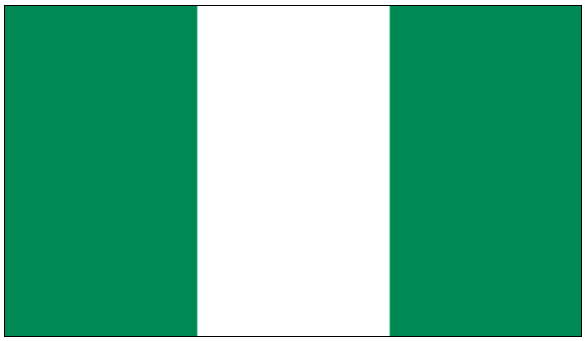
Evidence for Malaria Medicines Policy

Household Survey Report
Republic of Nigeria
2009



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Definitions

Antimalarial combination therapy – The simultaneous use of two or more drugs of different classes to treat malaria.

Artemisinin and its derivatives – Artemisinin is a plant extract used in the treatment of malaria. The most common derivatives of artemisinin used to treat malaria are artemether, artesunate, and dihydroartemisinin.

Artemisinin-based Combination Therapy (ACT) – A combination of artemisinin or one of its derivatives with a partner drug. The partner drug is an antimalarial(s) of a different class.

First-line treatment – The government recommended treatment for uncomplicated malaria. Nigeria's first-line treatment is artemether-lumefantrine, 20mg/120mg. Their alternate ACT first-line treatment is Artesunate-Amodiaquine and is included in the main category of first-line treatment in this survey unless otherwise specified in the results

Monotherapy – Antimalarial treatment with a single medicine: either a single active compound or a synergistic combination of two compounds with related mechanisms of action, such as sulfadoxine-pyrimethamine.

Abbreviations

--	No data was available
*******	Undefined ratio as a non-zero value is being divided by a value of zero
n/a	Not applicable: Indicates ratios cannot be calculated as the numerator is zero
ACT	Artemisinin-based Combination Therapy
AL	Artmether-Lumefantrine
ASAQ	Artesunate-Amodiaquine
SP	Sulfadoxine-Pyrimethamine
CQ	Chloroquine
RDT	Rapid Diagnostic Test
ITN	Insecticide-treated net
CHW	Community Health Worker
GPS	Global Positioning System
IQR	Inter-Quartile Range
PPS	Probability Proportional to Size
LSHTM	London School of Hygiene and Tropical Medicine
FMOH	Federal Ministry of Health
NMCP	National Malaria Control Programme
SFH	Society for Family Health
PPMV	Patent Proprietary Medicine Vendors
NGO	Non Governmental Organisation
PSI	Population Services International
PMI	President's Malaria Initiative
WHO	World Health Organization
UNICEF	The United Nations Children's Fund

Executive Summary

Background:

The ACTwatch Household Survey, one of the ACTwatch project components, conducts quantitative research at the household level in the ACTwatch countries (Cambodia, Uganda, Zambia, Nigeria, Benin, Madagascar and the Democratic Republic of Congo). Other elements of ACTwatch include Outlet Surveys led by Population Services International (PSI) and Supply Chain Research led by the London School of Hygiene & Tropical Medicine (LSHTM). This report presents the results of a cross-sectional survey of households conducted in Nigeria between August and September 2009 on consumer treatment-seeking behaviour including choice of antimalarials, price paid for treatment and diagnostic testing. Data from the household survey are also used to identify determinants of appropriate treatment behaviour.

Indicators are presented on knowledge, beliefs, experiences and behaviour with respect to seeking treatment for fever in children under-five. A set of core indicators related to prompt and effective treatment and cost of antimalarials for treatment of children is presented first. A second expanded section contains indicators on treatment-seeking behaviour; caregiver knowledge, practices and beliefs; and information on acquired antimalarials including source and relative number of treatments by type. Indicators are presented at the child, caregiver and treatment (antimalarial drug) levels. Core indicators are presented across household wealth quintiles, urban/rural residence, geo-political zones, and caregiver knowledge and child age.

Household inclusion criteria for this study included presence of a household member less than five years of age that experienced fever in the past 2 weeks. However, data were collected on treatment-seeking behaviour and experiences for all fevers that occurred among household members of all ages in the past 2 weeks. As such, data are presented for children under-five in the main body of the report, and for people age five and above in Appendix A. Results for people age five and above should be interpreted with caution given the sampling design.

Methods:

This study used data from a cross-sectional household survey of children's caregivers. A nationally-representative sample of households in malaria-endemic areas of Nigeria was drawn with equal allocation stratification across six geopolitical zones, and three-stage cluster sampling, probability proportional to size (PPS). One hundred and fourteen (114) localities were selected PPS from a list of 1,288 in the six geopolitical zones. At a second stage, 342 enumeration areas (EA) were sampled PPS from a total of 425 and a random sample of eight households within each EA was drawn. All households included in the study reported that at least one child under the age of five had fever in the past two weeks. Among eligible households, children's caregivers completed two questionnaire modules: 1) Treatment Seeking and Case Management regarding fever episodes among children under-five; and 2) Caregiver Knowledge, Beliefs and Attitudes. In eligible households containing a member aged five and above that had fever within the past two weeks, the Treatment Seeking and Case Management module was completed by the relevant household member or his/her caregiver on this episode of fever. Household heads provided information on the household including asset ownership and dwelling characteristics.

Several validation and data checking steps occurred during and after data collection. Double data entry was conducted using Microsoft Access (Microsoft Cooperation, Seattle, WA, USA). Stata 11 (Stata Corp, College Station, TX) was used for all analyses. To obtain the national estimates provided in this report, data were weighted to account for equal allocation stratified sampling from the geo-political domains. Standard error estimation in logistic regression analysis accounted for clustering at the locality level.

For more information on the study design log on to www.*ACTwatch*.info

Antimalarials are categorized in this report as follows: sulfadoxine-pyrimethamine (SP), chloroquine (CQ), artemisinin monotherapy (AMT), artemisinin-based combination therapy (ACT), national first-line ACT (AL), and other antimalarials comprising quinine, amodiaquine and halofantrine among others.

Results:

Data were collected between 10th August and 17th September 2009. A total of 4,649 households were screened and 2,734 households met inclusion criteria and agreed to participate in the study. Among these households, 2,833 caregivers were interviewed regarding 3,274 children with fever in the past two weeks preceding the survey. Additionally, caregivers and other household members were interviewed on episodes of fever among 1,029 people age five and above.

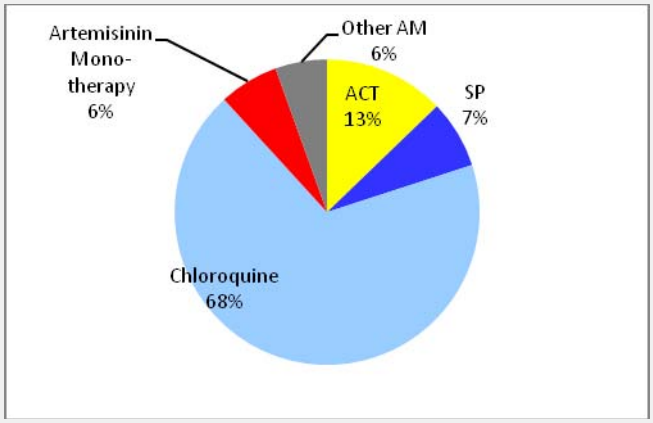
TYPE OF ANTIMALARIAL DRUGS ACQUIRED FOR CHILDREN UNDER-FIVE WITH FEVER:

The most commonly accessed drug for treatment of fever in children under-five was a non-artemisinin monotherapy, CQ, accounting for 68% of the 1,219 antimalarials acquired.

Only 13% of antimalarial drugs acquired were ACTs (n=171). ACTs acquired for children were primarily AL (63% of ACTs) or ASAQ (25% of ACTs) (data not shown).

Artemisinin monotherapies account for 6% of drugs acquired.

Figure 1. Antimalarials acquired for children under-five with fever



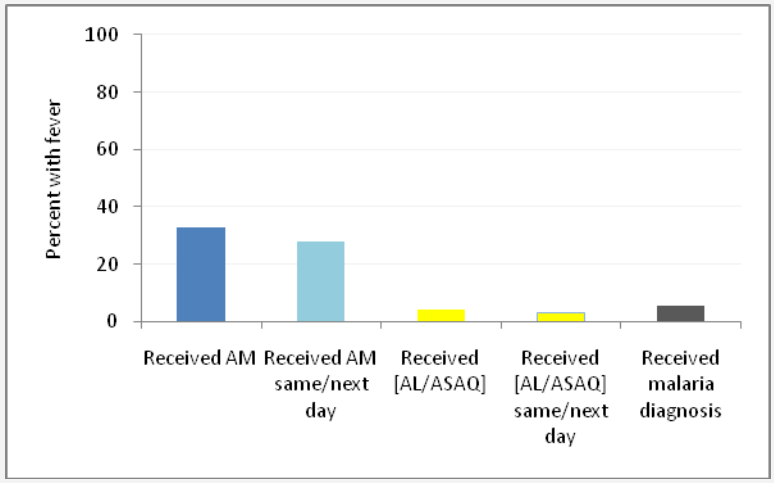
TREATMENT AND DIAGNOSIS OF CHILDREN UNDER-FIVE WITH FEVER:

33% of the 3,274 children under-five with fever were treated with an antimalarial, and 28% received antimalarial treatment on the same or next day after the onset of fever.

Only 4% of children with fever were treated with the first-line antimalarial [AL/ASAQ].

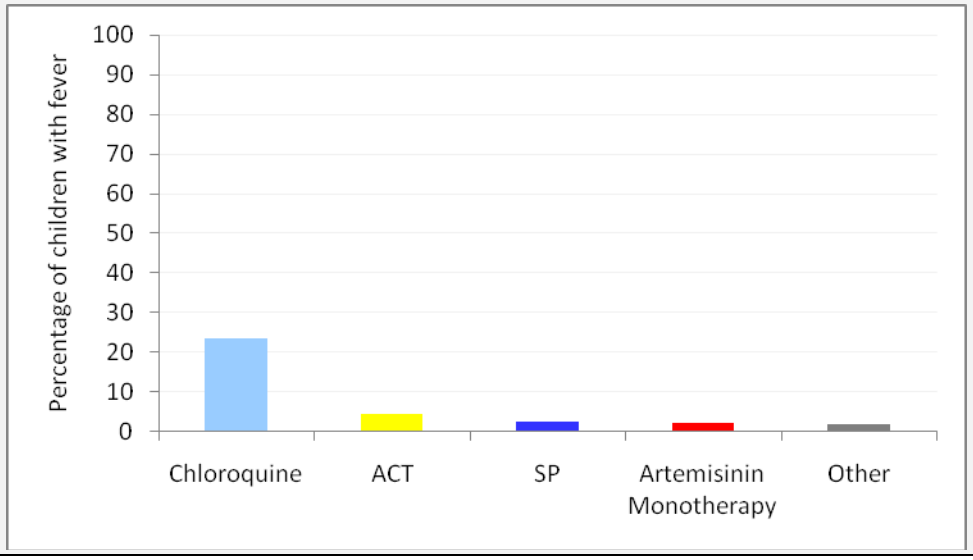
6% of children under-five with fever received a malaria diagnosis.

Figure 2. Percentage of children under-five with fever that received antimalarial treatment, first-line treatment, and diagnosis



ANTIMALARIAL TREATMENT FOR CHILDREN UNDER-FIVE WITH FEVER, BY ANTIMALARIAL TYPE: One in five of the n=3,274 children with fever were treated with chloroquine. 5% of the children with fever were treated with ACT; 3% with SP; 2% were treated with artemisinin monotherapy; and another 2% with other antimalarials (quinine, amodiaquine, halofantrine).

Figure 3.Percentage of children under-five with fever that received an antimalarial, by type



SOURCE OF ANTIMALARIAL AND ACT TREATMENT: Among children treated with an antimalarial (n=1,097), pharmacies (39%) and public health facilities (24%) were common sources of antimalarial treatment. 10% of treated children received an antimalarial from a private health facility. In comparison, among those children that received ACT treatment (n=166), pharmacies (28%) and public health facilities (30%) were common sources of ACT treatment, and 16% of treated children received ACT from private health facilities.

27% of treated children received an antimalarial that was reportedly stored in the home. Similarly, "at home" was the source of ACT treatment for 25% of treated children.

Figure 4. Source of antimalarial treatment, among treated children

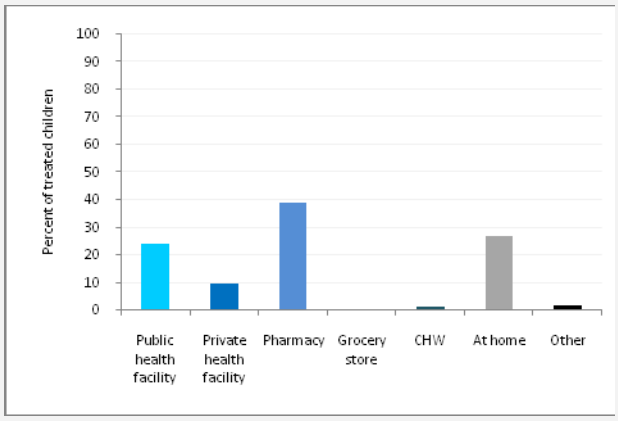
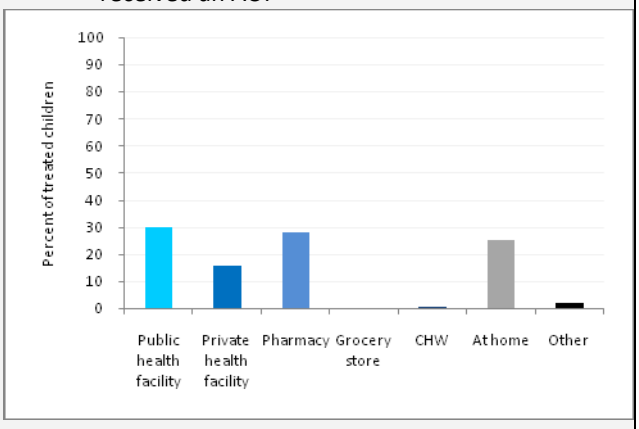
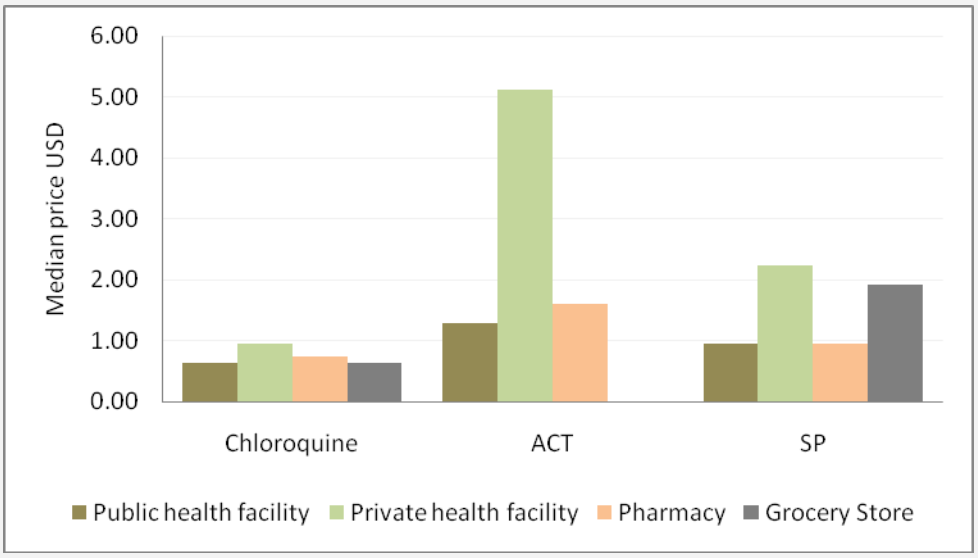


Figure 5. Source of ACT treatment, among children that received an ACT



COST OF ANTIMALARIAL TREATMENT FOR CHILDREN UNDER-FIVE: The most commonly reported treatment for children with fever, CQ, is also the least expensive with a median price of $0.96 in private health facilities. ACTs on the other hand, which were used to treat 4% of fevers, have a median price of $5.12 in private health facilities and $1.60 in private pharmacies.

Figure 6. Price in USD of antimalarial treatments acquired for children under-five, by most common treatment type and most common outlet type



TREATMENT-SEEKING BEHAVIOUR FOR FEVER IN CHILDREN UNDER-FIVE: Caregivers of 92% of children with fever responded with some sort of action to treat the child's fever. Caregivers of most children first sought treatment at a pharmacy (37%). 31% of children were initially treated at home. Caregivers were asked about reasons for choosing this initial source of treatment. Among children whose caregivers sought treatment (n=3,098), most caregivers selected the initial treatment source because it was close to home (52%). Other reasons for first source of treatment included reputation for quality treatment (20%); availability of modern medicines (9%); no need for intensive care (8%); and availability of inexpensive treatment (6%)

Figure 7. First Source of Treatment for Children with Fever

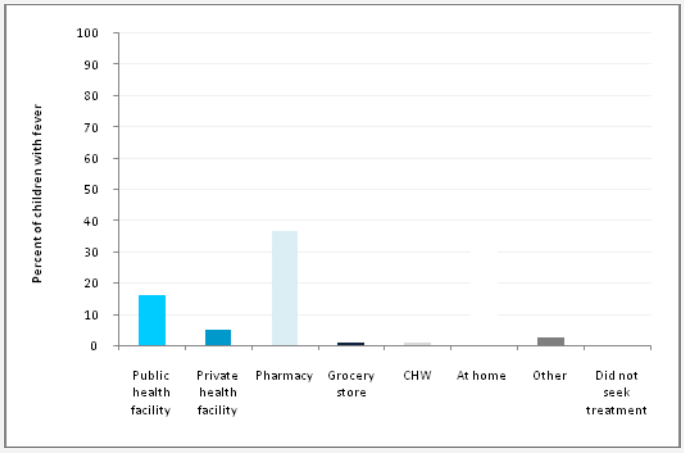
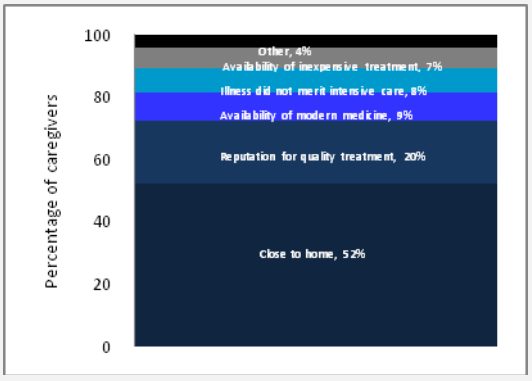
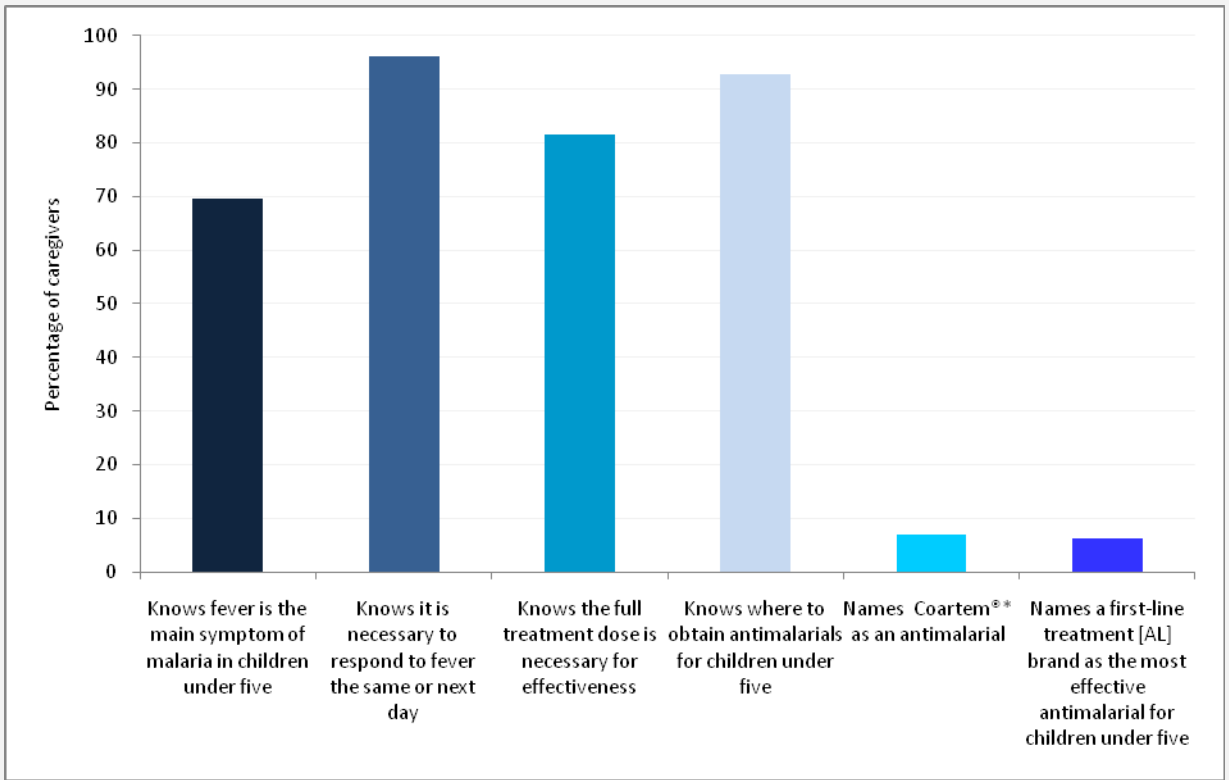


Figure 8. Reason for First Treatment Source among Caregivers who Sought Treatment



CAREGIVER KNOWLEDGE, PRACTICES AND BELIEFS: General knowledge of malaria and treatment of fever was high among caregivers of children under-five. A high percentage of caregivers know that fever is the main symptom of malaria in children under five (70%); that fever in children requires prompt response (96%); and that the full treatment dose is required for drug efficacy (82%). A significant number of caregivers reported knowing where to obtain antimalarials for children under five (93%) but only 7% of caregivers had heard of the most common brand of first-line treatment, Coartem®. Additionally, when asked to name the most effective antimalarial for children under five, 4% cited a brand of the national first-line AL treatment.

Figure 9. Caregiver Knowledge, Practices and Beliefs



*Coartem® is the most common brand of first-line [AL] treatment in Nigeria

DETERMINANTS OF TREATMENT OF FEVER IN CHILDREN UNDER-FIVE:

Treatment of fever with an antimalarial the same or next day after onset of fever: A full model examining prompt treatment of fever included the following determinants: household residence and wealth, caregiver education, child age, and psychometric scales measuring opportunity and motivation to treat fever with an antimalarial. Determinants with significant adjusted associations with prompt antimalarial treatment include: perceived availability of antimalarials in the community (AOR=1.20, 95% CI=1.05-1.36); beliefs about modern versus traditional treatment (AOR=1.24, 95% CI=1.11-1.39); and beliefs about seeking treatment promptly (AOR=1.56, 95% CI=1.32-1.84). In addition, children living in the wealthiest households are significantly more likely to receive prompt antimalarial treatment for fever as compared with children in the poorest households (AOR=1.85, 95% CI=1.25-2.74).

Country Background

Overview of the country

Nigeria is located in the West Africa sub-region and is bordered by Niger to the north, Chad to the northeast, Cameroun to the east and Benin to the west (see Figure 1.3.1). The country has approximately 850 km of coastline along the Atlantic Ocean, stretching from Badagry in the west to the Rio del Rey in the east. With a total land area of 923,768 square kilometres, Nigeria is the fourteenth largest country in Africa. It is also the most populous nation in Africa and the eighth most populous country in the world, with an estimated total population of 158 million (World Population Prospects, 2008).[1] 50% of the population are estimated to live in urban areas.[2] There are more than 250 ethnic groups, the largest of which are the Hausa, Fulani, Igbo, Yoruba, and Kanuri. The official language of Nigeria is English; however Hausa, Fulani, Igbo, Yoruba, and Kanuri are the most widely spoken Nigerian languages.

Nigeria has a varied climate. Distinct climatic zones can be distinguished, progressing from south to north. The southern part of the country has an equatorial monsoon climate, while the central regions are tropical and the northern-most parts are arid. In the south there is rainfall during most of the year, with a short break around August and a longer dry period from December to January. The central regions experience rains between March and October, and a pronounced dry season (including the Harmattan) between November and March. Temperatures are high during the dry season but fall during the rains.

Figure 1.3. 1: Location of Nigeria

Source: Central Intelligence Agency, *The World Factbook 2009*, https://www.cia.gov/library/publications/the-world-factbook/index.html

Description of health care system

Between 2000 and 2009 Nigeria's GDP grew at an average 6% year-on-year mostly driven by oil revenues, compared to a population growth rate estimated at 2% (World Bank, 2010). During the same period GDP per capita rose from $1,456 to $2,001, an increase of 38% (World Bank, 2010). However, an estimated 84% of the population continues to live on under $2 a day, and the country ranks 142nd out of 169 in the 2010 Human Development Index. Under-five mortality has dropped significantly, from 201 per 1000 births between 1998 and 2003, DHS (2003) to 157 per 1000 births between 2003 and 2008 (DHS, 2008). However, this is still higher than the rate for sub-Saharan Africa as a region. Only 23% of children are fully vaccinated. Malaria remains largely unchecked and leads to an estimated 300,000 deaths in children under five each year (Federal MoH, 2009).

Nigeria is sub-divided into 6 geopolitical zones, 36 states (plus the Federal Capital Territory, Abuja), and 774 Local Government Areas (LGAs). The public health system in Nigeria operates through three tiers, linked to the three levels of health care. At the highest level, the Federal Ministry of Health (FMOH) provides policy and technical guidance for the health sector. The FMOH also supports and manages tertiary level care, research, and academic "centres of excellence". State Ministries of Health (SMOH) fund and manage state hospitals, maternities, and teaching colleges. SMOHs are also responsible for the development of health sector staff for secondary and primary health care, from midwives and nurses to Community Health Extension Workers (CHEWS). At the third tier, Local Government Areas are tasked with planning, managing, staffing, supporting, and implementing primary health care (PHC) services. 71% of Nigerians have access to a PHC facility that is within a five kilometres radius of their homes (Federal MoH, 2010); however, many of these centres are not effectively functional due to lack of equipment, essential supplies, and qualified staff.

Up-to-date data on health facilities is difficult to come by, and the following figures are from surveys conducted between 1999 and 2001 and reported in the National Malaria Control Program (NCMP) Strategic Plan, 2009-2013. The public sector comprises 53 tertiary and specialized hospitals; 855 secondary facilities; and 13,000 PHC facilities, a category which includes health posts and dispensaries.

The private health care system consists of formal tertiary, secondary, primary facilities, and pharmacies, as well as informal proprietary patent medicine vendors (PPMVs) and drug sellers. Private health facility figures for the period 1999 to 2001 include 2,147 secondary facilities and 7,000 PHC facilities. For the same period there were a total of 2,751 registered pharmacies, and an estimated 36,000 PPMVs (2002 estimate). The private sector provides over 65% of healthcare delivery in Nigeria (Onwujekwe O et al., 2005). In Nigeria, PPMVs are usually the first choice in health care and are a recognized primary source of orthodox drugs for both rural and urban populations, especially the poor (Uzochukwu & Onwujekwe, 2004; Uzochukwu et al., 2008; Oladepo et al., 2008). In addition to selling drugs, they are also a major source of advice about illness and drug therapy (Ross-Degnan et al., 1996).

As a general policy, healthcare consumers are expected to pay for curative services, but preventive services are often subsidized. Health financing has been largely out of pocket hence efforts are made to provide public assistance to the socially and economically disadvantaged segments of the population (Federal Ministry of Health, 2004). To reduce financial barriers that prevent people in Nigeria, especially children, from accessing healthcare services, pre-payment schemes such as the National Health Insurance Scheme (NHIS) are being introduced (Federal Ministry of Health, 2006).

The public and private sectors have distinct and independent drug supply chains, although both are regulated by the National Agency for Food and Drug Administration and Control (NAFDAC). Quality control is provided by NAFDAC at the point of entry for imported products and at the factory gate for locally-manufactured products.

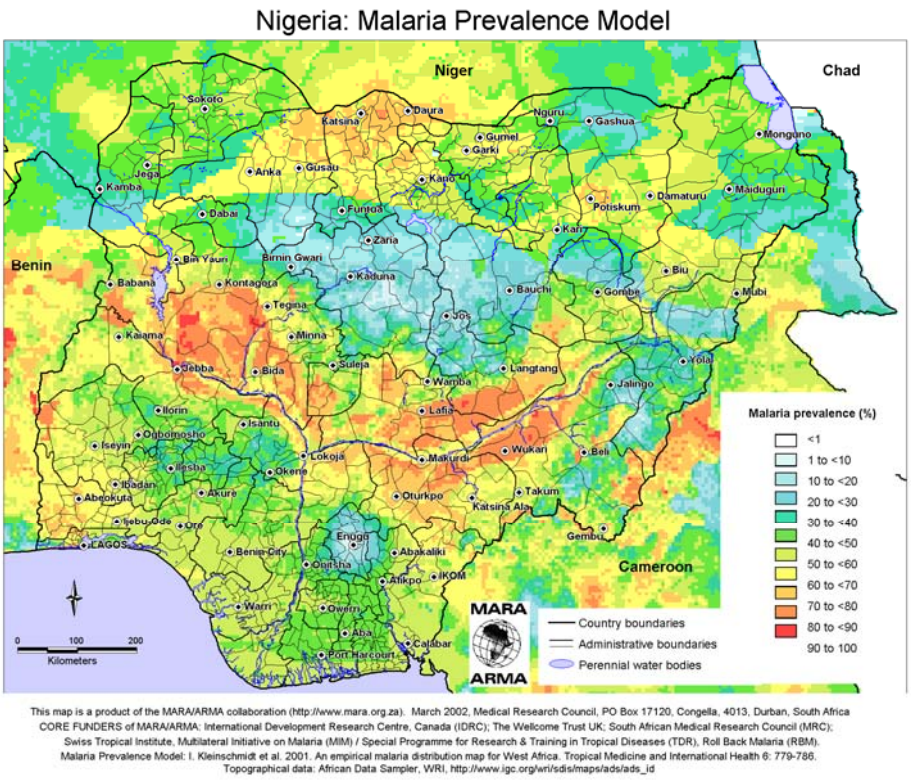
The public sector system is highly fragmented, with each disease having its own supply chain system. Government agencies and partners are first-line buyers and purchase medicines directly from manufacturers. Manufacturer's bid to supply the government through local and international competitive bid processes, managed by the Tenders Unit of the FMOH. However, donors also supply commodities directly to state-level medical stores, and both States and LGAs have funding for procurement. In anticipation of the AMFm pilot, donors are supporting the development of an improved logistics management information system for malaria commodities (PMI, 2010).

Procurement in the private sector is informed by government treatment guidelines, but predominantly driven by demand. In-country manufacturers are a key source of commodities for Nigerian wholesalers and distributors: there are almost 40 nationally-registered ACTs that are manufactured in-country (PMI, 2010). For products manufactured outside of Nigeria, it is common practice for an importer to act as the sole agent for a manufacturer. While importers are free to choose their suppliers, a tendency to enter into exclusivity agreements is fostered by the stringency of the registration requirements, the amount of time that it takes to develop a relationship with the supplier, and the amount of investment that goes into developing the local market for the imported product.

Epidemiology of malaria

Malaria is endemic in Nigeria and 97% of the population is at risk of infection. The country exhibits five ecological strata from south to north which define the seasonality and intensity of malaria transmission, and vector species dominance: mangrove swamps, rain forest, guinea-savannah, sudan-savannah and sahel-savannah. The duration of the transmission season decreases from perennial in the south to around 3 months in the northern border region with Chad. In the northern part of the country transmission is highly intense during the short wet season as compared with general low transmission during the long dry season. In the southern part of the country, transmission is intense, stable and uniform throughout the year.

Figure 1.3. 2: Malaria transmission risk map (MARA prevalence model), Nigeria, 2001



This map is a product of the MARA/ARMA collaboration (http://www.mara.org.za). March 2002, Medical Research Council, PO Box 17120, Congella, 4013, Durban, South Africa
CORE FUNDERS of MARA/ARMA: International Development Research Centre, Canada (IDRC); The Wellcome Trust UK; South African Medical Research Council (MRC);
Swiss Tropical Institute, Multilateral Initiative on Malaria (MIM) / Special Programme for Research & Training in Tropical Diseases (TDR), Roll Back Malaria (RBM).
Malaria Prevalence Model: I. Kleinschmidt et al. 2001. An empirical malaria distribution map for West Africa. Tropical Medicine and International Health 6: 779-786.
Topographical data: African Data Sampler, WRI, http://www.igc.org/wri/sdis/maps/ads/ads_id

Source: Kleinschmidt I. et al. 2001. *An empirical malaria distribution map for West Africa*. Tropical Medicine and International Health 6: 779-786. Map available online at http://www.mara.org.za

Malaria has remained a major public health problem in Nigeria. It causes more than 50% of the disease burden (Federal Ministry of Health, 2005) and almost 50% of all-cause health expenditure (Onwujekwe O, et al., 2000). Also, 20% of all hospital admissions, 30% of outpatient visits, and 10% of hospital deaths are attributable to malaria, while half of Nigeria's population is exposed to at least one episode of malaria every year [Okeke et al., 2003). Results from a modelling exercise presented in the NMCP Strategic Plan 2009-2013 show that malaria accounts for an estimated 300,000 annual deaths for children under five, and 11% of the maternal mortality burden in Nigeria. In relative terms, Nigeria contributes more than a third of the total African malaria burden (RBM, 2008). Malaria is responsible for 25% of all infant-related mortality and 30% of child-related mortality (Nigeria Demographic and Health Survey, 2008).

Antimalarial Policies and Regulatory Environment

In January 2005 the National Malaria Control Program (NMCP) adopted artemether-lumefantrine (AL) as the first-line treatment for uncomplicated malaria (Federal Minsitry of Health, 2004). Artesunate+amodiaquine (ASAQ) is recommended as the alternative first-line treatment, should AL not be available. At the time of the policy change, AL and ASAQ were prescription-only medications; NAFDAC reclassified these medicines as over the counter in 2006. Registered drug outlets, such as PPMVs or chemist, can sell the drug as an over the counter drug.

Parenteral quinine is recommended for the treatment of severe malaria and as pre-referral treatment. In addition, artemether and artesunate injections are included on the list of current medicines for severe malaria. Artesunate suppositories are also used at the peripheral health facilities where parenteral treatment cannot be administered (they are included in the national policy on malaria treatment as a pre-referral treatment only).

Oral artemisinin monotherapies have been banned in Nigeria since 2006, under legislation that prohibits their importation and local production. In order to support broader adoption of ACTs, NAFDAC stopped registering new artemisinin monotherapies in 2006. Thus licenses for the sale of oral artemisinin monotherapies were not renewed when they expired (which was by late 2009). In order to mitigate the risk of artemisinin monotherapy stockpiling prior to the end of valid registration, NAFDAC provided several incentives including a reduction in the cost of registering ACTs.

Malaria control strategy

The core interventions for malaria control in Nigeria include long lasting insecticide-treated net (LLIN) distribution through antenatal care clinics, immunization visits, large-scale stand-alone campaigns, and subsidized and at-cost sales in the commercial sector; intermittent preventive treatment for pregnant women (IPTp); case management following prompt diagnosis at all levels of health care; and, to a more-limited extent, indoor residual spaying (IRS).

Up to late 2008, public sector bed net distribution campaigns focussed on the most vulnerable groups: children under five and pregnant women. Initially starting with insecticide-treated nets (ITNs), distribution switched to LLINs in 2006. Nigeria has removed import tariffs on bed nets (M-TAP, 2010). More than 19 million ITNs were distributed during 2009 (WHO, 2010), a substantial increase on previous years. Results from the 2008 DHS show low net ownership and use: an estimated 8% of households own at least one ITN, and only 6% of children under five are reported to have slept under an ITN the night before the survey. Looking to the future, sufficient donor funds have been mobilised to enable the procurement of more than 62 million nets, enough to achieve universal coverage with two LLINs per household (PMI, 2010).

Large-scale IRS campaigns have not been conducted in Nigeria since the mid-1970s, and present institutional capacity for spraying is weak. Several trials have been conducted in recent years with the support of insecticide manufacturing companies, and World Bank-supported campaigns are present in 7 states. The NMCP Strategic Plan 2009-2013 sees an increased role for IRS in specific situations (such as where ITN usage rates remain low, and in more densely populated areas), and sets the target of 20% of households covered by IRS by 2013.

Nationwide, an estimated 58% of pregnant women have access to antenatal care (ANC) from a skilled provider, but only 5% receive the recommended two doses of sulphadoxine-pyrimethamine (SP) for IPTp (DHS, 2008). These figures vary widely by State, and coverage is greater in urban areas than in rural areas. IPTp is free of charge when given through ANC at public and NGO health facilities. Due to the supply chain problems outlined above, it is unclear if LGAs have sufficient stocks of SP to meet demand for IPTp.

Case management for malaria is based on prompt treatment with effective ACT. The NMCP's desire that such treatment be available close to home is aided by the classification of AL and ASAQ as over-the-counter medicines, and the policy supporting community case management of malaria with ACTs. The National Antimalarial Treatment Policy states that parasitological diagnosis is essential for all suspected cases of malaria, with microscopy providing the gold-standard. However, there is an understanding that the cost and capacity of providing laboratory services present a barrier to achieving coverage with microscopy, and as such RDTs should be introduced in facilities with no microscopes. Within the public sector, policy states that ACT is available free of charge for both under fives (as of 2006) and over fives (as of 2009).The exception are

some little pocket of states like Lagos that have free medical services for child under five and people over 70 years old.

Malaria financing

In Nigeria, funding for malaria control which was provided by the government and donors increased from US$ 18.5 million in 2005 to US$ 84.5 million in 2008 but this is insufficient to reach national targets for prevention and cure and thus there is no evidence of a systematic decline in malaria burden in Nigeria (World Malaria Report, 2008). Studies have shown that between 2001 and 2007, there was an increase in number of malaria deaths from 4,317 in 2001 to 10,289 in 2007 for all ages and 721 to 2,695 for under five year olds, although this upward trend may be due to improvements in reporting of cases (World Malaria Report, 2008) as a study showed that high mortality and morbidity rates are on the decline in some African countries (Hay et al., 2005). The National Malaria Control Program delivered about 17 million Insecticide treated bed nets during 2005-2007, enough to cover only 23% of the population at risk. The programme delivered 4.5 million courses of ACT in 2006 and 9 million in 2007 which is far below the country's total requirements (World Malaria Report, 2008).

Since then funding has dramatically increased as Nigeria signed a $500 million Global Fund to fight AIDS, Tuberculosis and Malaria Round 8 award in 2008, and additional funds were made available through the World Bank Malaria Booster Program and the UK Department for International Development (DfID). In 2010 Nigeria became a President's Malaria Initiative (PMI) country, with a proposed 2011 budget for PMI activities of $48.5 million.

Through Round 4 of the Global Fund, subsidized child doses of ASAQ (*Arsuamoon* and *Larimal)* have been made available since 2008 via the private sector in eighteen of Nigeria's 37 states. The subsidy includes the following private sector outlets: hospitals, pharmacy shops and PPMVs. Retailers in these 18 states may purchase the subsidized drug for 5 Naira ($0.03 USD) per treatment with an approved retail price set at 30 Naira ($0.20 USD).

In 2010, Nigeria signed a GFATM grant for the Affordable Medicines Facility-malaria (AMFm). This grant enables a prompt and effective treatment of malaria with Artemisinin-based Combination Therapy (ACT); Use of Sulphadoxine-Pyrimethamine (SP) for Intermittent Preventive Treatment (IPT) of malaria in pregnancy and Integrated Vector Management including use of Long Lasting Insecticidal Nets (LLINs).

The round 8 malaria grant has been approved and signed to commence from 1st August 2009. The title is 'Contributing to the scale up of malaria control interventions for impact in Nigeria'. It will be implemented in 36 states of Nigeria and the Federal Capital and will include the following interventions:

- Prompt treatment using ACTs – supported as part of core round 8 project and the AMFm.
- Prevention – LLINs to be provided through mass LLIN campaigns
- Diagnosis – using microscopy and Rapid Diagnostic Tests for children above 5 years and adults
- Cross cutting issues such as – Advocacy, Social Mobilization, Monitoring & Evaluation and Health Systems Strengthening.

The grant will be implemented using the private health care providers, except for the implementation of diagnosis using RDTs, which will involve both the public and private health care providers in selected states. The Service Delivery Points where implementation will take place at these levels are:

- Public Health facilities (For parasite diagnosis with RDTs and microscopy)
- Private Health Facilities including clinics, hospitals, Maternity homes
- Community Pharmacies
- Proprietary Patent Medicine Vendor (PPMV) Stores

Results:

Core Indicators

Table 1. Prompt treatment of fever among children under five

Percentage of children under five with fever in the 2 weeks preceding the survey who took an antimalarial drug, took an antimalarial drug the same/next day, and received a diagnosis, by background characteristics as reported by caregivers.

	Percentage who took an antimalarial drug	Percentage who took an antimalarial drug the same/next day	Percentage who received a diagnosis	# of children with fever
Age (in years)	%	%	%	n
<1	26.2	20.1	4.6	671
1	33.6	29.7	5.2	638
2	33.0	28.9	6.3	700
3	37.7	33.2	6.5	650
4	33.6	29.1	5.5	615
Residence				
Urban	35.3	30.8	6.5	1,160
Rural	31.1	26.4	5.0	2,114
Strata				
North Central	39.1	33.8	8.5	530
North East	26.0	21.4	3.8	585
North West	27.1	22.0	3.4	560
South East	40.5	34.9	5.8	556
South South	33.7	29.6	4.9	540
South West	35.6	32.6	9.2	503
Caregiver's education				
No education	24.2	19.1	3.1	1,062
Some primary	28.5	23.8	6.3	261
Primary plus	38.5	34.2	7.2	1,902
Wealth index				
Poorest	20.9	17.8	3.8	625
Second	28.2	22.0	4.8	642
Middle	30.5	25.2	4.4	650
Fourth	37.9	33.3	5.3	617
Richest	44.3	40.2	9.1	621
All children	32.8	28.1	5.6	3, 274*

*Denominators vary for indicators due to skip patterns, small numbers of refused questions, or missing data. Fluctuations in denominators for reasons other than skip patterns range from 0 – 5%. Caregiver's education, n = 3,225 ; diagnosis, n = 3,254; wealth, n = 3,155

Table 2. Type and timing of antimalarial drugs among children under five

Percentage of children under-five with fever in the two weeks preceding the survey who took antimalarial treatment, and percentage who took antimalarial treatment on the same day or the next day after developing fever, by background characteristics.

	Percentage who took:						Percentage who took the drug on the same or the next day:						# of children with fever
	SP	CQ	Art-Mono	First Line [AL/ASAQ]	ACT	Other anti-malarial†	SP	CQ	Art-Mono	First Line [AL/ASAQ]	ACT	Other anti-malarial†	
Geo-political zone	%	%	%	%	%	%	%	%	%	%	%	%	n
North Central	2.1	30.6	3.2	3.5	4.5	0.9	1.5	26.2	3.0	3.1	3.8	0.9	530
North East	2.9	19.3	0.3	3.1	4.3	0.7	2.2	16.6	0.2	2.1	2.9	0.7	585
North West	1.4	22.0	2.1	2.1	2.1	0.9	1.3	18.2	1.8	1.4	1.4	0.7	560
South East	5.4	24.8	2.0	7.2	7.7	3.8	4.7	21.6	1.6	5.4	5.8	2.9	556
South South	4.3	20.9	0.9	4.3	5.4	2.8	3.5	18.7	0.7	3.5	4.3	2.8	540
South West	2.0	23.9	3.2	5.8	6.6	3.2	1.8	21.9	3.0	4.4	5.0	3.0	503
Residence													
Urban	3.1	22.6	3.1	5.8	6.5	2.2	2.7	19.8	2.7	4.6	5.2	1.8	1,160
Rural	2.2	24.1	1.6	2.8	3.1	1.8	1.9	20.7	1.4	1.9	2.2	1.7	2,114
Caregiver's education													
No education	1.0	20.9	0.8	1.7	1.8	0.4	0.8	16.8	0.6	1.1	1.2	0.4	1,062
Some primary	2.9	19.1	2.5	5.0	5.0	1.3	2.6	16.7	2.1	3.5	3.6	0.3	261
Primary plus	3.6	25.4	3.1	5.2	6.1	2.9	3.0	22.8	2.8	4.1	4.7	2.6	1,902
Wealth index													
Poorest	0.9	18.8	0.1	1.3	1.5	0.9	0.7	15.9	0.1	1.0	1.1	0.9	625
Second	1.6	22.9	1.7	1.2	1.5	0.8	1.2	18.5	1.2	0.4	0.6	0.8	642
Middle	1.9	23.4	0.8	3.9	4.2	1.6	1.3	19.4	0.8	2.5	2.8	1.6	650
Fourth	3.6	27.4	3.0	4.2	4.9	1.7	3.3	24.4	2.2	3.6	4.4	1.3	617
Richest	4.4	25.1	5.2	7.8	8.8	4.5	3.9	23.1	5.1	6.2	6.7	3.9	621
All children	2.6	23.5	2.2	4.0	4.5	2.0	2.2	20.3	2.0	3.0	3.4	1.7	3,274

† Other antimalarial comprises of quinine and amodiaquine among others

Table 3. Source of antimalarials and ACTs, among children under five who received an antimalarial treatment†

Source of antimalarial and ACT treatment for children under five years with fever in the two weeks preceding the survey, among children who received an antimalarial treatment or ACT, by background characteristics.

	Source of antimalarial treatment among treated children:								Source of ACT among children treated with ACT:							
	Public Health Facility	Private Health Facility	Pharm-acy‡	Grocery	CHW	At home	Other	# children treated with anti-malarial	Public Health Facility	Private Health Facility	Pharm-acy‡	Grocery	CHW	At home	Other	# of children treated with ACT
Geo-political zone	%	%	%	%	%	%	%	n	%	%	%	%	%	%	%	n
North Central	34.5	9.7	36.4	0.5	2.9	18.5	1.5	207	43.5	4.4	34.8	-	0.0	13.0	4.4	24
North East	25.8	6.0	41.1	2.0	3.3	17.9	4.6	152	48.0	4.0	20.0	-	4.0	20.0	4.0	25
North West	31.8	8.9	38.5	0.7	0.7	21.0	1.4	152	25.0	25.0	33.3	-	0.0	25.0	0.0	12
South East	13.1	8.6	49.1	0.0	0.9	32.9	0.5	225	30.8	18.0	23.1	-	0.0	28.2	0.0	43
South South	16.7	9.4	49.4	0.0	2.2	23.9	1.7	182	24.1	10.3	34.5	-	3.5	24.1	3.5	29
South West	19.0	13.4	26.3	0.6	0.0	41.9	3.4	179	30.3	18.2	21.2	-	0.0	30.3	3.0	33
Residence																
Urban	24.7	14.4	31.6	0.3	1.0	29.7	1.4	431	33.7	18.9	23.0	-	0.0	24.9	2.3	85
Rural	24.1	6.6	44.7	0.6	1.3	25.2	2.0	666	25.0	12.1	35.4	-	1.8	26.1	1.8	81
Caregiver's education																
No education	35.4	4.6	39.5	0.1	2.1	16.8	2.6	255	32.8	0.0	41.4	-	0.0	25.3	0.0	27
Some primary	19.7	10.2	43.2	0.0	0.2	29.2	1.2	82	25.2	18.0	50.8	-	0.0	6.0	0.0	17
Primary plus	20.3	12.0	39.2	0.6	0.7	30.2	1.5	743	29.4	18.9	23.5	-	0.9	27.9	2.7	121
Wealth index																
Poorest	33.0	4.6	48.3	0.0	0.2	15.2	3.5	142	61.6	0.0	26.2	-	0.0	12.2	0.0	18
Second	29.4	5.9	45.0	0.6	0.1	18.5	1.4	193	43.8	20.3	34.8	-	0.0	0.0	0.0	11
Middle	27.2	7.6	36.0	0.0	1.9	28.7	1.5	209	26.3	17.3	31.4	-	3.4	25.6	0.3	31
Fourth	17.3	7.5	41.8	1.0	2.7	31.8	1.5	244	35.4	2.3	27.0	-	0.0	29.9	5.4	38
Richest	21.3	16.2	34.5	0.4	0.5	31.3	1.9	278	22.7	23.6	27.9	-	0.0	27.7	2.0	59
All children	24.2	9.9	39.1	0.4	1.2	27.1	1.7	1,097*	30.1	16.1	28.1	-	0.7	25.4	2.1	166*

† Where source of antimalarial could be established; source could not be established for n=11 and n=5 children for antimalarial and act respectively.

‡ The pharmacy category includes registered pharmacies as well as PPMVs.

* n = 1,080 and 165 for caregiver's education and source of antimalarial and act respectively; and n = 1,066 and 157 for wealth and source of antimalarial and act respectively

Table 4. Cost of antimalarial treatment for children under five[†]

Median price in USD[‡] paid for a single antimalarial drug regimen acquired for a child with fever as recalled by caregiver.[*]

	SP	CQ	Art-Mono	First Line [AL]	First Line [ASAQ]	ACT	Other anti-malarial	All anti-malarials
Source of treatment	$	$	$	$	$	$	$	$
Public health facility	0.96[4]	0.64[85]	2.56[9]	1.28[21]	1.28[10]	1.28[27]	2.56[4]	0.77[129]
Private health facility	2.24[3]	0.96[23]	5.12[3]	1.60[3]	6.40[3]	5.12[7]	6.40[3]	1.09[39]
Pharmacy[#]	0.96[39]	0.74[216]	3.84[10]	2.88[16]	1.28[16]	1.60[29]	1.60[17]	0.77[311]
All sources[††]	0.96[68]	0.64[477]	3.07[35]	2.24[53]	1.28[25]	1.60[87]	1.92[42]	0.77[709]

† Where source of antimalarial could be established; source could not be established for n=49 antimalarials as multiple sources of treatment were sought outside of the home.

‡ 1 USD = 156.25 naira at the time of data collection

* Price for n=510 antimalarials was reported as "don't know".

The pharmacy category includes registered pharmacies as well as PPMVs.

†† Including antimalarials without source information and antimalarials sourced from home (n=172) as well as from grocery stores (n=9), CHWs (n=15) and other sources (n=13).

Supplementary Indicators

Table 5. Treatment-seeking behaviour

Primary treatment source and reason for seeking treatment at this source, among children with fever in the two weeks preceding the survey.

	Percentage of children
Source of treatment	%
Public health facility	16.3
Private health facility	5.1
Pharmacy‡	36.6
Grocery store	0.8
Community health worker	0.8
Other source	2.7
Treatment at home	31.3
Did not seek treatment	6.4
Number of children	3,240*
Reason for treatment source	
Close by or easy to reach	52.3
Reputation for quality treatment	20.1
Availability of inexpensive treatment	6.6
Availability of modern medicine	9.0
Felt illness did not merit more intensive care	7.8
Other	4.3
Number of children that sought treatment	3,098

‡ The pharmacy category includes registered pharmacies as well as drug shops

* Denominator is different from the number of children with fever due to missing data on primary source of treatment

Table 6. Demand for specific antimalarial drugs[†]

Percentage of children with fever in the two weeks preceding the survey whose caregiver reportedly requested an antimalarial treatment by name, among children that received an antimalarial treatment, by type of antimalarial acquired.

	Percentage of treated children who received an antimalarial requested by their caregiver	# of children treated
Type of antimalarial acquired	%	n
National first line [AL/ASAQ]	12.5	141
ACT	12.2	166
SP/Fansidar	25.9	99
Chloroquine	21.0	769
Artemisinin Monotherapy	23.8	63
Other antimalarial	29.8	66
All children	21.5	1,097*

[†] Categories are not mutually exclusive; first line treatment also falls within the ACT category, and n=66 children received more than one antimalarial

* Including cases with missing details on demand

Table 7. Relative number of antimalarial treatments acquired

Relative number of antimalarial treatments acquired for children under 5 with fever in the 2 weeks preceding the survey.

	Relative number of treatments	Number of treatments
AM type	%	n
First line treatment [AL]	8.1	105
First line treatment [ASAQ]	4.4	59
ACT	12.8	171
SP/Fansidar	7.2	102
Chloroquine	68.2	814
Artemisinin Monotherapy	6.3	64
Other antimalarial	5.5	68
Total		1,219*

*Categories are not mutually exclusive (first line treatment also falls within the ACT category).

Table 8. Caregiver knowledge and practices

Percentage of caregivers of children under 5 with fever in the two weeks preceding the survey who have correct knowledge of malaria symptoms and treatment, know of an outlet where antimalarials can be obtained, have heard of the most common ACT brand[‡].

	Percentage of caregivers
Malaria knowledge	%
Knows that fever is the main symptom of malaria in children under five	69.6
Knows to respond to fever the same or next day	96.1
Knows the full treatment dose is necessary for effectiveness	81.5
Knowledge of treatment source	
Knows where to obtain antimalarials for children under five	92.8
Knowledge of ACTs	
Names AL[†] as an antimalarial	6.9
Number of caregivers	2,833*

[†] Artemether Lumefantrine (Coartem, Arsuamoon or Larimal) is a national first-line antimalarial and Coartem is the most common ACT brand

* n=2,828 for responding to fever; n=2,794 for knowing full treatment dose is necessary; and n=2,755 for knowing a treatment source

Table 9. Caregiver beliefs on the most effective antimalarial treatment

Type of antimalarial identified by caregivers of children under-five with fever in the two weeks preceding the survey as most the effective treatment of malaria in children under five, pregnant women and adults.

	Percentage who cite antimalarial type for children under five	Percentage who cite antimalarial type for pregnant women	Percentage who cite antimalarial type for adults
Antimalarial type	%	%	%
First line treatment [AL]	4.3	1.0	2.0
ACT	4.9	1.2	2.8
SP/Fansidar	4.6	4.9	15.0
Chloroquine	32.7	5.0	18.4
Quinine	0.7	<0.01	0.3
Artemisinin Monotherapy	2.8	0.9	3.6
Other antimalarial	1.1	0.2	0.6
Non-antimalarial[‡]	12.8	13.4	12.9
Don't know	40.3	74.2	46.3
Number of caregivers	2,833	2,833	2,833

‡ Medicines identified by the caregiver that are not antimalarials including pain-relievers and fever-reducers

Determinants of Prompt Treatment of Fever in Children Under-five

Several potential determinants of prompt treatment seeking behaviour were explored in this study. Behavioural determinants were measured using scales or indices. Qualitative research among children's caregivers was conducted to identify behavioural determinants related to opportunity, ability and motivation to seek prompt and effective treatment for fever. Focus group discussions and individual in-depth illness narratives were conducted among children's caregivers to identify relevant determinants and develop scale and index items. Agreement with each scaled item statement was measured on a four-point likert scale (strongly agree, slightly agree, slightly disagree, strongly disagree). Determinants were pilot tested on 124 respondents and psychometric analyses were conducted to refine the scaled items further and ensure reliability of constructs. Scale development was guided by exploratory factor analysis (principal axis factoring with varimax rotation) and scale reliability was assessed using Cronbach's alpha. Mean scale item scores were created. Resulting determinants include:

- Perceived availability of antimalarial treatment in community
- Perceived affordability of antimalarials
- Beliefs and attitudes towards prompt and appropriate treatment-seeking behaviour
- Financial support to seek treatment for fever in children
- Self efficacy on identifying someone who has malaria and giving appropriate treatment to them
- Perceived threat that malaria posses to child health and survival
- Perceived severity of malaria

A summary of all scale items and properties is provided in Appendix D.

A logistic model included background characteristics of the household, caregiver, child and the potential determinants. Adjusted associations for each determinant were examined. The final model includes only those determinants with significant ($p<0.05$) or marginally significant ($p<0.10$) adjusted associations (see Table 10). Significant determinants include:

- **Availability of antimalarial treatment in community**: measured with 4 items (see Appendix D) assessing perceived ease of accessing treatment at different outlet types (e.g. drugs available in the neighbourhood/community, are easy to find, and easy to obtain)
- **Affordability of antimalarials**: measured with 4 items (see Appendix D) assessing caregiver perceived affordability of antimalarials.
- **Beliefs about modern versus traditional treatment**: measured with 4 items (see Appendix D) assessing caregiver beliefs on treatment of malaria with traditional treatments.
- **Beliefs about seeking treatment promptly**: measured with 4 items (see Appendix D) assessing caregiver beliefs around seeking treatment quickly when fever presents.

Predicted probability of treatment of fever with an antimalarial same/next day increased with increasing age. The results also suggest that availability of antimalarials in the community; beliefs and attitudes on treatment seeking by the caregivers significantly explain prompt treatment of fever in children under-five. Those who strongly agreed with these statements had a higher probability of treating fever with antimalarials same/next day. On the other hand, those who agreed with the statement that they can afford treatment were more likely to seek prompt treatment.
Probability of seeking prompt treatment was higher in the fourth and richest wealth quintiles and significantly different from the poor quintile. Those who live in the rural area were also more likely ($p<0.10$) to seek treatment compared to urban dwellers. This is also observed for caregivers with higher education (primary plus).

The adequacy of the logistic model was tested using *svylogitgof* – a goodness-of-fit procedure for sample survey data[3]

Table 10. Determinants of prompt treatment of fever in children under-five

Adjusted odds ratios predicting treatment of fever with an antimalarial drug the same or next day after onset of fever in children under-five with fever in the two weeks preceding the survey.

INDICATORS	Predicted probability		AOR (95% CI)
OPPORTUNITY			
Availability of antimalarials in community • Good malaria drugs are easy to obtain • Drugs to treat my children for malaria are always available from a place nearby • Drugs to treat my child for malaria are easy to find • Drugs to treat my child for malaria are always available in my community	Strongly disagree	0.21	1.20**(1.05, 1.36)
	Slightly disagree	0.24	
	Slightly agree	0.27	
	Strongly agree	0.31	
MOTIVATION			
Beliefs about modern versus traditional treatment • I normally use traditional medicine if a child has symptoms of fever (R) • Malaria can be treated with raw cow oil (mai-shanu) rubbed all over the body (R) • Local herbs are very effective for treating stubborn malaria (R) • I use local herbs to treat malaria	Strongly disagree	0.22	1.24***(1.11, 1.39)
	Slightly disagree	0.25	
	Slightly agree	0.29	
	Strongly agree	0.34	
Beliefs about seeking treatment promptly • When my child has symptoms of fever, I normally wait a few days to see if the symptoms disappear before seeking treatment (R) • I always seek treatment the same day I notice that my child has fever • It is OK to wait for about 3 to 4 days to observe my child's fever before treating for malaria (R) • When my child has fever, I usually wait a couple of days to see if the child improves before seeking treatment (R)	Strongly disagree	0.13	1.56***(1.32, 1.84)
	Slightly disagree	0.19	
	Slightly agree	0.26	
	Strongly agree	0.34	
POPULATION CHARACTERISTICS			
Age of child with fever	0.26		1.15**(1.05, 1.26)
Age of child's caregiver	0.26		1.01 (1.00-1.02)
Caregiver's education			
No education	0.23		Ref
Some primary	0.25		1.14 (0.77, 1.70)
Primary plus	0.32		1.67**(1.20, 2.33)
Wealth			
Poor	0.24		Ref
Second	0.25		1.05 (0.75, 1.46)
Middle	0.26		1.08 (0.72, 1.64)
Fourth	0.32		1.47*(1.00, 2.17)
Richest	0.37		1.85**(1.25, 2.74)
Residence			
Urban	0.26		Ref
Rural	0.31		1.31*(1.01,1.69)
Number of children	3,081		
F - Adjusted Mean Residual goodness of fit (df)	0.87 (12, 104)		
P- value	0.56‡		

‡ Model is adequate as examined by goodness-of-fit test (svylogitgof)

* p<0.05 ** p<0.01 *** p<0.001

Appendix A: Treatment-Seeking, Diagnosis & Treatment of Fever among People Age Five & Above

Data on people aged five and above who had fever in the two weeks preceding the survey was collected in eligible households (those with at least one child under five with fever in the two weeks preceding the survey). The relevant household member or his/her caregiver for this episode of fever completed the Treatment Seeking and Case Management module of the survey.

Table A 1. Treatment-seeking, diagnosis and treatment for fever among people age five and above

Percentage of people age five and above with fever in the two weeks preceding the survey who sought treatment for fever and received an antimalarial treatment. Median price paid for acquired antimalarial regimens *.

	Percentage of children age 5-14	Percentage of adults age 15+
Antimalarial treatment	%	%
Sought treatment	87.6	83.6
Received an antimalarial	23.3	27.4
Number of children/adults	444	585
	Median price [n] among children age 5-14	Median price [n] among adults age 15+
Median price paid in USD‡ for acquired antimalarial treatments	$	$
First line treatment [AL/ASAQ]	0.00[2]	6.08[5]
ACT	0.00[5]	4.48[13]
SP/Fansidar	0.64[28]	0.77[56]
Chloroquine	0.77[46]	0.96[56]
Artemisinin Monotherapy	2.24[6]	2.24[16]
Other antimalarials	2.56[4]	0.77[3]
All antimalarials	0.77[89]	0.96[144]

* Price for n=92 antimalarials was reported as "don't know"
# the pharmacy category includes registered pharmacies as well as PPMVs.
‡ 1 USD = 156.25 naira at the time of data collection

Table A 2. Relative numbers of antimalarials acquired for children age 5 to 14

Relative numbers of full-course antimalarial treatments acquired for children age 5 to 14 with fever in rural and urban areas, by antimalarial type.

	Urban		Rural		All antimalarials	
	Relative number	Number of treatments	Relative number	Number of treatments	Relative number	Number of treatments
Type of antimalarial	%	n	%	n	%	n
First line treatment [AL/ASAQ]	2.8	1	3.1	3	3.0	4
ACT	9.2	6	7.4	5	8.1	11
SP/Fansidar	24.4	12	19.4	18	21.3	30
Chloroquine	50.0	19	63.9	52	58.7	71
Artemisinin Monotherapy	13.5	5	4.7	3	8.0	8
Other antimalarial	2.8	1	4.6	4	4.0	5
Total		43*		82*		125*

*Categories are not mutually exclusive (first line treatment also falls within the ACT category).

Table A 3. Relative number of antimalarials acquired for people age 15 and above

Relative volumes of full-course antimalarial treatments acquired for people age 15 and above with fever in rural and urban areas, by antimalarial type.

	Urban		Rural		All antimalarials	
	Relative number	Number of treatments	Relative number	Number of treatments	Relative number	Number of treatments
Antimalarial type	%	n	%	n	%	n
First line treatment [AL]	5.0	5	1.0	2	2.9	7
ACT	10.2	9	11.4	12	10.8	21
SP/Fansidar	26.9	27	31.1	41	29.1	68
Chloroquine	35.3	28	41.2	53	38.4	81
Artemisinin Monotherapy	21.1	16	10.7	6	15.8	22
Other antimalarials	6.5	4	5.3	4	5.9	8
Total		84*		116*		200*

*Categories are not mutually exclusive (first line treatment also falls within the ACT category).

Appendix B: Price & Volumes Data for Antimalarials Acquired for Children under-Five in Rural & Urban Areas and by strata

Table B 1. Cost of antimalarial treatment for children under-five

Median price in USD‡ paid for a single antimalarial drug regimen acquired in urban and rural areas for a child with fever, among children under-five.*

	Median price [n] of antimalarials acquired in urban areas:							Median price [n] of antimalarials acquired in rural areas:						
	SP	CQ	Art-Mono	First Line [AL]	ACT	Other	All anti-malarials	SP	CQ	Art-Mono	First Line [AL]	ACT	Other anti-malarials	All AMs
Source of treatment	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Public health facility	-	0.64[27]	3.20[5]	2.56[12]	2.56[16]	1.76[2]	0.96[50]	0.96[4]	0.64[58]	0.96[4]	0.00[9]	1.92[11]	11.52[2]	0.64[79]
Pharmacy#	0.77[18]	0.83[71]	3.52[4]	3.52[7]	1.92[15]	1.60[7]	0.96[115]	1.28[21]	0.64[145]	3.84[6]	1.60[9]	1.60[14]	0.77[10]	0.77[196]
Private health facility	-	1.09[14]	-	1.60[3]	1.60[5]	6.40[3]	1.28[22]	2.24[3]	0.64[9]	5.12[3]	-	5.12[2]	-	0.96[17]
All sources††	0.96[28]	0.77[171]	2.56[18]	2.88[30]	1.92[51]	2.88[21]	0.96[289]	0.96[40]	0.64[306]	3.84[17]	1.28[23]	0.96[36]	1.92[21]	0.77[420]

‡ 1 USD = 156.25 naira at the time of data collection

* Price for n=510 antimalarials was reported as "don't know"; where source of antimalarial could be established - source could not be established for n=49 drugs as multiple sources of treatment were sought outside of the home.

The pharmacy category includes registered pharmacies as well as PPMVs.

†† Including antimalarials without source information as well as antimalarials that were acquired from home (urban n=81, rural n=90), grocery stores (urban n=2, rural n=7), CHWs (urban n=5, rural n=10) and other sources (urban n=3, rural n=10).

Table B 1. Cost of antimlarial treatment for children under-five

Median price in USD‡ paid for a single antimalarial drug regimen acquired in North Central and North East for a child with fever, among children under-five.*

	Median price [n] of antimalarials acquired in North Central:							Median price [n] of antimalarials acquired in North East:						
	SP	CQ	Art-Mono	First Line [AL]	ACT	Other anti-malarials	All anti-malarials	SP	CQ	Art-Mono	First Line [AL]	ACT	Other anti-malarials	All anti-malarials
Source of treatment	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Public health facility	0.61[2]	0.96[27]	4.48[3]	3.52[3]	3.52[5]	-	0.96[37]	-	0.77[13]	-	2.66[2]	0.51[3]	0.32[1]	0.64[17]
Pharmacy#	1.28[5]	0.64[41]	2.56[2]	0.70[2]	1.50[4]	4.32[2]	0.70[54]	0.96[2]	1.28[25]	2.56[1]	1.09[2]	1.09[4]	0.32[1]	0.96[36]
Private health facility	-	0.64[5]	-	-	-	-	1.60[7]	0.64[5]	2.18[2]	-	-	-	-	0.90[4]
	1.28[9]	0.64[99]	2.88[9]	1.28[5]	1.92[11]	4.32[2]	0.80[130]	0.96[10]	0.77[65]	2.56[1]	1.06[6]	1.06[10]	0.32[3]	0.77[89]

‡ 1 USD = 156.25 naira at the time of data collection

* Price for n=510 antimalarials was reported as "don't know"; where source of antimalarial could be established - source could not be established for n=49 drugs as multiple sources of treatment were sought outside of the home.

The pharmacy category includes registered pharmacies as well as PPMVs.

†† Including antimalarials without source information as well as antimalarials that were acquired from home (North Central n=19, North East n=16), grocery stores (North Central n=1, North East n=4), CHWs (North Central n=2, North East n=6) and other sources (North Central n=1, North East n=5).

Table B 1. Cost of antimalarial treatment for children under-five

Median price in USD‡ paid for a single antimalarial drug regimen acquired in North West and South East for a child with fever, among children under-five.*

	Median price [n] of antimalarials acquired in North West:							Median price [n] of antimalarials acquired in South East:						
	SP	CQ	Art-Mono	First Line [AL]	ACT	Other anti-malarials	All anti-malarials	SP	CQ	Art-Mono	First Line [AL]	ACT	Other anti-malarials	All anti-malarials
Source of treatment	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Public health facility	-	0.51[15]	2.56[3]	-	0.19[1]	-	0.51[19]	-	0.77[4]	-	0.00[6]	0.00[6]	11.52[1]	0.77[11]
Pharmacy#	-	0.58[24]	3.84[2]	-	0.51[1]	-	0.64[27]	3.84[14]	0.83[52]	3.84[3]	4.80[4]	3.84[5]	0.32[8]	0.77[82]
Private health facility	-	0.38[2]	5.12[1]	-	-	-	0.45[3]	-	0.77[3]	-	1.60[1]	6.40[3]	-	1.28[6]
All sources††	1.92[3]	0.51[53]	2.88[8]	0.00[1]	0.19[3]	1.92[1]	0.64[68]	0.64[19]	0.77[89]	1.92[5]	1.12[16]	0.96[21]	0.86[16]	0.77[150]

‡ 1 USD = 156.25 naira at the time of data collection

* Price for n=510 antimalarials was reported as "don't know"; where source of antimalarial could be established - source could not be established for n=49 drugs as multiple sources of treatment were sought outside of the home.

The pharmacy category includes registered pharmacies as well as PPMVs.

†† Including antimalarials without source information as well as antimalarials that were acquired from home (North West n=9, South East n=41), grocery stores (North West n=3, South East n=0), CHWs (North West n=1, South East n=3) and other sources (North West n=1, South East n=2).

Table B 1. Cost of antimalarial treatment for children under-five

Median price in USD‡ paid for a single antimalarial drug regimen acquired in South South and South West for a child with fever, among children under-five.*

	Median price [n] of AMs acquired in South South:							Median price [n] of AMs acquired in South West:						
	SP	CQ	Art-Mono	First Line [AL]	ACT	Other anti-malarials	All anti-malarials	SP	CQ	Art-Mono	First Line [AL]	ACT	Other anti-malarials	All anti-malarials
Source of treatment	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Public health facility	1.28[2]	1.15[15]	2.88[2]	2.56[5]	2.56[7]	-	1.22[26]	-	0.64[11]	6.40[1]	1.28[5]	1.28[5]	1.76[2]	1.28[19]
Pharmacy#	1.02[11]	0.96[51]	-	2.24[3]	1.60[9]	1.76[2]	1.02[75]	0.70[4]	0.77[23]	4.16[2]	3.52[5]	2.72[6]	2.50[2]	0.96[37]
Private health facility	2.24[1]	1.09[7]	-	1.28[1]	3.20[2]	7.78[4]	1.18[12]	-	0.96[4]	-	16.0[1]	8.70[2]	6.40[1]	1.41[7]
All sources††	1.02[20]	0.96[90]	3.07[3]	2.56[9]	1.76[20]	1.92[9]	1.06[142]	0.77[7]	0.77[81]	3.07[9]	3.65[16]	2.40[22]	3.20[11]	0.96[130]

‡ 1 USD = 156.25 naira at the time of data collection

* Price for n=510 antimalarials was reported as "don't know"; where source of antimalarial could be established - source could not be established for n=49 drugs as multiple sources of treatment were sought outside of the home.

The pharmacy category includes registered pharmacies as well as PPMVs.

†† Including antimalarials without source information as well as antimalarials that were acquired from home (South South n=26, South West n=60), grocery stores (South South n=0, South West n=1), CHWs (South South n=1, South West n=2) and other sources (South South n=2, South West n=2).

Table B 2. Relative numbers of antimalarials acquired in urban versus rural areas

Relative numbers of antimalarial treatments acquired for children under-five with fever in the 2 weeks preceding the survey.

	Urban		Rural	
	Relative numbers	Number of treatments	Relative numbers	Number of treatments
Antimalarial type	%	n	%	n
First line treatment [AL]	11.3	53	5.3	52
ACT	17.5	87	9.3	84
SP/Fansidar	8.0	43	6.6	59
Chloroquine	60.9	282	73.6	532
Artemisinin Monotherapy	8.1	36	5.0	28
Other antimalarial	5.6	29	5.5	39
Total		477*		742*

*Categories are not mutually exclusive (first line treatment also falls within the ACT category).

Table B 2. Relative numbers of antimalarials acquired in the different geo-political zones

Relative numbers of antimalarial treatments acquired for children under-five with fever in the 2 weeks preceding the survey.

	North Central		North East	
	Relative numbers	Number of treatments	Relative numbers	Number of treatments
Antimalarial type	%	n	%	n
First line treatment [AL]	4.2	10	9.6	16
ACT	10.1	24	15.6	26
SP/Fansidar	5.9	14	10.2	17
Chloroquine	74.8	178	70.7	118
Artemisinin Monotherapy	7.1	17	1.2	2
Other Antimalarial	2.1	5	2.4	4
Total		238*		167*

*Categories are not mutually exclusive (first line treatment also falls within the ACT category).

Table B 2. Relative numbers of antimalarials acquired in the different geo-political zones

Relative numbers of antimalarial treatments acquired for children under 5 with fever in the 2 weeks preceding the survey.

	North West		South East	
	Relative numbers	Number of treatments	Relative numbers	Number of treatments
Antimalarial type	%	n	%	n
First line treatment [AL]	5.3	9	11.9	30
ACT	7.7	13	17.1	43
SP/Fansidar	4.7	8	11.9	30
Chloroquine	76.9	130	57.5	145
Artemisinin Monotherapy	7.7	13	4.4	11
Other Antimalarial	3.0	5	9.1	23
Total		169*		252*

*Categories are not mutually exclusive (first line treatment also falls within the ACT category).

Table B 2. Relative numbers of antimalarials acquired in the different geo-political zones

Relative numbers of antimalarial treatments acquired for children under 5 with fever in the 2 weeks preceding the survey.

	South South		South West	
	Relative numbers	Number of treatments	Relative numbers	Number of treatments
Antimalarial type	%	n	%	n
First line treatment [AL]	7.3	14	12.9	26
ACT	15.6	30	17.4	35
SP/Fansidar	12.0	23	5.0	10
Chloroquine	62.0	119	61.7	124
Artemisinin Monotherapy	2.6	5	8.0	16
Other Antimalarial	7.8	15	8.0	16
Total		192*		201*

*Categories are not mutually exclusive (first line treatment also falls within the ACT category).

Appendix C: Demographic Characteristics

Table C 1. Demographic characteristics

Characteristics of children under-five with fever in the two weeks preceding the survey, of children's caregivers, and of households

	Percentage of children under 5	Percentage of people age 5+	Percentage of caregivers‡
Residence	%	%	%
Rural	64.6	69.9	64.1
Geo-political Zone	%	%	%
North Central	16.2	13.8	16.6
North East	17.9	26.3	17.5
North West	17.1	15.7	17.1
South East	17.0	18.2	16.3
South South	16.5	15.3	16.3
South West	15.4	10.7	16.3
Household wealth index			
Lowest	19.8	-	-
Second	20.4	-	-
Middle	20.6	-	-
Fourth	19.6	-	-
Highest	19.7	-	-
Age in years			
Infants (<1 year)	20.5	-	-
1	19.5	-	-
2	21.4	-	-
3	19.9	-	-
4	18.8	-	-
5-14	-	43.5	0.5
15-24	-	16.1	24.1
25-34	-	20.7	49.1
35-44	-	11.3	19.2
45-54	-	5.0	5.0
55+	-	3.4	2.2
Sex			
Female	48.5	-	100
Education			
No education	-	-	32.7
Some primary	-	-	8.1
Primary or higher	-	-	59.2
Total Number	3,274		2,833

* Caregiver education n=2,811; Caregiver age n=2,828; wealth 3,155 for children below five with fever and their caregivers

‡ Caregiver's of children under-five with fever

Appendix D: Behavioral Determinants, Scale Items & Scale Properties

Scale Items	Scale Properties
Availability of Antimalarials in community	
Good malaria drugs are easy to obtain	Cronbach's Alpha: 0.91 Range: 1-4 Mean (SD): 3.19 (0.85) Median: 3.50
Drugs to treat my children for malaria are always available from a place nearby	
Drugs to treat my child for malaria are easy to find	
Drugs to treat my child for malaria are always available in my community	
Affordability of malaria treatments	
It is expensive to obtain malaria drugs (R)	Cronbach's Alpha: 0.85 Range: 1-4 Mean (SD): 2.14 (0.86) Median: 2.00
Good malaria drugs are very cheap in my neighborhood	
It is expensive to treat malaria (R)	
Malaria drugs are expensive (R)	
Belief on treatment	
I normally use traditional medicine if a child has symptoms of fever (R)	Cronbach's Alpha: 0.84 Range: 1-4 Mean (SD): 2.74 (0.97) Median: 2.75
Malaria can be treated with raw cow oil (mai-shanu) rubbed all over the body (R)	
Local herbs are very effective for treating stubborn malaria (R)	
I use local herbs to treat malaria (R)	
Personal attitudes about treatment seeking	
When my child has symptoms of fever, I normally wait a few days to see if the symptoms disappear before seeking treatment (R)	Cronbach's Alpha: 0.82 Range: 1-4 Mean (SD): 3.30 (0.74) Median: 3.50
I always seek treatment the same day I notice that my child has fever	
It is OK to wait for about 3 to 4 days to observe my child's fever before treating for malaria (R)	
When my child has fever, I usually wait a couple of days to see if the child improves before seeking treatment (R)	
Perceived severity of malaria	
Early treatment of malaria reduces treatment costs	Cronbach's Alpha: 0.80 Range: 1-4 Mean (SD): 3.73 (0.42) Median: 4.00
Early treatment of malaria reduces the likelihood of severe malaria	
Delayed treatment of malaria will lead to severe malaria	
Early treatment of malaria reduces the length of illness	
Self efficacy	
I cannot identify the symptoms of malaria in my child (R)	Cronbach's Alpha: 0.70 Range: 1-4 Mean (SD): 3.16 (0.71) Median: 3.25
I do not know what to do when my child has malaria (R)	
I do not have transport to treat my child's fever quickly (R)	
I do not always understand the instructions to treat my child (R)	

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