 000	2010–2015
Average no of children/woman	7.6	2010–2015
HIV+ women 15+ years	0%	2012
PW ITN and/or IRS	20%	2012

Factors of interest	No or %	Time period/year
ANC 2+ visits	79%	2012
ANC 4+ visits	33%	2012
Start ANC <6 months	62%	2012
Anthelmintics use in PW	51%	2012

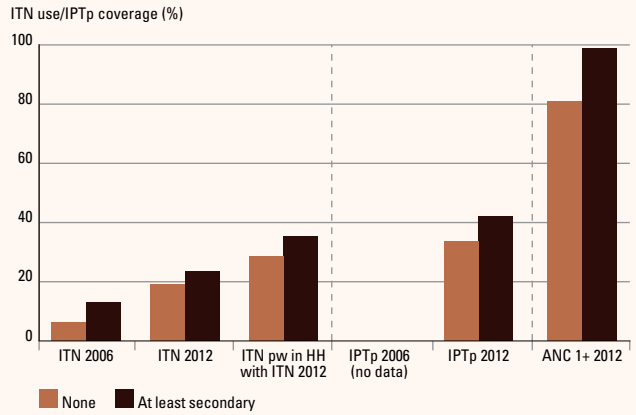
ITN use and IPTp coverage by wealth



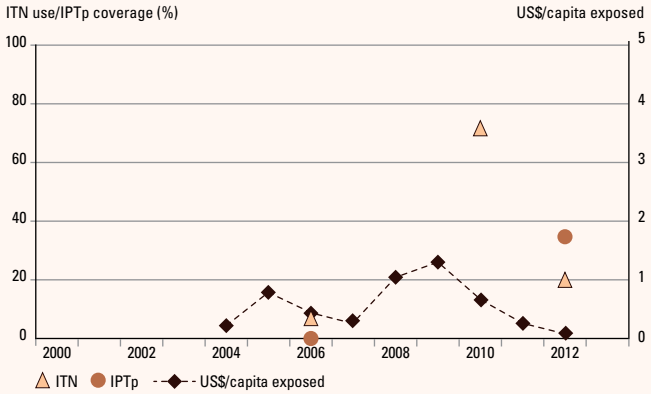
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Nigeria

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)				1				NA	5		34	17		16
IPTp2 ANC (%)								3	5		13	13		15
Any antimalarial (%)*				20				15	18		40	45		49
ANC (1+ visit, %)				60				61	58		57	66		61
Tetanus (%)†				40				51	48		NA	55		53
Iron suppl. (%)				58				NA	54		NA	NA		NA
PW Hb <11 g/dL (%)				NA				NA	NA		NA	NA		NA
ANC HIV testing (%)‡				NA				16	13		NA	28		NA
Disbursement (millions)§					8.8	5.8	13.3	48.2	48.1	318.3	59.3	84.3	199.0	NA
Disbursement/capita ($)§					0.1	0.0	0.1	0.3	0.3	2.1	0.4	0.5	1.2	NA

*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2003: 2+ doses, 2007, 2008, 2011 and 2013: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

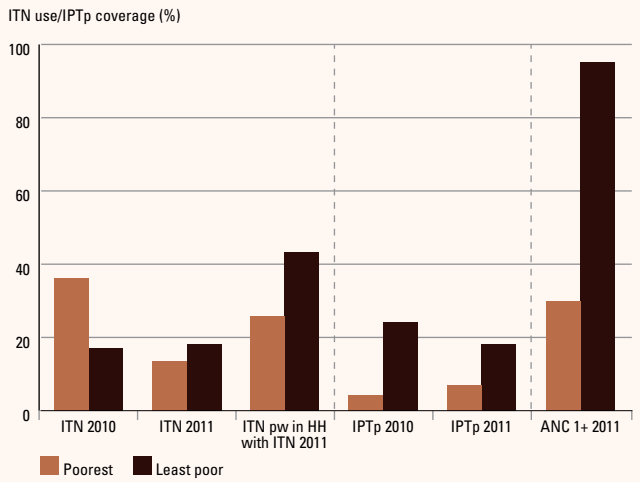
Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	7 339 000	2010–2015
Average no of children/woman	6	2010–2015
HIV+ women 15+ years	4%*	2010
PW ITN and/or IRS	17%	2013

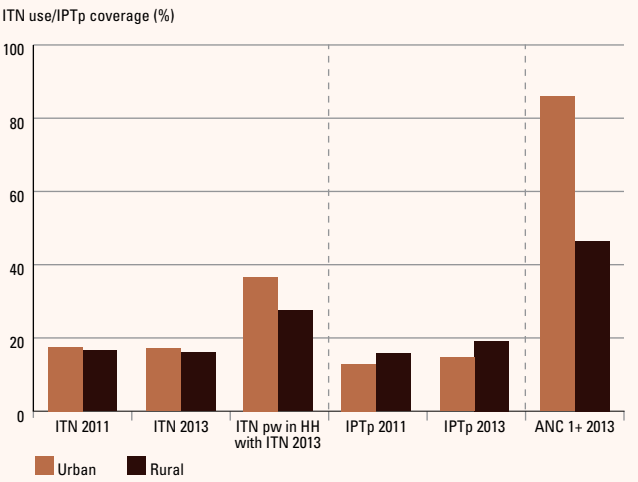
Factors of interest	No or %	Time period/year
ANC 2+ visits	65%	2011
ANC 4+ visits	57%	2011
Start ANC <6 months	45%	2008
Anthelmintics use in PW	10%	2008

* Among pregnant women

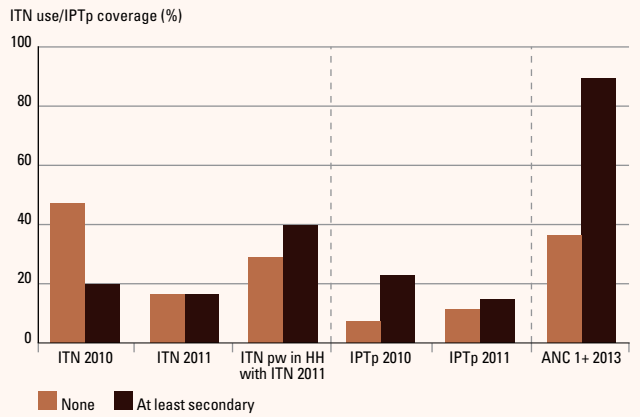
ITN use and IPTp coverage by wealth



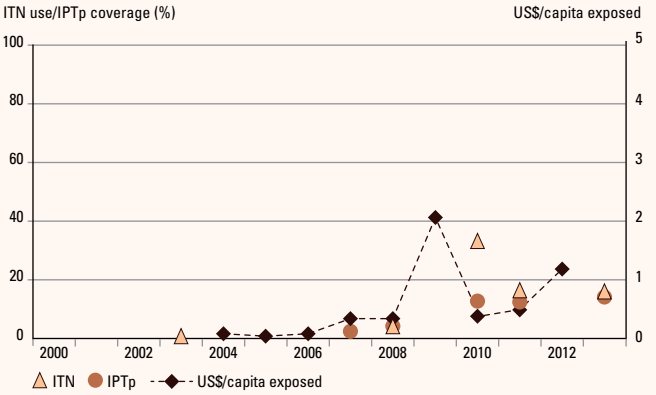
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Rwanda

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)	NA					17			60		72			
IPTp2 ANC (%)						0			17					
Any antimalarial (%)*	8					6			55		13			
ANC (1+ visit, %)	92					94			96		98			
Tetanus (%)†	65					22			72		79			
Iron suppl. (%)	20					28			41		73			
PW Hb <11 g/dL (%)	NA					35			29		19			
ANC HIV testing (%)‡	NA					21			NA		88			
Disbursement (millions)§			0.7	0.0	7.4	4.4	32.6	3.7	37.3	62.6	33.2	34.1	41.3	NA
Disbursement/capita ($)§			0.1	0.0	1.5	0.8	6.1	0.7	6.6	10.7	5.5	5.4	6.4	NA

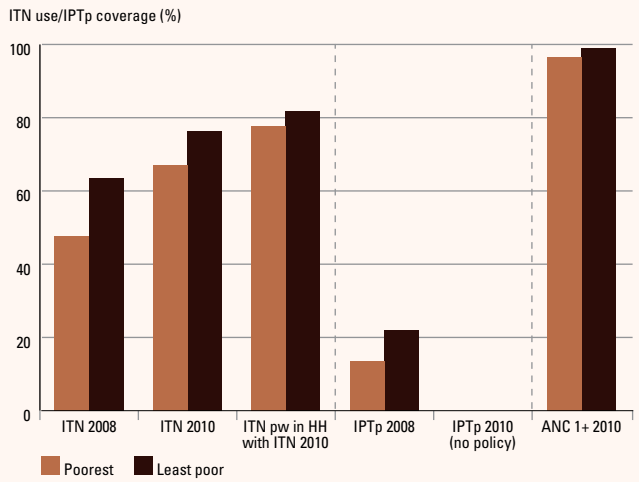
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000: "Received tetanus", 2005: 2+ doses, 2008 and 2010: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

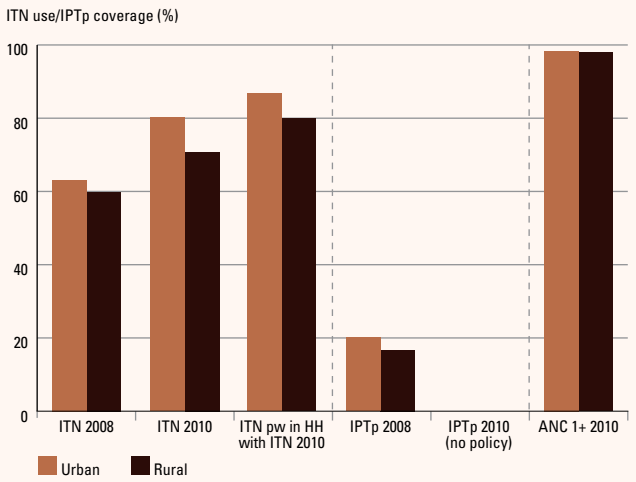
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	240 000	2010–2015
Average no of children/woman	4.6	2010–2015
HIV+ women 15+ years	4%	2010
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	94%	2010
ANC 4+ visits	35%	2010
Start ANC <6 months	76%	2010
Anthelmintics use in PW	39%	2010

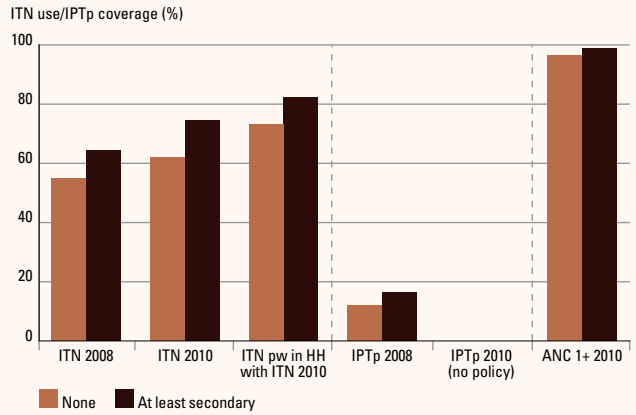
ITN use and IPTp coverage by wealth



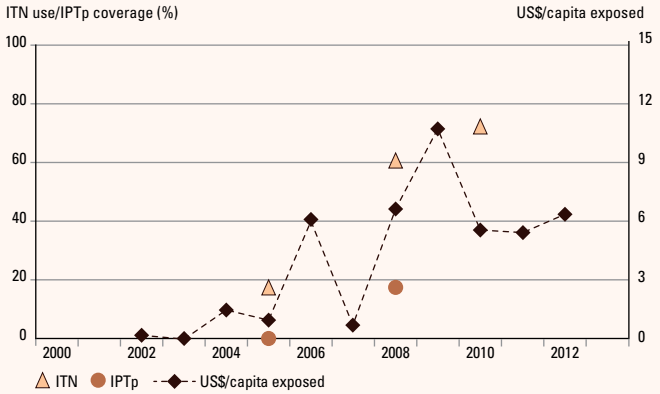
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Sao Tome and Principe

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							NA		57					
IPTp2 ANC (%)							NA		60					
Any antimalarial (%)*	NA						90		88					
ANC (1+ visit, %)	91						97		98					
Tetanus (%)†	64						87		81					
Iron suppl. (%)	NA						NA		91					
PW Hb <11 g/dL (%)	NA						NA		56					
ANC HIV testing (%)‡	NA						54		63					
Disbursement (millions)§						1.1	1.1	0.5	2.5	0.0	1.1	2.1	0.1	
Disbursement/capita ($)§						7.6	7.2	3.3	16.4	0.1	6.7	11.9	0.3	

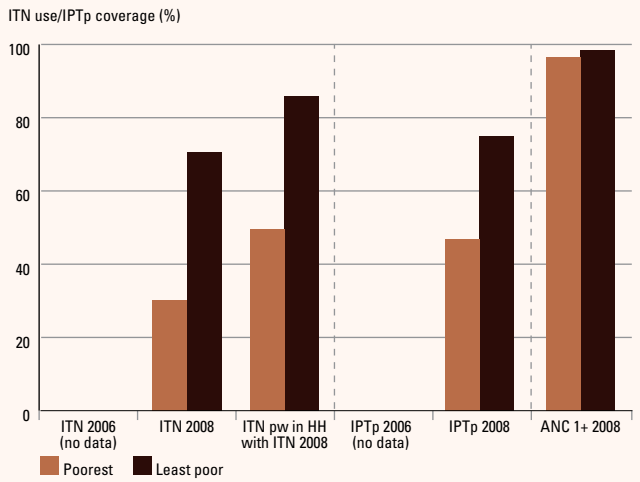
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000, 2006 and 2008: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

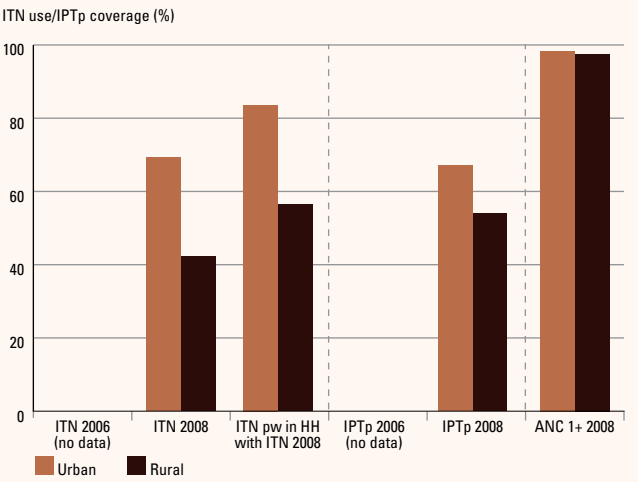
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	7 000	2010–2015
Average no of children/woman	4.1	2010–2015
HIV+ women 15+ years	NA	
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	87%	2008
ANC 4+ visits	72%	2008
Start ANC <6 months	82%	2008
Anthelmintics use in PW	52%	2008

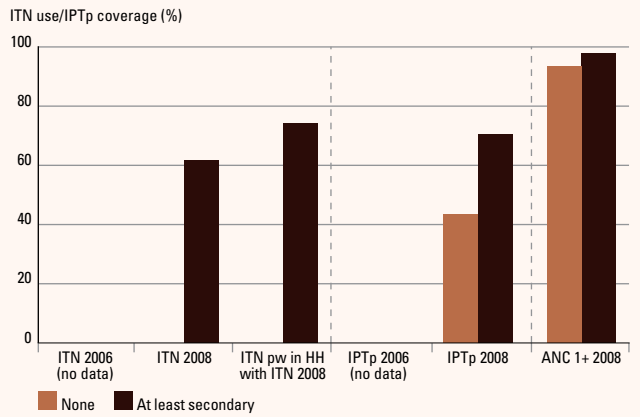
ITN use and IPTp coverage by wealth



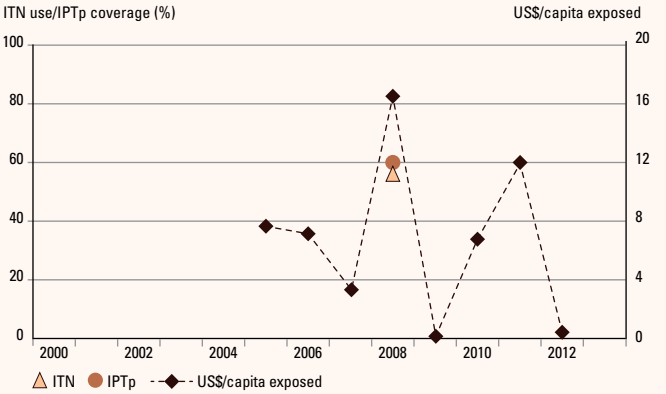
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Senegal

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)	NA					8	17		28		37			43
IPTp2 ANC (%)						9	49		52		39			41
Any antimalarial (%)*	NA					83	87		82		88			88
ANC (1+ visit, %)	79					87	NA		NA		93			94
Tetanus (%)†	75					66	NA		NA		69			82
Iron suppl. (%)	NA					90	NA		NA		94			93
PW Hb <11 g/dL (%)	NA					70	NA		NA		61			NA
ANC HIV testing (%)‡	NA					NA	NA		NA		19			NA
Disbursement (millions)§			0.2	0.9	1.7	11.3	9.6	1.9	26.8	27.1	17.5	15.9	54.8	NA
Disbursement/capita ($)§			0.0	0.1	0.2	1.0	0.9	0.2	2.3	2.2	1.4	1.2	4.0	NA

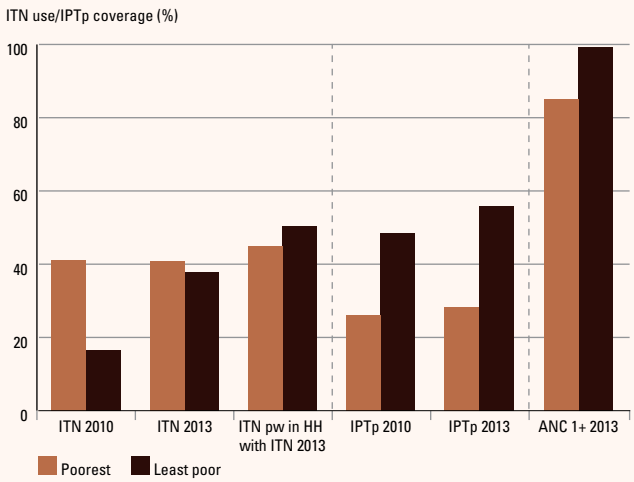
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2005: 2+ doses, 2000, 2010 and 2013: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

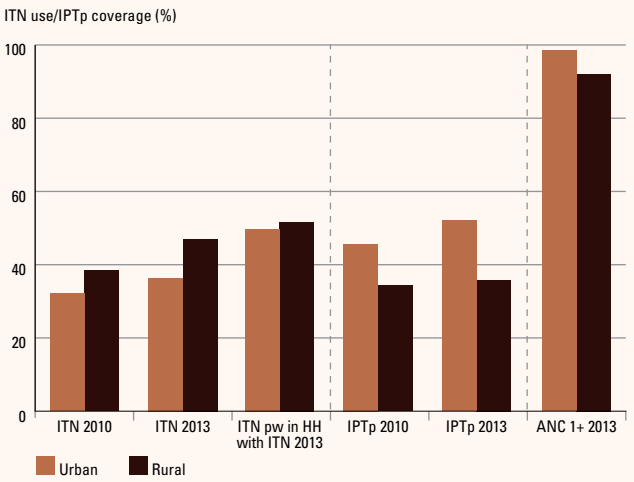
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	545 000	2010–2015
Average no of children/woman	5.0	2010–2015
HIV+ women 15+ years	1%	2010
PW ITN and/or IRS	50%	2013

Factors of interest	No or %	Time period/year
ANC 2+ visits	90%	2010
ANC 4+ visits	50%	2010
Start ANC <6 months	85%	2010
Anthelmintics use in PW	25%	2010

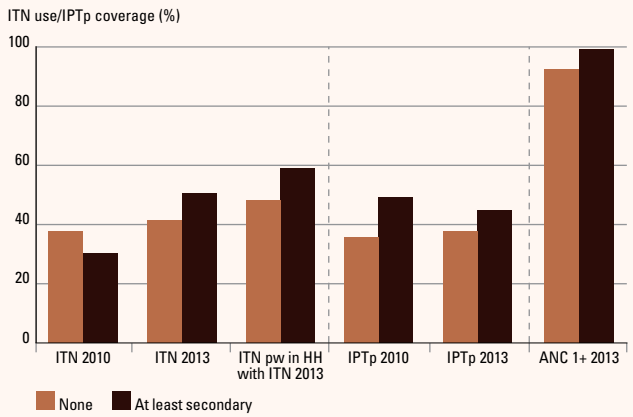
ITN use and IPTp coverage by wealth



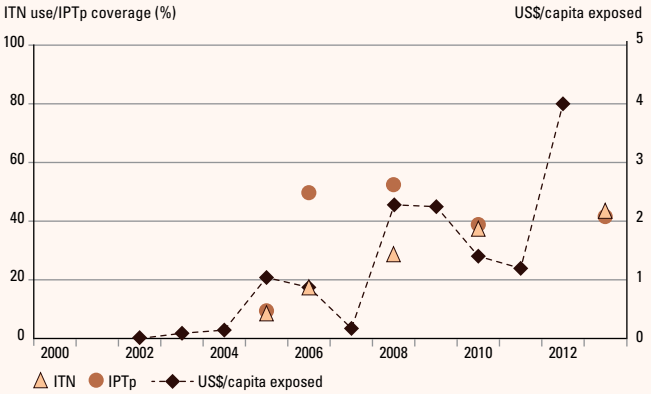
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Sierra Leone

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)						NA			27		27			53
IPTp2 ANC (%)						2			10		38			45
Any antimalarial (%)*	NA					6			34		73			83
ANC (1+ visit, %)	68					81			87		93			97
Tetanus (%)†	57					78			79		87			90
Iron suppl. (%)	NA					NA			79		NA			NA
PW Hb <11 g/dL (%)	NA					NA			62		NA			NA
ANC HIV testing (%)‡	NA					5			8		23			NA
Disbursement (millions)§						2.0	4.0	3.7	6.0	4.9	8.5	13.9	3.3	NA
Disbursement/capita ($)§						0.4	0.8	0.5	1.1	0.8	1.4	2.4	0.5	NA

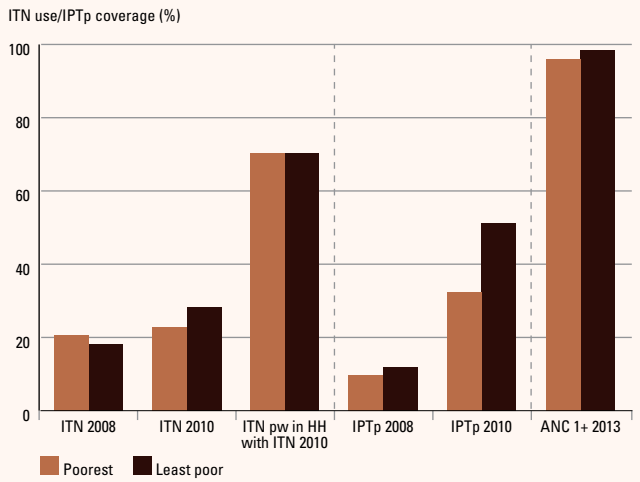
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000, 2005, 2008, 2010 and 2013: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

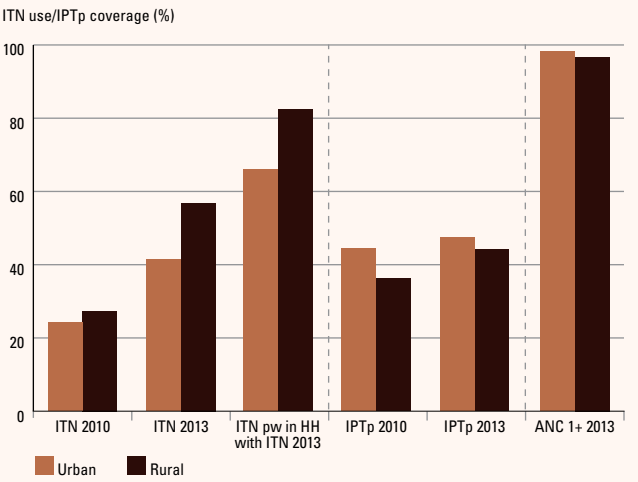
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	231 000	2010–2015
Average no of children/woman	4.7	2010–2015
HIV+ women 15+ years	2%	2012
PW ITN and/or IRS	55%	2013

Factors of interest	No or %	Time period/year
ANC 2+ visits	86%	2010
ANC 4+ visits	75%	2010
Start ANC <6 months	71%	2008
Anthelmintics use in PW	44%	2008

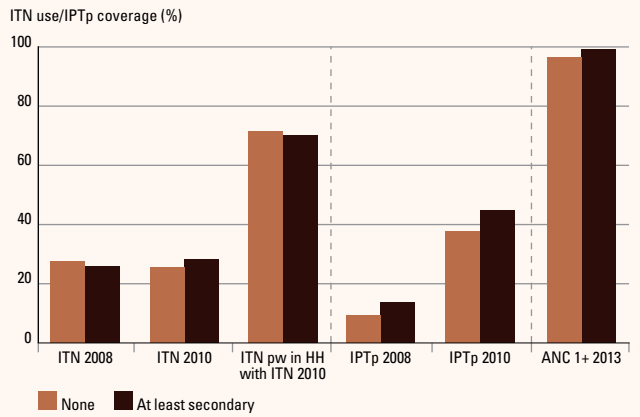
ITN use and IPTp coverage by wealth



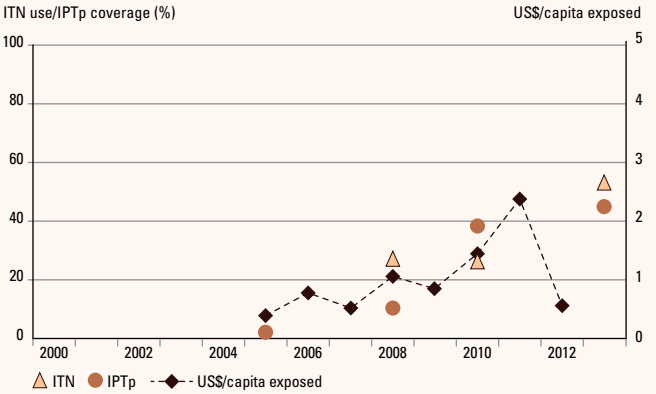
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Somalia

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							2					21		
IPTp2 ANC (%)							1					0		
Any antimalarial (%)*							6					3		
ANC (1+ visit, %)							26					28		
Tetanus (%)†							26					31		
Iron suppl. (%)							NA					NA		
PW Hb <11 g/dL (%)							NA					NA		
ANC HIV testing (%)‡							NA					2		
Disbursement (millions)§					4.7	3.9	4.3	7.3	3.9	1.2	5.2	2.6	22.1	
Disbursement/capita ($)§					0.6	0.5	0.5	0.8	0.4	0.1	0.6	0.3	2.2	

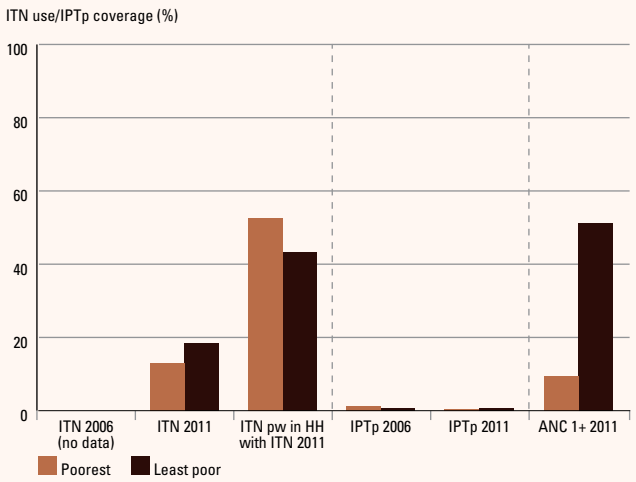
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2006 and 2011: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

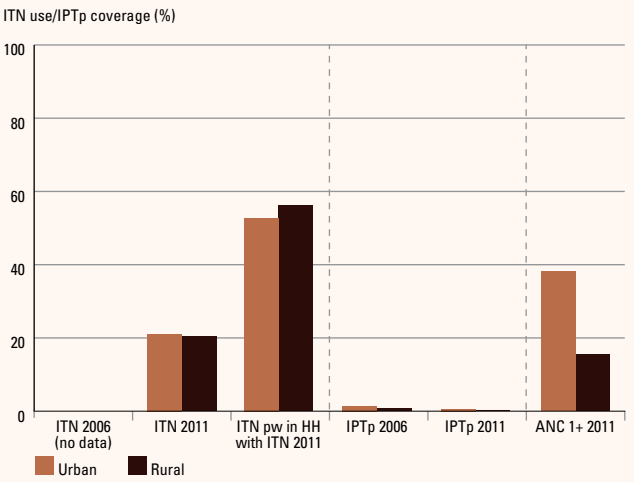
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	477 000	2010–2015
Average no of children/woman	6.6	2010–2015
HIV+ women 15+ years	0%	2013
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	28%	2011
ANC 4+ visits	9%	2011
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

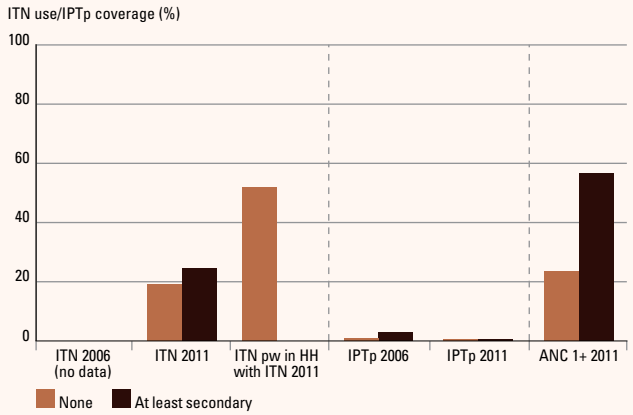
ITN use and IPTp coverage by wealth



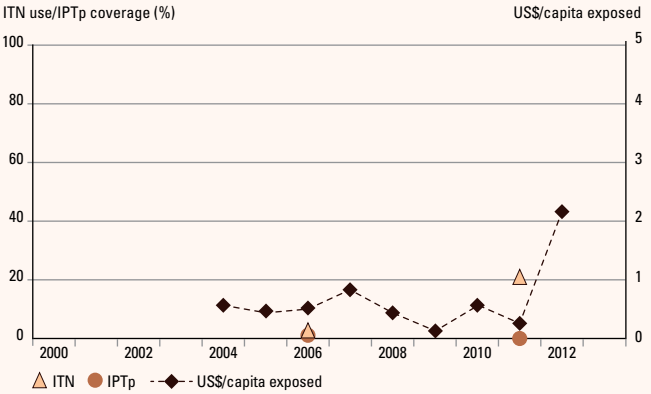
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



South Sudan

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)										36				
IPTp2 ANC (%)										13				
Any antimalarial (%)*										44				
ANC (1+ visit, %)										55				
Tetanus (%)										NA				
Iron suppl. (%)										NA				
PW Hb <11 g/dL (%)										46				
ANC HIV testing (%)										NA				
Disbursement (millions)§												26.8	29.3	
Disbursement/capita ($)§												2.6	2.7	

*Use of any antimalarial for prevention of malaria in pregnancy; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	423 000	2010–2015
Average no of children/woman	5.0	2010–2015
HIV+ women 15+ years	NA	
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	NA	
ANC 4+ visits	NA	
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

ITN use and IPTp coverage by wealth

No data

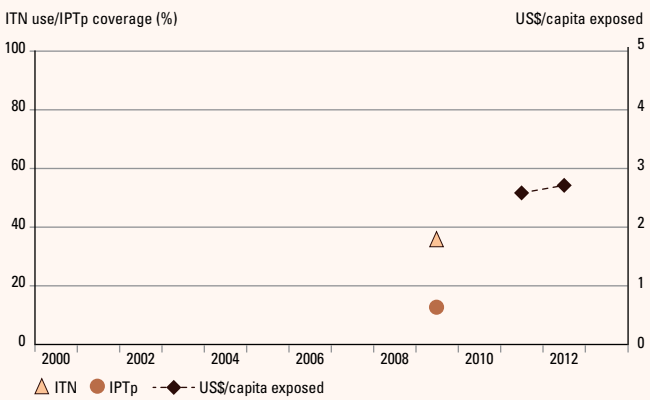
ITN use and IPTp coverage by residence

No data

ITN use and IPTp coverage by level of education

No data

ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Sudan

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)						13				17				
IPTp2 ANC (%)						1¤				2¤				
Any antimalarial (%)*						10					NA			
ANC (1+ visit, %)						73					74			
Tetanus (%)†						NA					55			
Iron suppl. (%)						NA					NA			
PW Hb <11 g/dL (%)						NA					NA			
ANC HIV testing (%)						NA					NA			
Disbursement (millions)§					4.9	11.4	7.9	17.8	44.1	13.3	33.1	15.1	51.9	
Disbursement/capita ($)§												0.4	1.4	

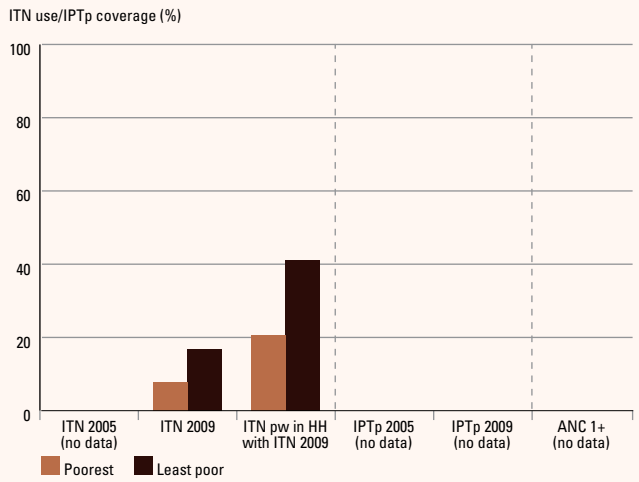
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2010: "Protected"; ¤: Study population included pregnant women; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

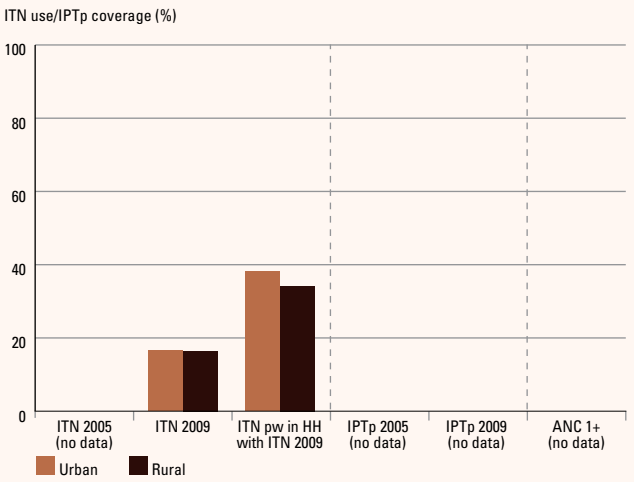
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	1 340 000	2010–2015
Average no of children/woman	4.5	2010–2015
HIV+ women 15+ years	NA	
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	NA	
ANC 4+ visits	NA	
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

ITN use and IPTp coverage by wealth



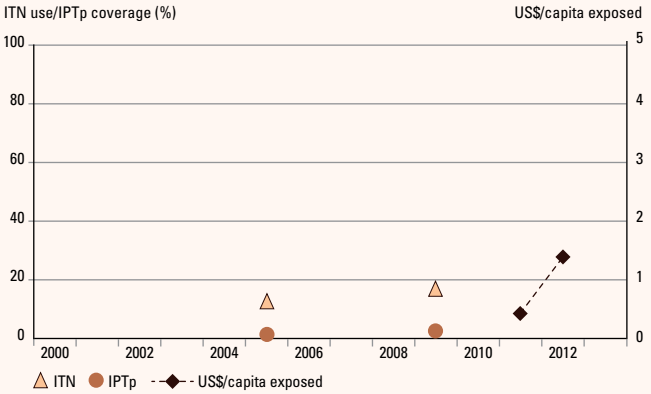
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education

No data

ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Swaziland

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							1				4	2		
IPTp2 ANC (%)														
Any antimalarial (%)*	NA						7				NA	10		
ANC (1+ visit, %)	87						97				NA	97		
Tetanus (%)†	80						75				NA	79		
Iron suppl. (%)	NA						88				NA	NA		
PW Hb <11 g/dL (%)	NA						40				NA	NA		
ANC HIV testing (%)‡	NA						42				NA	77		
Disbursement (millions)§				0.4	0.0	0.2	0.4	0.1	0.3	2.6	1.4	0.0	1.1	
Disbursement/capita ($)§				1.5	0.0	0.9	1.5	0.5	1.1	9.7	5.1	0.0	4.0	

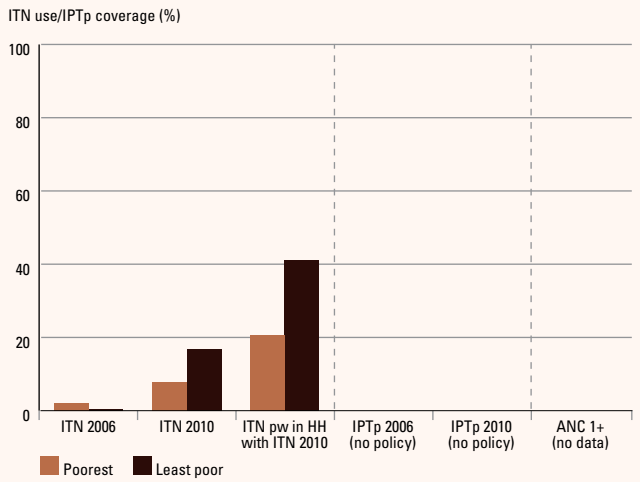
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000, 2006 and 2011: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

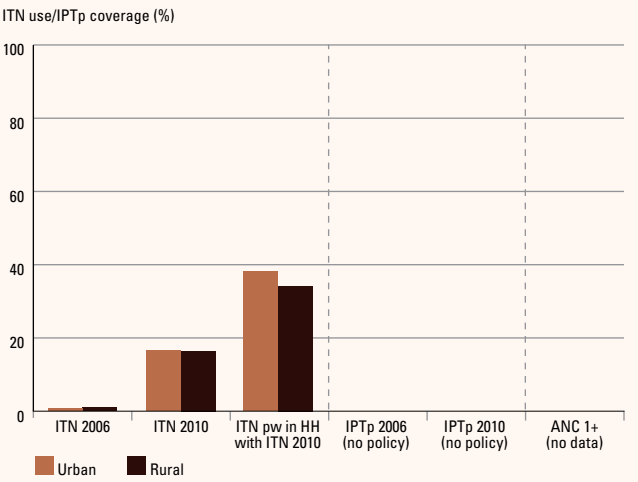
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	9 000	2010–2015
Average no of children/woman	3.4	2010–2015
HIV+ women 15+ years	28%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	95%	2010
ANC 4+ visits	77%	2010
Start ANC <6 months	73%	2006
Anthelmintics use in PW	10%	2006

ITN use and IPTp coverage by wealth



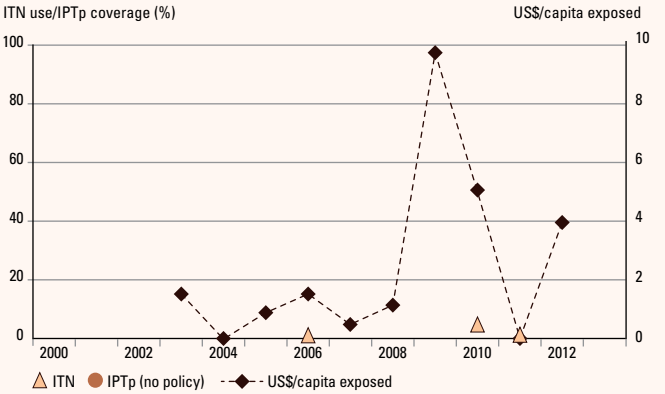
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education

No data

ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Togo

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							NA				46			
IPTp2 ANC (%)							18				36			
Any antimalarial (%)*	NA						78				64			
ANC (1+ visit, %)	73						84				72			
Tetanus (%)†	94						71				67			
Iron suppl. (%)	NA						NA				NA			
PW Hb <11 g/dL (%)	NA						NA				NA			
ANC HIV testing (%)‡	NA						8				36			
Disbursement (millions)§					2.1	4.4	0.6	5.2	5.0	0.3	8.5	21.0	1.1	
Disbursement/capita ($)§					0.4	0.8	0.1	0.9	0.9	0.0	1.4	3.2	0.2	

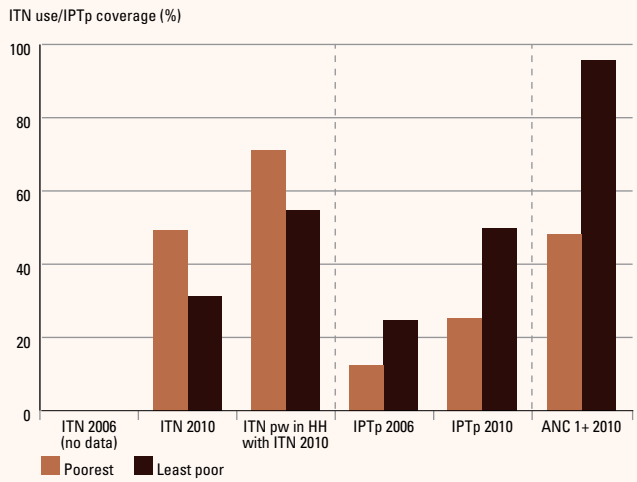
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000, 2006 and 2010: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

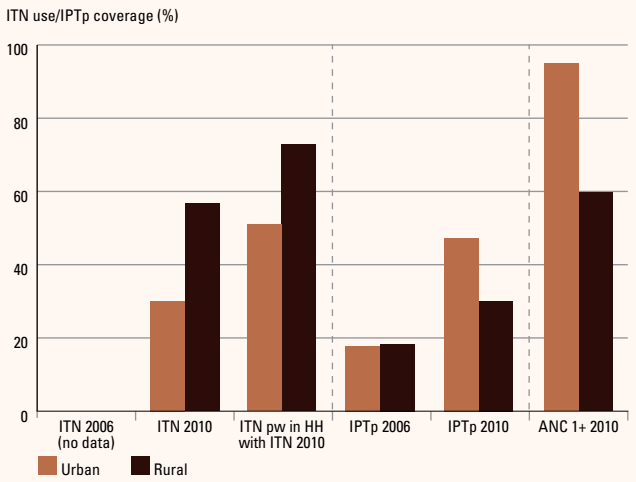
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	254 000	2010–2015
Average no of children/woman	4.7	2010–2015
HIV+ women 15+ years	3%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	65%	2010
ANC 4+ visits	38%	2010
Start ANC <6 months	NA	
Anthelmintics use in PW	NA	

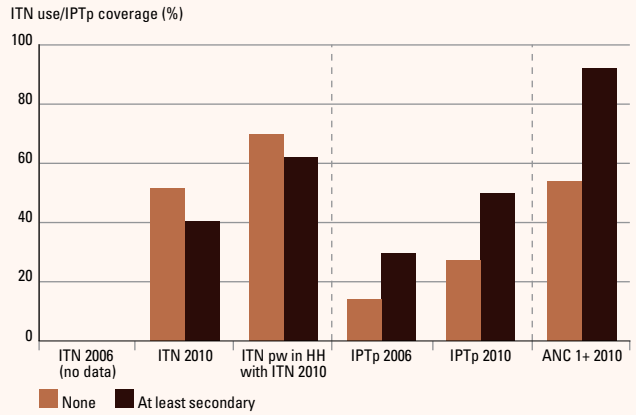
ITN use and IPTp coverage by wealth



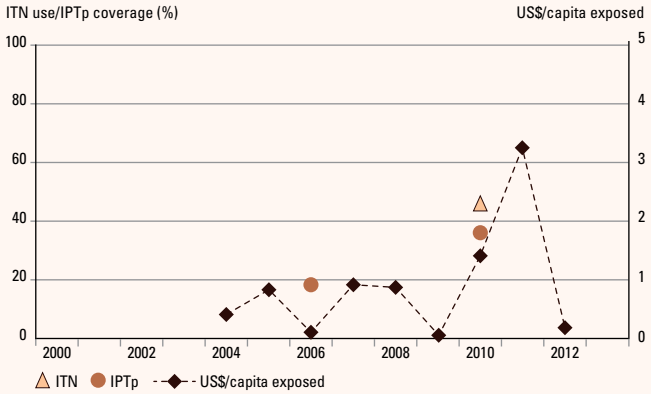
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Uganda

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)							10			44		47		
IPTp2 ANC (%)	NA						16			32		24		
Any antimalarial (%)*	32						45			64		67		
ANC (1+ visit, %)	92						93			95		95		
Tetanus (%)†	42						76			NA		84		
Iron suppl. (%)	51						63			NA		75		
PW Hb <11 g/dL (%)	41						64			NA		31		
ANC HIV testing (%)‡	NA						17			NA		60		
Disbursement (millions)§					9.7	31.1	27.7	11.8	25.2	54.4	54.8	45.4	140.3	
Disbursement/capita ($)§					0.4	1.2	1.0	0.4	0.9	1.8	176.0	1.4	4.1	

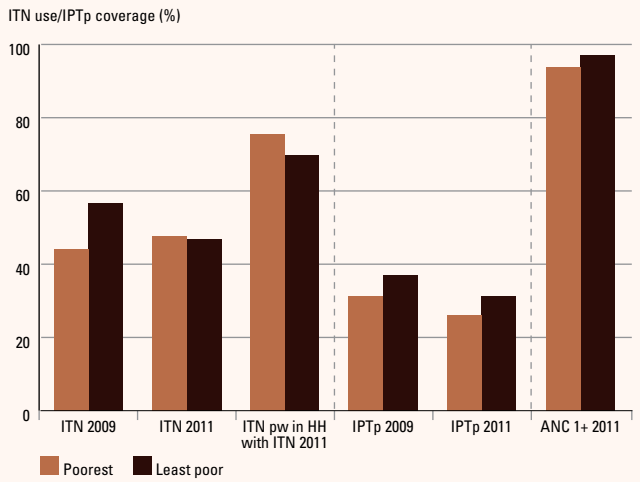
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2000: 2+ doses, 2006 and 2011: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

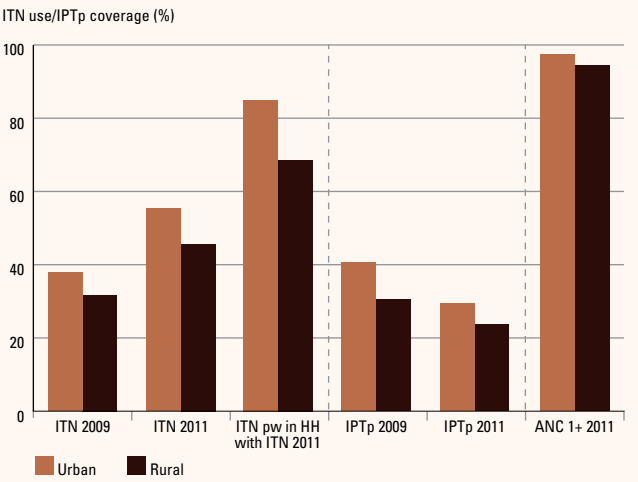
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	1 553 000	2010–2015
Average no of children/woman	5.9	2010–2015
HIV+ women 15+ years	8%	2011
PW ITN and/or IRS	50%	2011

Factors of interest	No or %	Time period/year
ANC 2+ visits	90%	2011
ANC 4+ visits	48%	2011
Start ANC <6 months	65%	2011
Anthelmintics use in PW	50%	2011

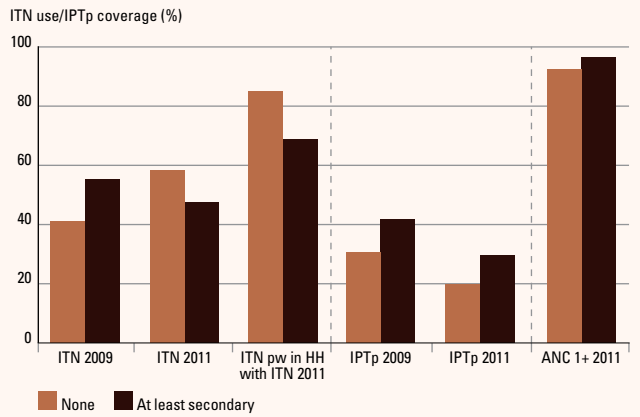
ITN use and IPTp coverage by wealth



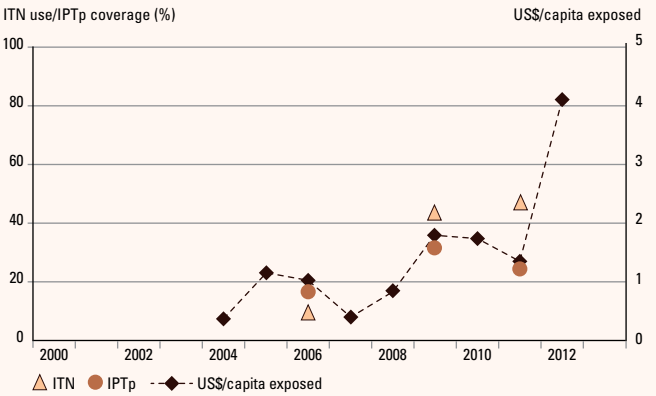
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



United Republic of Tanzania

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)						18			27		57		75	
IPTp2 ANC (%)						22			30		26		32	
Any antimalarial (%)*						58			59		66		63	
ANC (1+ visit, %)						94			97		96		96	
Tetanus (%)†						56			NA		88		NA	
Iron suppl. (%)						61			NA		59		NA	
PW Hb <11 g/dL (%)						58			NA		53		NA	
ANC HIV testing (%)‡						8			30		55		52	
Disbursement (millions)§				0.6	8.5	22.2	25.4	31.1	85,4	96.4	95.9	86.8	67.2	
Disbursement/capita ($)§				0.0	0.2	0.6	0.7	0.8	2.1	2.3	2.2	1.9	1.5	

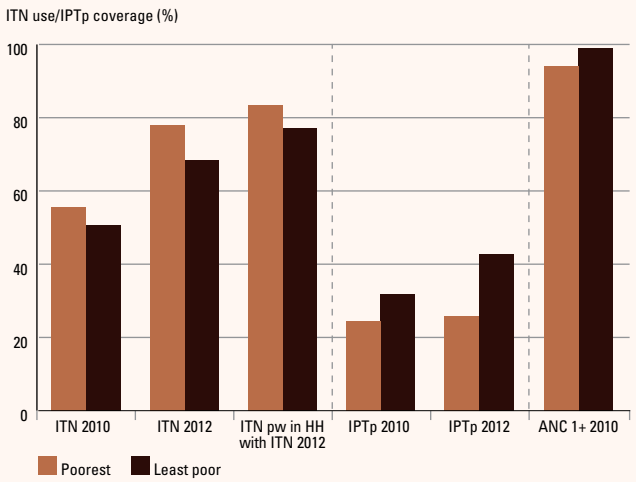
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2005: 2+ doses, 2010: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

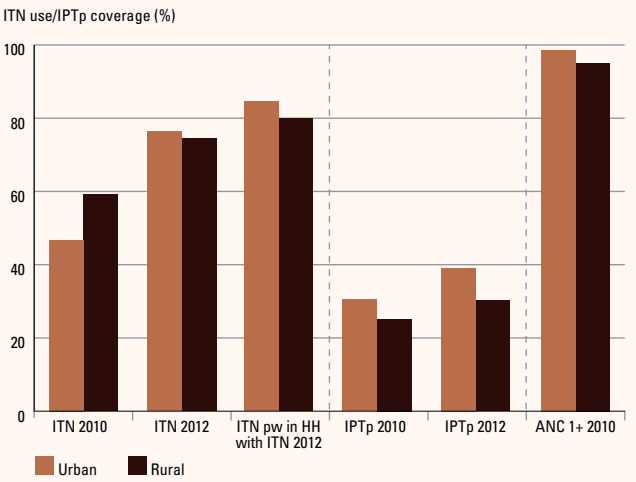
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	1 895 000	2010–2015
Average no of children/woman	5.2	2010–2015
HIV+ women 15+ years	6%	2012
PW ITN and/or IRS	79%	2012

Factors of interest	No or %	Time period/year
ANC 2+ visits	92%	2010
ANC 4+ visits	43%	2010
Start ANC <6 months	65%	2010
Anthelmintics use in PW	NA	

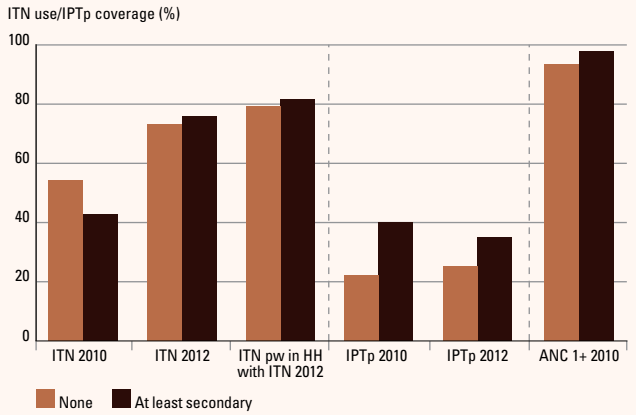
ITN use and IPTp coverage by wealth



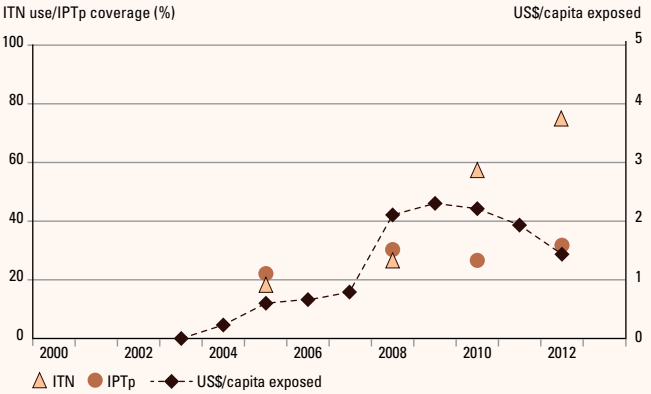
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Zambia

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)			8				22	33	43		46		58	
IPTp2 ANC (%)			NA				59	62	60		69		70	
Any antimalarial (%)*			36				77	87	88		89		88	
ANC (1+ visit, %)			93				NA	94	NA		NA		NA	
Tetanus (%)†			27				NA	81	NA		NA		NA	
Iron suppl. (%)			71				NA	90	NA		NA		NA	
PW Hb <11 g/dL (%)			NA				NA	NA	NA		NA		NA	
ANC HIV testing (%)‡			NA				NA	37	NA		NA		NA	
Disbursement (millions)§				4.9	11.9	10.1	6.3	28.2	27.3	24.9	20.5	40.3	55.8	
Disbursement/capita ($)§				0.4	1.1	0.9	0.5	2.3	2.2	2.0	1.6	2.9	3.9	

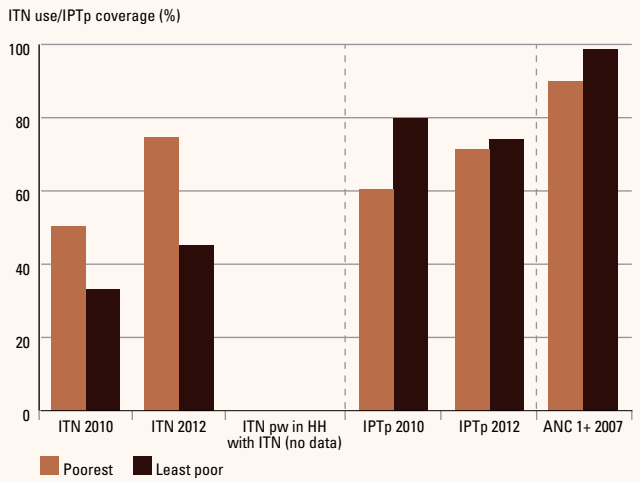
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2002: 2+ doses, 2007: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

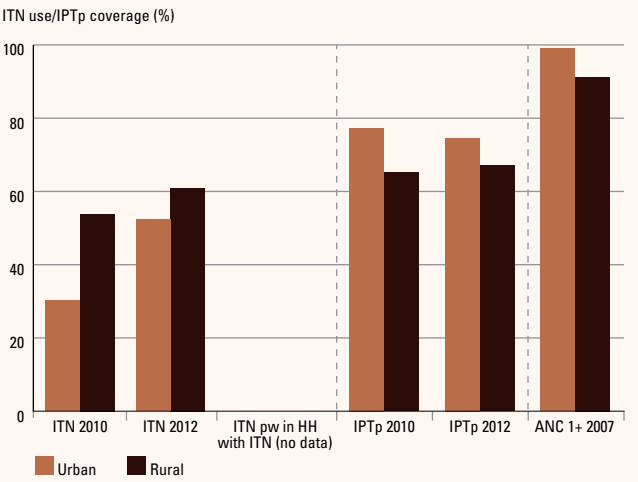
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	637 000	2010–2015
Average no of children/woman	5.7	2010–2015
HIV+ women 15+ years	13%	2012
PW ITN and/or IRS	NA	

Factors of interest	No or %	Time period/year
ANC 2+ visits	94%	2007
ANC 4+ visits	60%	2007
Start ANC <6 months	73%	2007
Anthelmintics use in PW	36%	2007

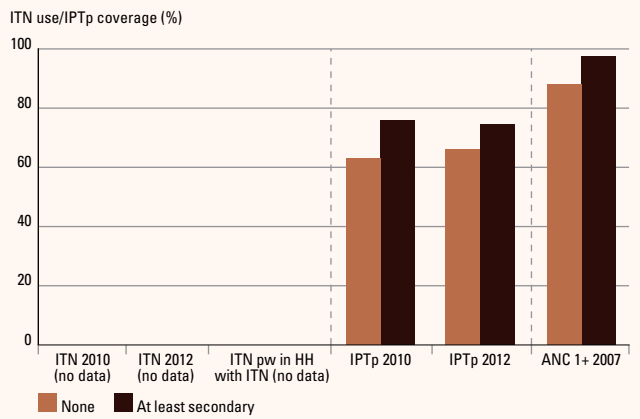
ITN use and IPTp coverage by wealth



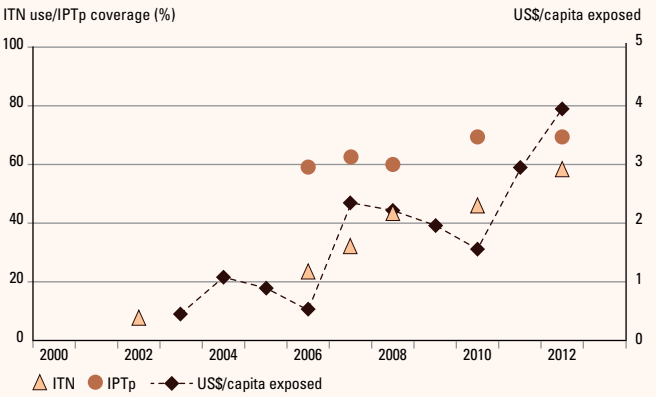
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed



Zimbabwe

Timeline

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ITN use (%)						3			6	NA	10			
IPTp2 ANC (%)						6			NA	14	7			
Any antimalarial (%)*						38			NA	36	25			
ANC (1+ visit, %)						94			NA	88	90			
Tetanus (%)†						58			NA	64	54			
Iron suppl. (%)						43			NA	NA	49			
PW Hb <11 g/dL (%)						47			NA	NA	32			
ANC HIV testing (%)‡						23			NA	53	59			
Disbursement (millions)§				1.4	0.0	3.9	0.7	10.1	0.1	1.8	21.0	26.5	51.1	
Disbursement/capita ($)§				0.2	0.0	0.5	0.1	1.4	0.0	0.3	3.0	3.5	6.6	

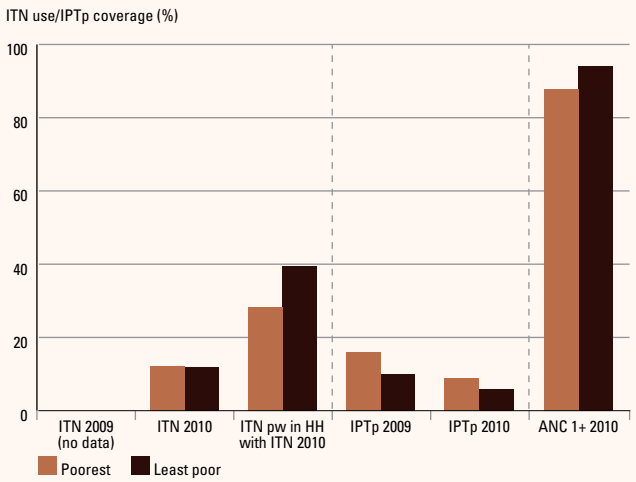
*Use of any antimalarial for prevention of malaria in pregnancy; †Tetanus 2005, 2009 and 2010: "Protected"; ‡Received HIV counselling, testing and the HIV test result; § Disbursement of external funds for malaria control (in US$) per malaria exposed person in a country.

Abbreviations: Hb: haemoglobin; HH: household; IPTp2: IPTp from ANC, at least 2 doses; NA: not available; PW: pregnant women; Suppl: supplementation.

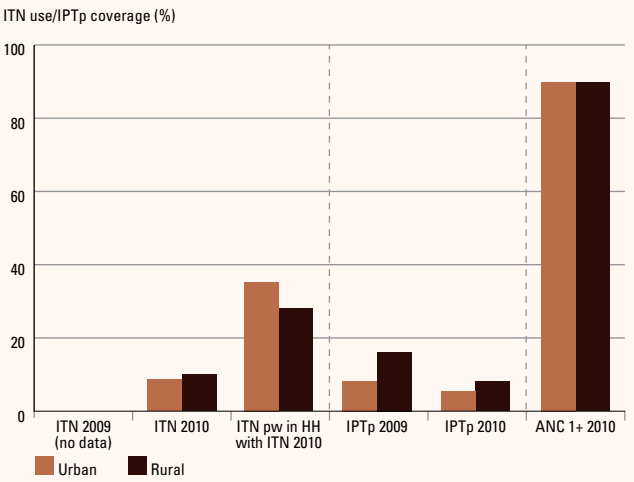
Factors of interest	No or %	Time period/year
Annual number of malaria exposed births	250 000	2010–2015
Average no of children/woman	3.5	2010–2015
HIV+ women 15+ years	18%	2010
PW ITN and/or IRS	23%	2010

Factors of interest	No or %	Time period/year
ANC 2+ visits	86%	2010
ANC 4+ visits	65%	2010
Start ANC <6 months	59%	2010
Anthelmintics use in PW	2%	2010

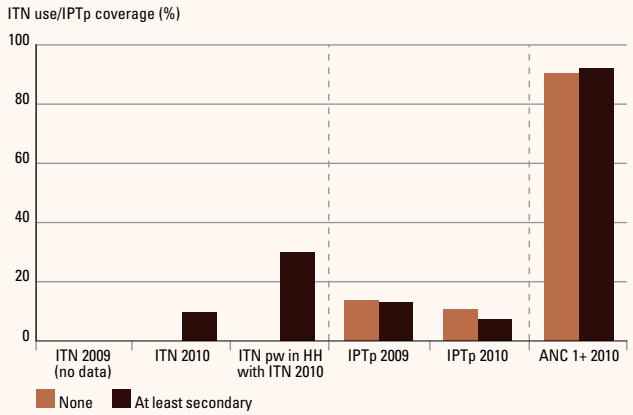
ITN use and IPTp coverage by wealth



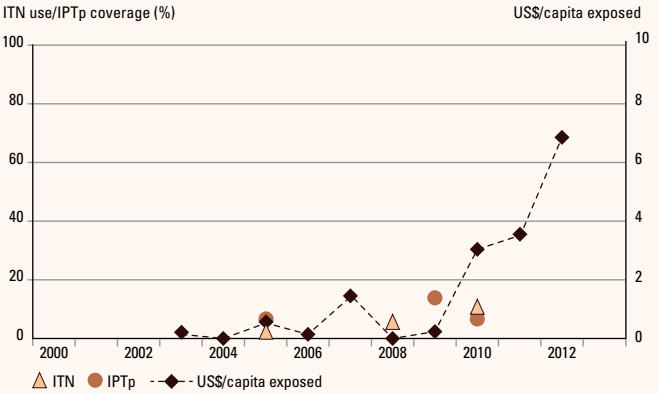
ITN use and IPTp coverage by residence



ITN use and IPTp coverage by level of education



ITN use/IPTp coverage and disbursement for malaria control per capita malaria exposed




du verre de lait
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GLOSSARY

A

Abortion
Abortion is the premature exit of the products of conception (the fetus, fetal membranes, and placenta) from the uterus. It is the loss of a pregnancy and does not refer to why that pregnancy was lost.

ACT
Artemisinin-based combination therapy: a combination of artemisinin or one of its derivatives with an antimalarial or antimalarial drugs of a different class. Artemisinin derivatives are not recommended in the first trimester of pregnancy.

Amodiaquine
Antimalarial. Safe to use in second and third trimesters of pregnancy.

Anaemia
A reduction in the number of circulating red blood cells or in the quantity of haemoglobin. In pregnancy usually defined as <11 g/dL.

Antibody
Also known as an immunoglobulin (Ig): it is a large Y-shaped protein produced by B-cells that is used by the immune system to identify and neutralize foreign objects such as bacteria, viruses, and parasites.

Antigen
Substance that prompts the generation of antibodies and can cause an immune response; used in vaccines.

Antimalarial
Drug directed against malaria.

Artemether-lumefantrine
Fixed combination drug of artemether-lumefantrine for the treatment of malaria. Most common tradenames: Coartem and Riamet. Can be used in the second and third trimesters of pregnancy. Can only be used in first trimester if the risks associated with treatment outweigh the risks of malaria for the fetus and mother.

Artemisinin derivatives
Group of antimalarials derived from the Artemisia annua tree (annual wormwood). These include artesunate, artemether, dihydroartemisinin, artelinic acid, artenimol and artemotil. They can be used only as part of combination therapies. They can be used in the second and third trimesters of pregnancy.

Atovaquone-proguanil
Fixed drug combination antimalarial of atovaquone and proguanil; used for treatment and prevention of malaria. Most common tradename: Malarone. Can be used in second and third trimesters of pregnancy.

B

Burden
The impact of malaria on morbidity and mortality.

C

Chemoprophylaxis
The use of antimalarial drugs at regular intervals (daily, weekly) to prevent disease from infection with malarial parasites.

Chloroquine

An antimalarial drug that has been used extensively for the treatment and prevention of malaria; widespread resistance has now rendered it ineffective against *P. falciparum,* but it still maintains considerable efficacy for the treatment of *P. vivax, P. ovale,* and *P. malariae* infections. Chloroquine can be used in all trimesters of pregnancy.

Congenital malaria

Malaria in a newborn or infant, transmitted from the mother via the placenta.

E

Elimination

The interruption of local mosquito-borne malaria transmission; reduction to zero of the incidence of locally transmitted infection caused by *Plasmodia* in a defined geographical area as a result of deliberate malaria control efforts. Continued intervention measures are required to prevent reintroduction.

F

Fetus

The unborn offspring from the end of the eighth week after conception (when the major structures have formed) until birth. Up until the eighth week, the developing offspring is called an embryo.

Fever

Although a fever technically is any body temperature above the normal 37 degrees Celsius, in practice a person is usually not considered to have a significant fever until the temperature is 37.5 or 38 degrees Celsius.

G

Gestational age

Relates to the age of an embryo or fetus (or newborn infant). In human obstetrics, gestational age is often defined as the time elapsed since 14 days prior to fertilization. This is approximately the duration since the woman's last menstrual period (LMP) began. There is also a further distinction between the calendar gestational age, and the developmental gestational age determined by comparing an embryo or fetus to the average age of others that were at the same stage of development.

Gravida

A pregnant woman.

Gravidity

Gravidity indicates the number of times a woman has been pregnant, regardless of whether the pregnancies were interrupted (by abortion, or fetal death) or resulted in a live birth. The current pregnancy is included in this count.

H

HIV

Human immunodeficiency virus.

Hypoglycaemia

Blood glucose less than the lower value of normal. Blood sugar below 70 mg/dL is considered low. Hypoglycaemia is common in malaria in pregnancy. In addition, quinine treatment can stimulate insulin secretion, reducing blood glucose.

I

Immunity

The condition of being immune to a certain condition. This can be innate (from birth) or conferred by a previous infection or immunization.

Infant

A child under the age of 12 months.

Intrauterine growth retardation (IUGR)

Intrauterine growth retardation or restriction refers to the poor growth of a baby while in the mother's womb during pregnancy. Specifically, it means the developing baby weighs less than 90% of other babies at the same gestational age.

IPTp

Intermittent preventive treatment during pregnancy: the administration of a full course of an antimalarial treatment to pregnant women at specified time-points regardless of whether or not they are known to be infected. Sulfadoxine-pyrimethamine is currently recommended for IPTp by WHO.

ISTp

Intermittent screening and treatment in pregnancy: screening of a pregnant woman for malaria at each antenatal clinic visit, and treatment of positive cases with an effective antimalarial. For pregnant women the treatment drug may vary according to gestation and geographic location.

ITN

Insecticide treated mosquito net: a net which has been treated with insecticide to kill mosquitoes that rest on its surface.

L

LLIN

Long-lasting insecticidal net: a factory-treated mosquito net made with netting material that has insecticide incorporated within or bound around fibres; these nets are designed not to require re-treatment with insecticide during their recommended life (average duration of three years) under field conditions but this ultimately depends on usage.

Low birth weight

A birth weight less than 2500 grams.

M

Malaria

An infectious disease caused by protozoan parasites from the *Plasmodium* family that can be transmitted by the bite of a female Anopheles mosquito or, more rarely, by a contaminated needle or via blood transfusion. *Plasmodium falciparum* causes the most severe malaria infections, some of which are fatal.

Maternal

Pertaining to the mother (for example, maternal mortality rate) or related through the mother (maternal grandparents) or inherited from the mother (maternal X-chromosome).

Mefloquine

Antimalarial that is used for treatment and prophylaxis. Safe to use in second and third trimester. Probably safe in first trimester, although there is ongoing debate about this (References: Schlagenhauf et al, *Clinical Infectious Diseases*, 2012, 54(11):e124–131; Nevin, *Clinical Infectious Diseases*, 2012, 55(8):1167–1168; Nevin, *Biology of Reproduction*, 2012, 87(3):65).

Miscarriage

Inadvertent loss of a pregnancy before the fetus is viable. A considerable proportion of pregnancies ends in a miscarriage. Also called a spontaneous abortion.

Monitoring and evaluation

Monitoring: routine tracking of key elements of programme performance through record keeping, regular reporting, surveillance systems or surveys. Evaluation is the episodic assessment of a programme and the extent to which a particular intervention may be linked to a specific output or result.

Multigravidae

A multigravida or more specifically a gravida 2 (also secundigravida), gravida 3, and so on, is a woman who has been pregnant more than one time.

N

Neonate or newborn

An infant in the first 28 days after birth.

P

Peripheral parasitaemia

The presence of malaria parasites in red blood cells that are circulating in the blood vessels of the body.

Piperaquine

Antimalarial. Often used in combination with dihydroartemisinin. Its safety in pregnancy is not yet fully defined.

Placenta

A temporary organ joining the mother and fetus; the placenta transfers oxygen and nutrients from the mother to the fetus, and permits the release of carbon dioxide and waste products from the fetus. It is roughly disc-shaped, and at full term measures about 18 cm in diameter and is about 5 cm thick. The upper surface of the placenta is smooth, while the under surface is rough. The placenta is rich in blood vessels and can host malaria parasites, particularly among women in their first and second pregnancies.

Placental parasitaemia

The presence of malaria parasites in red blood cells that are circulating in the placenta vascular system.

Plasmodium

The parasite which causes malaria (paludism). *Plasmodium* is a protozoan, a single-celled organism able to divide only within a host cell.

Plasmodium falciparum

Malaria caused by this species (also called malignant or *falciparum* malaria) is the most dangerous form of malaria, with the highest rates of complications and mortality. *P. falciparum* can adhere to the placenta.

Plasmodium vivax

The most frequent and widely distributed cause of recurring malaria. This species is less virulent than *P. falciparum*, but can cause severe complications as well. It does not adhere to the placenta, but can cause adverse effects in pregnancy.

Pregnancy

The state of carrying a developing embryo or fetus within the female body. This condition can be indicated by positive results on an over-the-counter urine test, and confirmed through a blood test, ultrasound, or detection of a fetal heartbeat. Pregnancy lasts for about nine months, measured from the date of the woman's last menstrual period (LMP). It is conventionally divided into three trimesters, each trimester approximately three months long.

Preterm birth

Birth of a baby of less than 37 weeks gestational age.

Proguanil

Antimalarial used for prophylaxis only. This antimalarial can be used in all trimesters of pregnancy and in combination with chloroquine for prophylaxis.

Prophylaxis

Use of a drug for the prevention of a disease or condition.

Q

Quickening

Stage in pregnancy when the pregnant woman feels the first fetal movements (usually about 16–18 weeks).

Quinine

A drug used to treat malaria, obtained from the bark of the cinchona tree. It is used mainly to treat severe malaria. It is safe to use in all trimesters of pregnancy.

R

RDT

Rapid diagnostic test. RDTs for malaria comprise malaria antigen detection tests, which are a group of commercially available tests that allow the rapid diagnosis of malaria by people who are not otherwise skilled in traditional laboratory techniques.

S

SP

Sulfadoxine-pyrimethamine: antimalarial drug mainly used for intermittent preventive treatment during pregnancy. An adult dose consists of a single dose of three tablets. This drug is not recommended in the first trimester of pregnancy.

Stillbirth

A stillbirth occurs when the fetus dies in the uterus.

T

Therapy

The treatment of disease.

Transmission intensity

The rate at which people in a given area are infected with malaria parasites by mosquitoes. In the WHO malaria report it is defined as: low transmission, when reported malaria case incidence from all species is less than one per 1000 population per year, but greater than zero; and high transmission, when the reported malaria case incidence from all species is one or more per 1000 population per year.


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