RAPID IMPACT ASSESSMENT OF ANTIMALARIA INTERVENTIONS IN NIGERIA

National Malaria Elimination Programme

FEDERAL MINISTRY OF HEALTH ABUJA, NIGERIA

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The Nigeria Rapid Impact Assessment (RIA) was carried out in 36 states and the Federal Capital Territory (FCT) to assess and quantify the impact of the scale up of interventions; artemisinin-based combination therapies, long lasting insecticidal nets and indoor residual spraying; on malaria morbidity and mortality between 2003 and 2013.

We would like to express our gratitude to the Honourable Minister of Health, Prof. Isaac Adewole, the Honourable Minister of State for Health, Dr. E. Osagie Ehanire, the Permanent Secretary, Mrs Binta Adamu Bello and the Director of Public Health, Dr. Evelyn Ngige for their encouragement and support.

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List of Acronyms

ACT	Artemisinin based Combination Therapy
ACSM	Advocacy Communication and Social Communication
ANC	Ante-Natal Care
BCC	Behaviour Change Communication
DfID	Department for International Development (UK)
DHIS	District Health Information System
DPH	Department of Public Health
EPI	Expanded Programme on Immunisation
FCT	Federal Capital Territory
FMOH	Federal Ministry of Health
FGN	Federal Government of Nigeria
GF	Global Fund
GFATM	Global Fund to Fight AIDS, TB and Malaria
GH	General Hospital
HF	Health Facility
IDSR	Integrated Disease Surveillance and Response
IPD	Inpatient Department
IPT	Intermittent Preventive Therapy
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Net
IVM	Integrated Vector Management
LGA	Local Government Area
LLIN	Long lasting Insecticidal Net
MAPS	Malaria Action Programme for States
M & E	Monitoring and Evaluation
MIP	Malaria in Pregnancy
MIS	Malaria Indicator Survey
NDHS	Nigeria Demographic and Health Survey

NHMIS	National Health Management Information System
NPHCDA	National Primary Health Care Development Agency
NMEP	National Malaria Elimination Programme
NMEF	National Monitoring and Evaluation Framework
NMSP	National Malaria Strategic Plan
OPD	Outpatient Department
PHC	Primary Health Care/Centre
PMI	President's Malaria Initiative
PMV	Patent Medicine Vendors
PSM	Procurement and Supply Chain Management
RBM	Roll Back Malaria
RDT	Rapid Diagnostic Test
RIA	Rapid Impact Assessment
SHMB	State Hospital Management Board
SP	Sulphadoxine/Pyrimethamine
SPR	Slide Positivity Rate
SMOH	State Ministry of Health
SUFI	Scaling Up for Impact
SuNMaP	Support to National Malaria Programme (DfID funded project)
UNICEF	United Nations Children's Fund
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WHO	World Health Organization

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EXECUTIVE SUMMARY

The government of Nigeria and its partners have deployed multiple malaria prevention and treatment interventions since 2005. This was massively scaled up from 2009 to 2013 across all regions in the country. Artemisinin-based combination therapy (ACTs), malaria rapid diagnostic test (RDTs) and Long Lasting Insecticidal Nets (LLINs) were massively distributed across all states in the federation with support from donors such as the Global Fund, World Bank, United Kingdom Department of International Development (DFiD) and the United States' President's Malaria Initiative (PMI). The large population of Nigeria and its diverse and complex operational system did not allow any of these interventions to reach universal coverage about the same time in all states of the Federation. However, available data shows significant coverage between 2009 to 2013.In order to measure impact of antimalarial interventions on the trends in malaria morbidity and mortality, the National Malaria Elimination Programme of the Federal Ministry of Health in collaboration with World Health Organization and Global Fund conducted a Rapid Impact Assessment (RIA).

Malaria interventions and trends in malaria cases and deaths were assessed at public secondary level hospitals in malaria transmission areas during 2007–2013. Data on total outpatient and inpatient cases including deaths were collected including malaria cases and deaths. This study found that proportion of outpatient attendance due to confirmed malaria was 21% among the general population and 32% among children under five of age. Results from the study showed evidence of a decline in the rate of outpatient malaria cases from 2009 to 2012, however cases sharply increased from 2012 to 2013. Further investigation may be needed to highlight the possible causes.

On the other hand, malaria mortality consistently reduced over time by 18% and this cuts across the general population and among children under five years of age. Similar decrease was also reported from non-malaria death, showing comparable trend observed in the decreased under-five mortality rate reported in the 2013 national demographic health survey.

This study has various limitations which allowed descriptive analysis of the data only and also call for caution in extrapolating the result of this finding to the whole nation. Primary health care centres (PHCs) and private health facilities were excluded from the study because of lack of historical data to calculate trends, including limited inpatient services rendered at this level; although substantial interventions were deployed at PHC level. Likewise, there were issues with quality of data collection and documentation at the health facilities which must be addressed if Nigeria intends to continue using this methodology to evaluate impact of malaria interventions.

1. INTRODUCTION

Nigeria is in the West African sub-region, bordered by Niger in the north, Chad in the northeast, and Cameroon in the east, and Benin in the west. To the south, Nigeria is bordered by approximately 850 kilometres of 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 fourth largest country in Africa. Nigeria has a tropical climate, wet and dry seasons associated with the movement of the two dominant winds- the rain-bearing south-westerly winds and the cold, dry, and dusty north-easterly winds, commonly referred to as harmattan. The dry season occurs from October to March, with a spell of coolness accompanied by the dry, dusty harmattan wind, felt mostly in the north in December and January. The wet season occurs from April to September. The temperature in Nigeria oscillates between 25°C and 40°C, and rainfall ranges from 2,650 millimetres in the southeast to less than 600 millimetres in some parts of the north, mainly on the fringes of the Sahara Desert. The vegetation that results from these climatic differences ranges from Mangrove swamp forest in the Niger Delta to Sahel grassland in the north.

Nigeria has a population of about 198 million[1] with 36 States plus the Federal Capital Territory (FCT), comprising of 32.6 million children under-5 years of age and estimated 8.2 million pregnant women.

1.1. Nigeria Health System

Administratively, the political structure of Government has three tiers, namely; Federal, State and Local Government Authorities. In the same vein, the public health services are organized along the same tiers of Government as follows:

- Tertiary Health Care provides highly specialized services to patients referred from the primary and secondary levels of care and is the sole responsibility of the Federal Government. *(Revised National Health Policy, 2004)*
- Secondary Health Care provides specialized services to patients referred from the primary health care level and is the responsibility of the state government, with oversight from the federal level;

[1] Projected from 2006 National Population Census

- Primary Health Care (PHC), is largely the responsibility of the Local Government Area (LGA), with the support of the State and Federal Governments;

In addition to the public health sector, Nigeria has a viable private health sector that provides various health care services ranging from primary to tertiary. These include private, not-for-profit sector, notably Non-Governmental Organizations (NGOs); including religious organizations, individuals, and the profit sector, which is dominated by private hospitals, clinics and registered drug shops.

Malaria control is incorporated into the existing health care delivery system. Malaria prevention and treatment interventions are delivered through every available outlet where health services are provided in Nigeria. These include community outreach services, commercial outlets, school health services and all levels of health facilities in the country. A lot of interventions have also gone into strengthening the health system; program management, social and behaviour change communication (SBCC), health management information system; in support of stronger malaria control in Nigeria.

1.2. Burden of Malaria in Nigeria

Malaria is endemic and a major public health problem in Nigeria. The global burden of malaria mortality is heavy in sub-Saharan African; Nigeria and the Democratic Republic of Congo accounts for 35% of global malaria deaths[2]. Malaria-related deaths are responsible for up to 11 percent of maternal mortality, and contribute up to 25 percent of infant mortality as well as 30 percent of under-5 mortality resulting in about 300,000 childhood deaths annually[3]. The disease also exerts a huge social and economic burden on families, communities, and the country at large, resulting in an annual loss of approximately 132 billion Naira as payments for treatment and prevention as well as hours not at work.

The geographic location of Nigeria makes the climate suitable for malaria transmission throughout the country. It is estimated that up to 97 percent of the population is at risk of getting malaria. The remaining 3 percent of the population, who live in the mountains at an altitude ranging from 1,200 to 1,400 metres, are at relatively low risk for malaria. The seasonality, intensity and duration of the malaria transmission vary according to the five

[2] World Malaria Report 2015

[3]FMOH, 2009

ecological strata that extend from the South to North[4]. These include: Mangrove swamps, Rainforest, Guinea-savannah, Sudan-savannah and Sahel-savannah. The duration of the malaria transmission season decreases as one moves from the South to the North (figure 1.1), being perennial in duration in most of the South but lasting three months or less in the North-eastern region bordering Republic of Chad. Malaria risk map developed in 2013 shows a reduction from hyper/holoendemic to mesoendemic epidemiologic pattern in 2010[5].

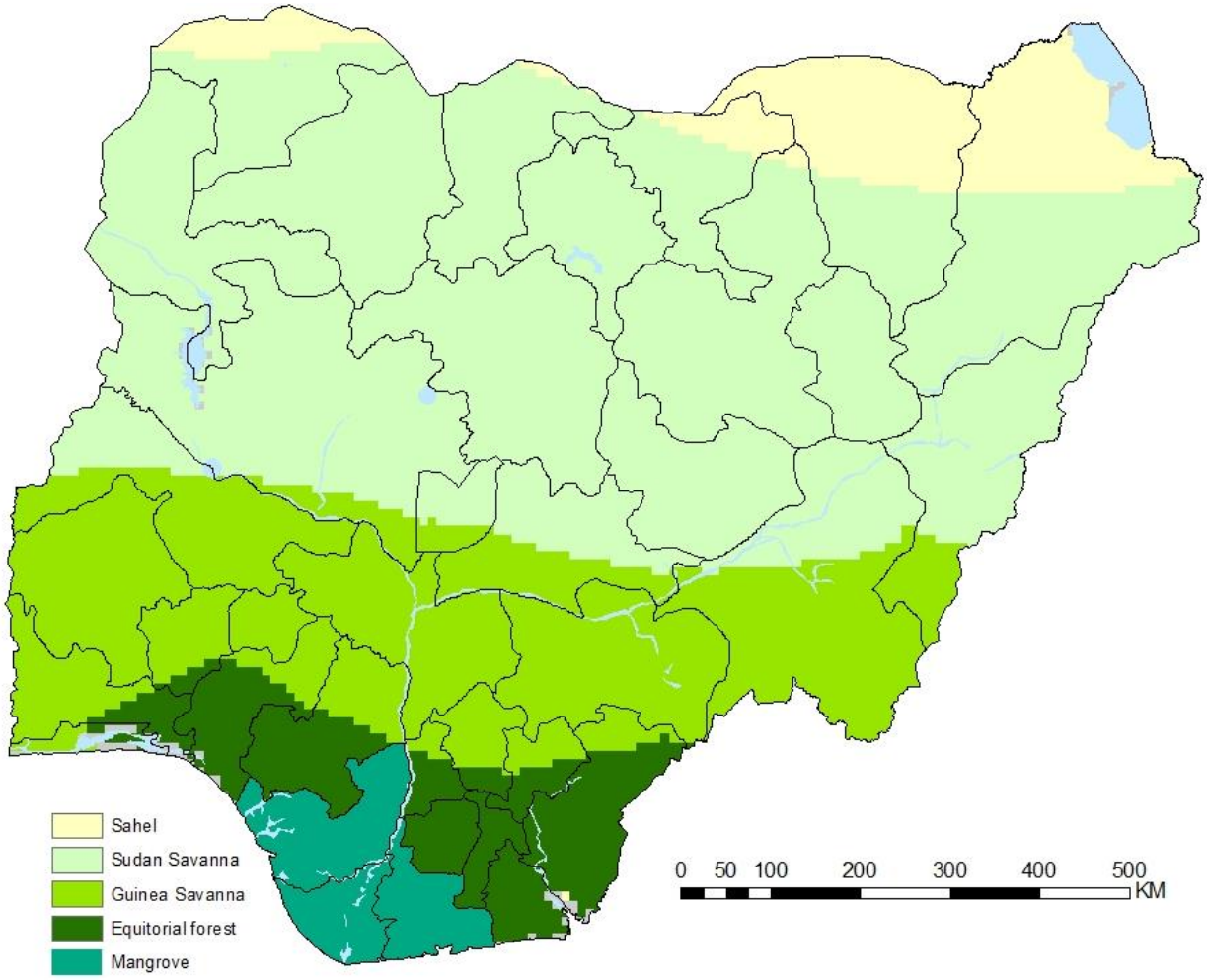


Figure 1.1 Map of Nigeria showing the various ecological zones.

[4]MARA/ARMA 2000

[5] NMCP et al. 2013

Sahel Savannah: This is the last vegetation belt to the north of Nigeria with proximity to the fringes of the fast-encroaching Sahara Desert. It is located in the extreme north-eastern part of the country, close to Lake Chad, where the dry season lasts for up to 9 months and the total annual rainfall is hardly up to 700mm. The Lake Chad basin, with its seasonally flooded undulating plains, supports a few tall trees. At the same time, the drainage system of rivers and streams into the Lake Chad basin has favoured irrigation, without which cultivation would be virtually impossible.

Sudan Savannah: This vegetation belt is found in the north-west stretching from the Sokoto plains in the west, through the northern sections of the central highland. It spans almost the entire northern states bordering the Niger Republic and covers over one quarter of Nigeria's total area. The low annual rainfall of usually less than 1000 mm and the prolonged dry season (6-9 months) sustain fewer trees and shorter grasses than the Guinea savannah. It is by far the most densely human populated zone of northern Nigeria.

Guinea Savannah: The Guinea Savannah, located in the middle of the country, is the most extensive vegetation belt in Nigeria, covering near half of the country. It extends from Ondo, Edo, Anambra and Enugu States in the south, through Oyo State to beyond Zaria in Kaduna State. It is occasioned by the local climatic conditions of low rainfall and long dry periods. The Guinea savannah, with its typically short trees and tall grasses, is the most luxuriant of the savannah vegetation belts in Nigeria.

The Tropical Evergreen Equatorial Rainforest: This is a belt of tall trees with dense undergrowth of shorter species dominated by climbing plants. The prolonged rainy season, resulting in high annual rainfall above 2000mm in this area, ensures adequate supply of water and promotes perennial tree growth. This luxuriant vegetation belt stretches from the western border of Nigeria with Benin Republic, through a narrow stretch on the Niger-Benue river system into the extensive area in the south-east of the country.

The Mangrove: Saline Water Swamp:** This vegetation type is restricted to the coastal strip, which varies in width from less than 1.5km in the Badagry and Lekki peninsula areas to over 50km in the Sapele area. It is pronounced where the fresh water from the rivers meets and mixes with the salt water from the sea, forming brackish swamps. The low-lying nature of the Nigerian coastal zone allows for the influx of saline water through tidal movements into the lagoons, creeks and extensive brackish wetlands. This has

encouraged the growth of different species of mangrove vegetation, typical in the wetlands of the backshore areas.

Freshwater Swamp Forest: This vegetation belt, on freshwater wetlands, occurs further inland beyond the reach of tidal waters. Here, there is an enormous supply of freshwater from the inland rivers and run-off from abundant rainfall in the area. The major drainage systems, from west to east, are the Ogun, Benin, Imo, Niger Delta and Cross River, which deposit vast quantities of silt, mud and sandy materials into this area. It is a low-lying region, with hardly any part rising over 30m thus, it facilitates the development of freshwater swamps along the Niger Delta, drowned estuaries, lagoons and creeks[6].

The dominant vector species in Nigeria are the *Anopheles gambiae* species and the *A. funestus* group with some other species playing a minor or local role. The most prevalent species of malaria parasites in Nigeria is *Plasmodium falciparum* (>95 percent) which is responsible for the most severe forms of the disease. The other types found in the country, *Plasmodium ovale* and *Plasmodium malariae,* play minor role. *Plasmodium malariae* is commonly isolated from children with mixed infections.

1.3. Malaria Control Efforts

The National Malaria Elimination Programme (NMEP) is domiciled in the National Malaria and Vector Control Division, which is a division in the Department of Public Health of the Federal Ministry of Health, Nigeria. NMEP has the leading role of overseeing and coordinating efforts to control malaria. NMEP and its development partners have made concerted efforts to scale-up key antimalarial interventions in the country.

Over 57 million LLINs were distributed between 2009 and 2013 through mass campaigns to achieve universal coverage. Before this time, Insecticide Treated Nets were provided to children under 5 years and pregnant women in selected areas in the Country through stand-alone campaigns, integrated campaigns with EPI and routine distribution in ANC settings.

In 2011, following the recommendations of WHO to ensure parasitological diagnosis of fever cases before treatment, Nigeria updated the National Guidelines for Diagnosis

[6] http://www.onlinenigeria.com/links/adv.asp?blurb=70#ixzz31UmYQWmf accessed 23/01/2017

and Treatment of Malaria to reflect priority for parasite based diagnosis. Diagnosis through Rapid Diagnostic Test (RDTs) Kits was introduced to supplement malaria microscopy at facility level both in public and private settings. The availability of RDTs is still limited in most states as there are frequent stock outs and therefore the practice of presumptive treatment may occur in these settings.

Access to prompt diagnosis and treatment of malaria cases has been scaled up since 2008 when the focus shifted from providing Artemisinin-based Combination Therapies (ACTs) to the biologically vulnerable groups to all populations at risk of Malaria. Prior to 2008, the recommended medicines for the treatment of uncomplicated malaria were changed from Chloroquine and Sulphadoxine Pyrimethamine as first line drugs to the more effective ACTs. This was necessitated due to evidence of widespread *P. falciparum* resistance strains to these conventional drugs. Over 200 million doses of ACTs have been distributed through public health facilities and Private Sector Co-payment Mechanism (PSCM) formerly known as Affordable Medicine Facility-Malaria (AMFm) since 2006.

Parenteral quinine has been the recommended medicine for the treatment of severe malaria at secondary and tertiary facilities and therefore is not part of medicines distributed at programme level. In line with WHO recommendations, Intravenous Artesunate was favoured as the drug of choice for severe malaria. Like Quinine, IV Artesunate is not distributed as part of programme level medicines.

Indoor Residual Spraying(IRS) as a vector control intervention has been implemented in very limited scale in nine states in Nigeria. These states are Jigawa, Gombe, Rivers, Bauchi, Anambra and Akwa Ibom supported by the Malaria Control Booster Project; four LGAs in Nasarawa State supported by PMI/USAID and seven LGAs in Lagos State funded by the Lagos State Government.

There has been a corresponding vibrant investment in behavioural change communication and social mobilization activities to create demand for malaria preventive and treatment services across the whole country especially for LLINs, RDT and ACTs.

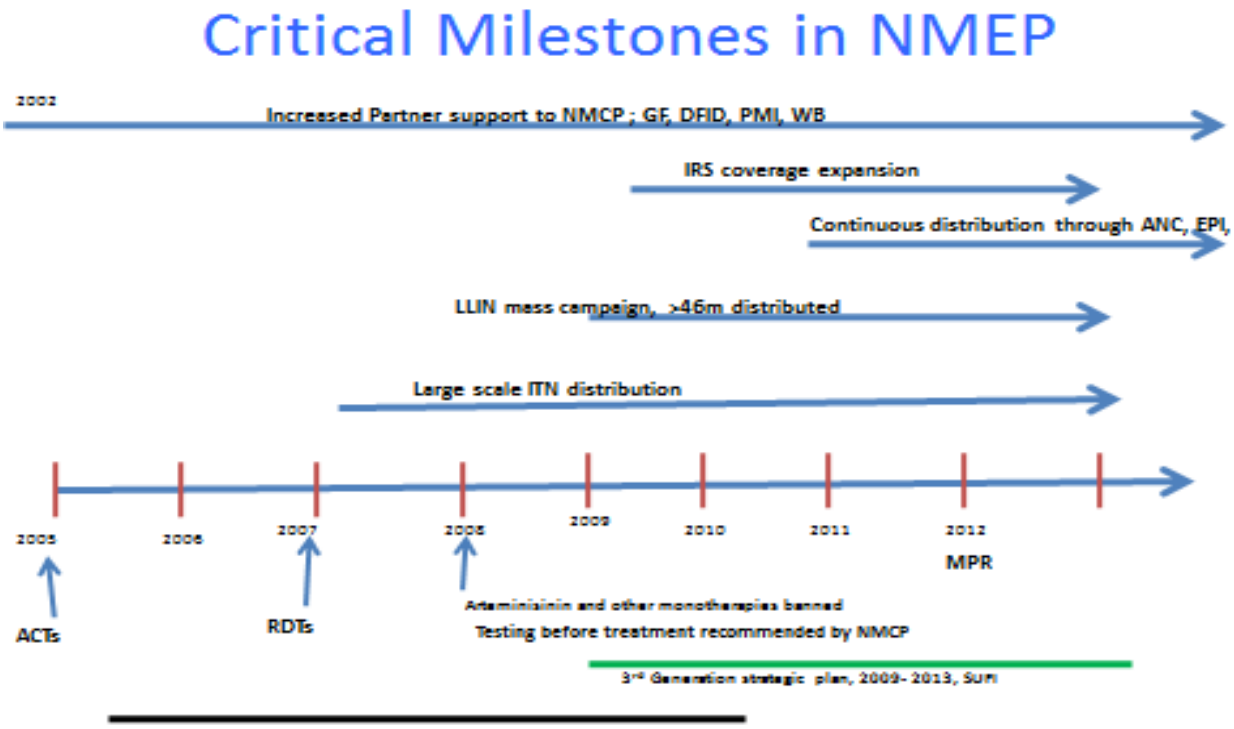


Figure 1.2. Critical Milestones in National Malaria Eradication Program of Nigeria

Nigeria has implemented three comprehensive National Malaria Strategic Plan for malaria control; the first spanned from 2001- 2005 followed by the second,2006 – 2010 and a third, 2009 - 2013. Presently a new National Malaria Strategic Plan that spans 2014 – 2020 has been developed. The goal of the current 2014-2020 Malaria Strategic Plan is to reduce malaria burden to pre-elimination levels and bring malaria-related mortality to zero through various interventions, namely:

- Prompt diagnosis and treatment with effective medicines (ACTs)
- Distribution of insecticide-treated nets (ITNs) to achieve universal coverage
- Indoor residual spraying (IRS)
- Laval source management – Larviciding and Environmental Management
- Prevention of malaria in pregnancy through intermittent preventive treatment (IPT) and

- Other cross cutting interventions includes Advocacy, Communication and Social Mobilization, Procurement and Supply Chain Management, Monitoring and Evaluation, Partner Coordination and Inter-Sectoral Collaboration.

Despite the huge resources invested in the malaria programme with resulting increase in the coverage and access to antimalarial interventions in Nigeria, it has been difficult to show evidence of impact of these intervention using routine health data. The malaria programme harmonized the programme-specific indicators with the National Health Management Information Systems (NHMIS) in 2013. Data reported through the District Health Information Software (DHIS) from the health facilities can now be viewed and analysed at the national level. However, data from routine NHMIS is not sufficient for malaria surveillance in the country because implementation of the NHMIS is currently limited mainly to primary health facilities, few secondary health facilities and no tertiary health facility. Available malaria indicators are also limited and reporting is sub-optimal.

1.4. Justification and Objectives

In order to measure trend of impact of antimalarial interventions, theme in collaboration with WHO and Global Fund conducted a Rapid Impact Assessment (RIA) using the WHO RIA tool[7] to assess the impact of the scale-up of interventions (ACT, LLINs) and IRS in few LGAs, on the trend in malaria morbidity and mortality between 2003 and 2013.The assessment also highlights areas for improvement in the use of RIA for evaluation.

The general objectives of Rawer to:

- Use facility-based inpatient and outpatient malaria cases and death data to document trends in malaria infection from 2003 to 2013.
- Demonstrate the use of routine malaria surveillance and logistics data for programme management and evaluation of malarial interventions in Nigeria

Specific objectives were to:

- Collect and analyse outpatient and inpatient data for patients under 5 years and 5 years and above age groups from 2003 to 2013 from sample health facilities

[7] Attached in addition to this report as a separate tool

- Collect and analyse state level intervention activities from 2006 to 2013 and stock out of antimalarial medicines
- Relate coverage of interventions to the observed trends in malaria cases and deaths from sampled facilities

2.0 METHODOLOGY

The RIA looked for health impact due to malaria intervention in communities with sufficiently large intervention by analysing morbidity and mortality data from health facilities with data on malaria interventions. Health facility data was used as proxy for population disease burden. Studies have shown that disease burden at health facilities reasonably reflect disease burden in the community they serve. Although absolute levels may differ, disease trends observed in health facilities often reflect disease trends in the community.

2.1. Study Population

All populations at risk of malaria that accessed health care services within the period of the study in the selected health facilities were targeted. They were classified into general population, children under five years; and five years and above.

2.2. Study Sites

All the thirty-six states and the Federal Capital Territory were included in this study. However, data were collected for 12 states in 2014 while data for another 24 states and the FCT were collected in 2015. All the states in Nigeria lie within the six ecological zones described above (see also figure 1.1 and Annex 1&2). The frequency and intensity of transmission of malaria varies with the ecological zones in which the vector exist. The geographic variation in the intensity of malaria transmission is of prime importance for development of appropriate control measures.

2.3. Sampling Method

This was a non-experimental study that used the plausibility approach to demonstrate linkages between trends in morbidity and mortality and malaria control interventions. Historical data in selected secondary facilities were retrieved from 2003 to 2013, being the period of progressive roll out of malaria control interventions in Nigeria.

Study Questions

i. Has malaria morbidity and mortality decreased from 2003 – 2013
ii. Does the scale-up of malaria control interventions between have any impact on malaria cases and deaths?
iii. How has the scale up of interventions impacted the malaria burden in Nigeria?

2.4. Eligibility criteria

Secondary health facilities where parasitological diagnoses of malaria are conducted were eligible for the study. These include public secondary and comprehensive health centres. Primary health facilities were excluded from the study because malaria cases were treated based on presumptive diagnosis until 2010 when RDTs were introduced at this level of care. Historical data with confirmed malaria cases were therefore not available. In addition, primary health facilities provide limited inpatient services so relevant data will not be available at this level.

2.5. Sample size

In each state, all public secondary health facilities (including cottage hospitals, some Military heath facilities), Comprehensive Health Centres and a Research Institute where parasitological diagnoses of malaria were carried out were visited. However, in some LGAs in Plateau State where public secondary facilities were not available, private secondary health facilities were visited. The list of hospitals was drawn from the States Hospital Management Board (SHMB). Although it was desirable that all private secondary facilities in the states are also included, however, the limited resources available for the survey and the paucity of information regarding most of these facilities could not allow for this.

A total of 985secondary health facilities were listed to be sampled. Annex 2 shows the number of eligible health facilities in the selected states that were visited.

2.6. Data Management

Data collection

Data on malaria were retrieved from various primary data sources from relevant departments with the support of hospital medical record officer of each facility. The main source of information was the Monthly Summary Record (MSR) however where this was incomplete or not available, outpatient department (OPD) registers, Inpatient registers, patient folders, laboratory registers were used. The pharmacy records were used to elicit stock out while state and LGA reports on prevention and treatment of

malaria were also used to collect programmatic report to ascertain type and timing of malaria interventions.

Table 2.1: Information from secondary health facilities

Indicators	Age group	Source
Total monthly inpatient all-cause cases	<5 years, 5 years +	Inpatient register
Total monthly inpatient malaria cases	<5 years, 5 years +	Inpatient register
Total monthly inpatient anaemia cases	<5 years, 5 years +	Inpatient register
Total monthly inpatient all -cause deaths	<5 years, 5 years +	Inpatient register
Total monthly inpatient malaria deaths	<5 years, 5 years +	Inpatient register
Total monthly outpatient all-cause cases	<5 years, 5 years +	Outpatient register
Total monthly outpatient malaria cases (probable or clinical plus confirmed)	<5 years, 5 years +	Outpatient register
Total monthly examined (tested) cases	All age	Outpatient register
Total monthly confirmed (positive)	All age	Outpatient register
Monthly ACT stock status (Yes, No)	By 4 age category	Pharmacy or dispensary records
Total monthly inpatient malaria-in-pregnancy cases	Pregnant women	Inpatient register
Total monthly outpatient malaria-in-pregnancy cases	Pregnant women	Outpatient register

A WHO tool was adapted for use for this survey and this has 6 sections (Annex 4)

Section A: Background data

Section B: Intervention data

Section C: Stock out data

Section D: Laboratory results

Section E: Outpatient data; all-cause cases

Section F: Inpatient data; admission, deaths, anaemia, all-cause cases

Data Cleaning

Data collected from facilities/LGAs/States were merged into one country database spreadsheet. Data cleaning and compilation was first done to normalize the data by indicator, age group, facility, LGA, endemicity etc. Facilities with large missing data for

the time period under study were excluded from the analysis and used as "non-response" during data analysis. However, facilities with few data missing were used but data were smoothened by use of averages of available data to extrapolate data for the missing years. Filters were used to identify missing values while variables were used to assess the availability of data in each submission. Pivots tables, box plots and direct visual were used to identify outliers. Figures from the identified outliers were then crosschecked from the hard copies submitted for correction or deletion where necessary. In an effort to ensure quality, only facilities with at least 6 months' data on inpatient malaria for children under-5 for the last consecutive 7 years were included in the analysis. This cleaning reduced usable hospital data from 2007 to 2013 instead of 2003 to 2013. However, intervention data from 2006 to 2013 were available and analysed.

Data analysis

LLINs distribution data collected from the LGAs was found to be grossly inadequate and incomplete. Therefore, national LLIN distribution data obtained from NMEP was used instead of data from the LGAs as stated in the protocol. The proportion of the population potentially protected by LLINs in a given year was calculated based on a net useful life of 3 years and protection of 1.8 persons[8] (number of LLINs distributed during the 3-year period *1.8/population). Days-of-stock data collected by facilities were more representative and complete; and were used to calculate proportion of facilities with stock of ACTs, IV Artesunate and Quinine by year. Hospital surveillance data were further analysed for trends by eco-zones and national average. LGA population was used to calculate rates of morbidity and mortality per 100,000 populations. 2009 was used as a break point, hence 2007-2009 were classified as pre-intervention years while 2010-2013as post intervention period.

2.7. Survey Implementation

A one-day training of trainers was conducted to acquaint the state coordinators and their assistants with the tools. A total of twenty facilitators were trained. Step down two-day training was conducted for the data collectors and supervisors on the use of the

[8] World Health Organization. Estimating population access to ITNs versus quantifying for procurement for mass campaigns. Geneva, 2014. www.who.int/malaria/publications/atoz/who-clarificationestimating-population-access-itn-mar2014.pdf

survey tools and protocol. Thirty-nine teams made up of 3 personnel per team consisting of 2 data collectors and 1 supervisor were trained. Each team worked with one medical record officer at each site for data collection. The number of teams per state depended on the number of facilities in each state.

Field testing of the survey instrument was done during the RIA 2014 in order to validate the data collection instrument and assess the feasibility of conducting the study. Three General Hospitals (Bwari, Kubwa and Gwarinpa) were used for the tool validation. Based on the findings from the field test, additional adjustment to the survey instruments was made and the instruments were finalized.

Each state had a Coordinator whose responsibility was to coordinate all RIA activities in the state. At the end of field data collection, each state coordinator submitted both hard and electronic copies as well as the report of the activity to the central coordinator.

2.8. Ethical Considerations

Ethical clearance was obtained for this study from the National Health Research Ethics Committee (NHREC). Consent letters were given to the management of each secondary facility visited for endorsement before data were collected from various relevant departments of the facility. No personal identifiers were used in the study.

2.9. Study Limitation

This study provides information on trend of malaria morbidity and mortality and is somewhat useful to see how interventions provided over the years have affected the burden of malaria. However, some results of the study should be interpreted with caution based on the limitations mentioned below. There is need to triangulate other sources of information available for a more comprehensive interpretation of the malaria trends in Nigeria.

This study relied on documentation of sufficient historical data from individual facilities for pre-intervention and post-intervention periods. However, records were poorly kept and since most facilities were not using modern Information and Communication Technology (ICT) such as desktop or lap-top computers to store records, there was little or no accountability for record keeping. Consequently, some data were of poor quality, incomplete or inconsistent which necessitated a 4-year reduction from analysis; from 2003 - 2013 to 2007 - 2013.

Also, routine quality assurance of laboratory diagnosis was not in place and this might have affected quality of laboratory data. This limitation should be considered when interpreting the slide positivity rates reported over time.

Rates in this study were calculated based on a projected LGA population instead of health facilities' catchment population. The implication is that the denominator is likely to be bigger thus making rates smaller. In addition, private and primary health facilities, where a large proportion of the population seeks health solutions, were not covered. These results may thus be skewed owing to the focus of data collection solely from public secondary health facilities.

3. RESULTS

This section narrates summary findings of malaria interventions at national level and presents the yearly trends of malaria cases, admissions and deaths at national level and by age of population.

3.1. Interventions

LLINs: The study protocol intended to collect all intervention data from the LGA malaria offices however, due to incomplete documentation at that level, LLIN data collected was grossly incomplete. Data from the NMEP was therefore used to better appreciate the extent of coverage of the LLINs. The NMEP distributed a total of 57.8 million LLINs between 2009 and 2013 across all the 36 states and the FCT (see figure 3.1). The proportion of population potentially protected by LLINs increased from almost zero because of no record of LLIN distributed at sub-national level from 2006 - 2008 to 14% in 2009, and 50% in 2011 before dropping to 30% in 2013 (figure 3.2). NMEP commenced mass replacement campaigns in 2014 to replace all the worn out nets.

Indoor Residual Spraying (IRS): Implementation of IRS in Nigeria was not at national level and the proportion of the population covered is very minimal. Actual implementation and technical assistance to states with committed government fund for IRS is ongoing in selected LGAs and states with the support of the World Bank and Presidential Malaria Initiative (PMI). This intervention is therefore not covered in this report.

ACTs: The National Malaria Policy changed the first-line treatment for malaria from chloroquine to ACTs in 2004. Therefore, up until 2005, very few public health facilities had ACT in stock. The percentage coverage of ACTs however rose steadily from 22%

in 2006 to about 52% in 2013 using data from the field. This reflects the total percentage of health facilities with stock of ACTs.

Artesunate and Quinine: These antimalarial drugs are used for the management of severe malaria, unlike ACTs which are used for the management of uncomplicated malaria. The stock of both drugs in the facilities have dropped over the years. Quinine has been in the market longer than Artesunate; stock was 41% of HFs in 2006 and 38% in 2013. Quinine, was replaced by parenteral Artesunate in 2009 as the drug of choice in the management of severe malaria. However, findings indicate that the stock of Artesunate also dropped from 50% in 2007 to 34% in 2010 and remained at same level till 2013.

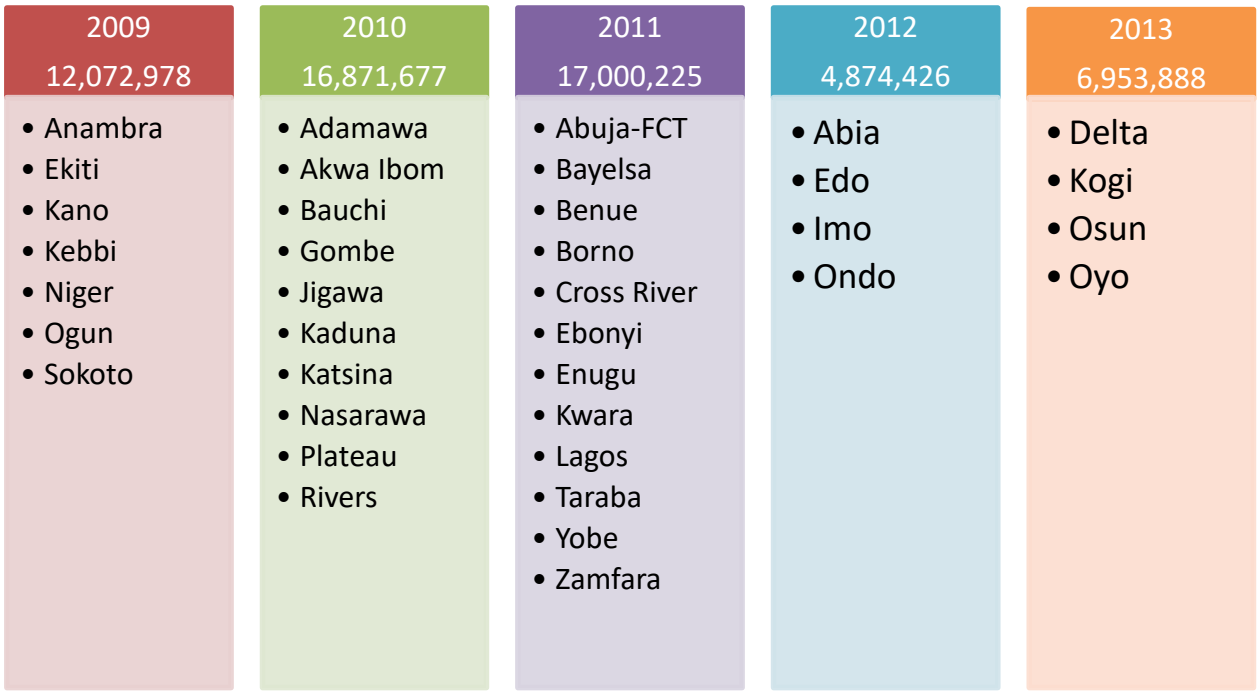
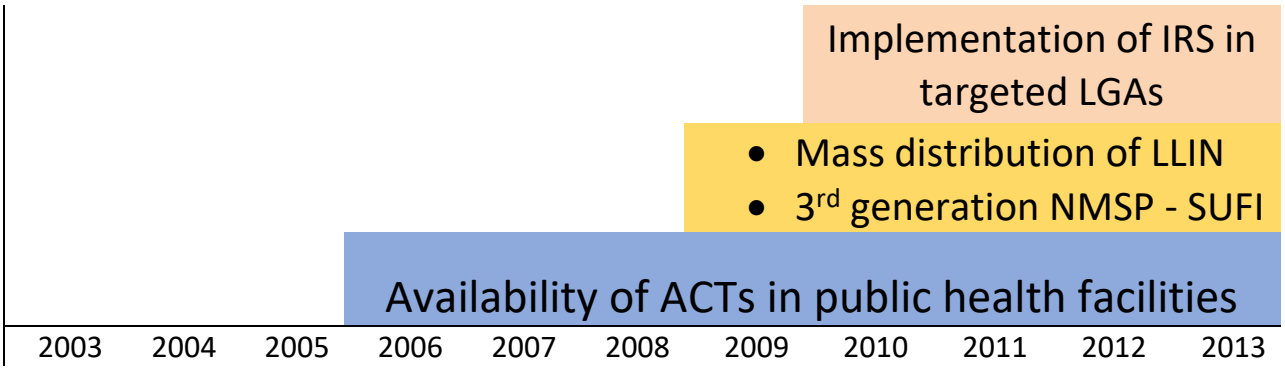
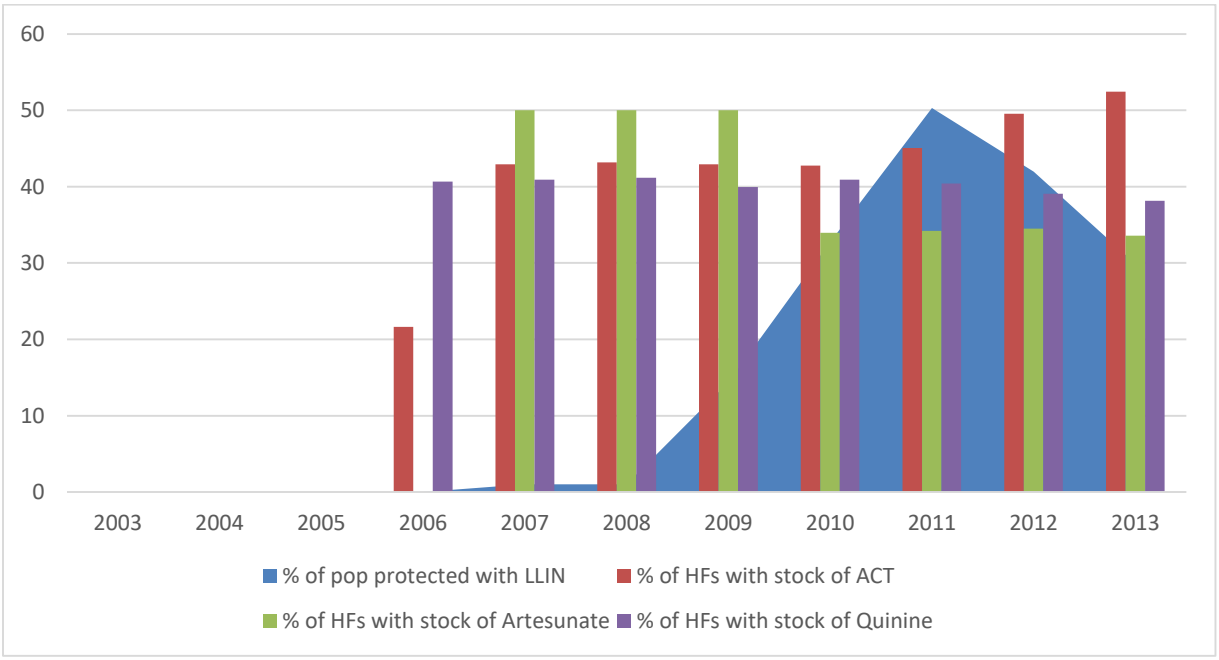


Figure 3.1 Mass Distribution of LLINs across the 36 states and FCT; 2009 to 2013



*SUFI – Scale up for impact

Figure 3.2: Timeline of implementation of antimalarial interventions, 2003–2013, Nigeria.



(*number of LLINs distributed by NMEP during the 3-year period*1.8/population)

Figure 3.3 Percentage of population potentially protected with LLINs, and percentage of health facilities with stock of ACT, Artesunate and Quinine available by year, 2003–2011, Nigeria*

3.2. Yearly trend of malaria cases, admissions and deaths

Response Rate

A total of 953 (97%) out of planned 985 health facilities were visited; out of these, only 577 (59%) facilities that had complete data (>5 months' data per year) were included in the analysis. Only data from 2007 met this criterion and therefore pre-intervention health facility data was defined from 2007 to 2009 while intervention period was defined as 2010 to 2013. In addition, only 37% of 953 HFs had complete lab record which were used for further analysis.

Table 3.1: Summary of facility counts with inclusion criteria for malaria cases and deaths

	Malaria admissions (Count of hospitals with complete data)		
Eco Zones	**RIA 2015 (24 states)**	**RIA 2014 (12states)**	**Total**
Equatorial Forest	105	39	144
Guinea Savannah	102	70	172
Mangrove	68	12	80
Sahel	73	26	99
Sudan Savannah	57	25	82
Grand Total	**405**	**172**	**577**

Similar trends were observed in most of the ecological zones, so the result is presented at national level only and in some cases, data for children under 5 is shown. Data is purely descriptive; minimal statistical analysis was done.

Outpatient malaria and non-malaria cases

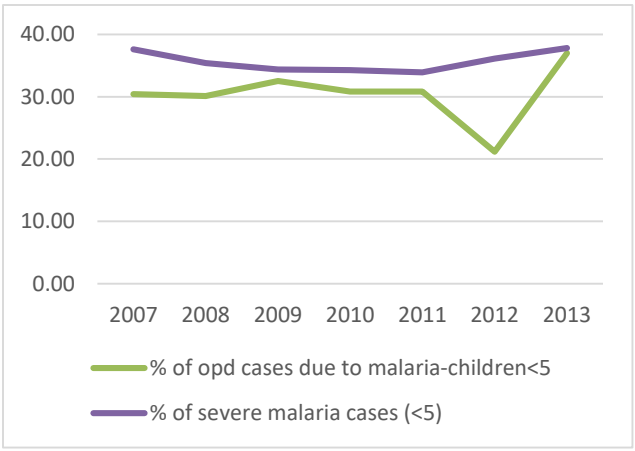
This study shows increase in absolute number of cases including confirmed malaria reported in the hospitals sampled over time. Confirmed malaria cases defined as parasitological confirmed cases showed a sharp decline from 2009 to 2012 and a sharp increase in 2013 (figure 3.4). Similar decline was not seen in the non-malaria cases over the same period.

Overall outpatient cases reported was 3986 cases per 100,000 population in 2007 - 2009 compared to 4374 cases per 100,000 population in 2010 – 2013.

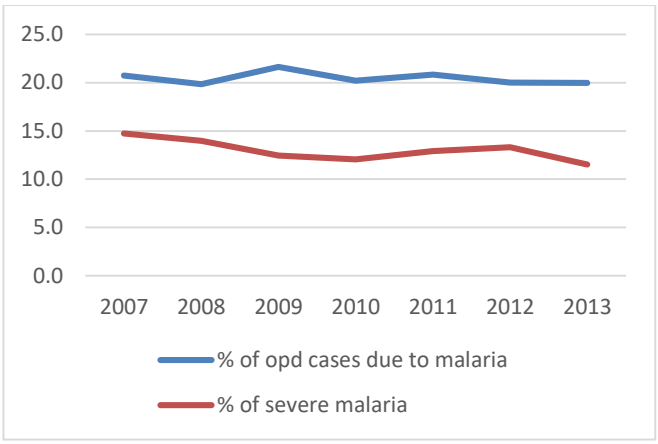
	2007	2008	2009	2010	2011	2012	2013
opd malaria	148	154	169	157	148	144	162
non-malaria opd	3,006	3,094	3,374	3,579	3,308	3,280	3,786

Figure 3.4: Confirmed rate of malaria cases and non-malaria cases per 100,000 population, per year

At the national level, available data showed confirmed malaria cases was responsible for between 19.8 to 21.6% of total outpatient, in the general population, while among children under 5, it ranged between 30 to 37%, in these secondary health facilities. The proportion of malaria cases that required admission decreased over time from 14.7% to 11.5% among the general population; while among children under 5, trend showed initial decrease from 38% in 2007 but this showed steady increase from 2011 (Figure 3.5).



a)



b)

Figure 3.5: Percentage of outpatients cases due to malaria and percentage that became severe requiring admission by age group; a) Children under 5 and b) All ages.

Slide positivity rate (SPR)

Slide positivity rate increased over time. Slide positivity remained high at between 90-97% (figure 3.6).

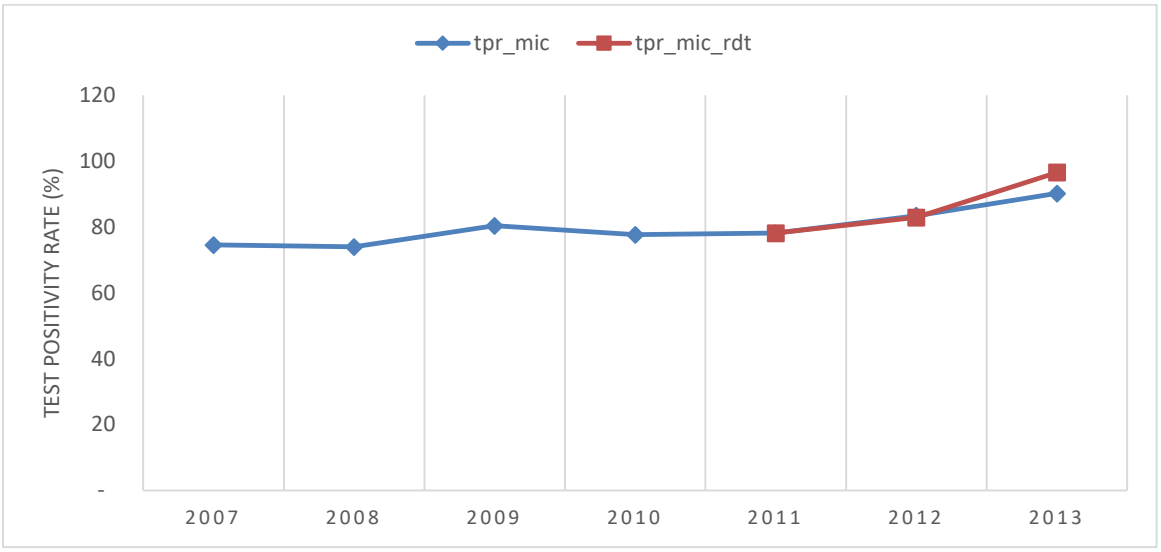
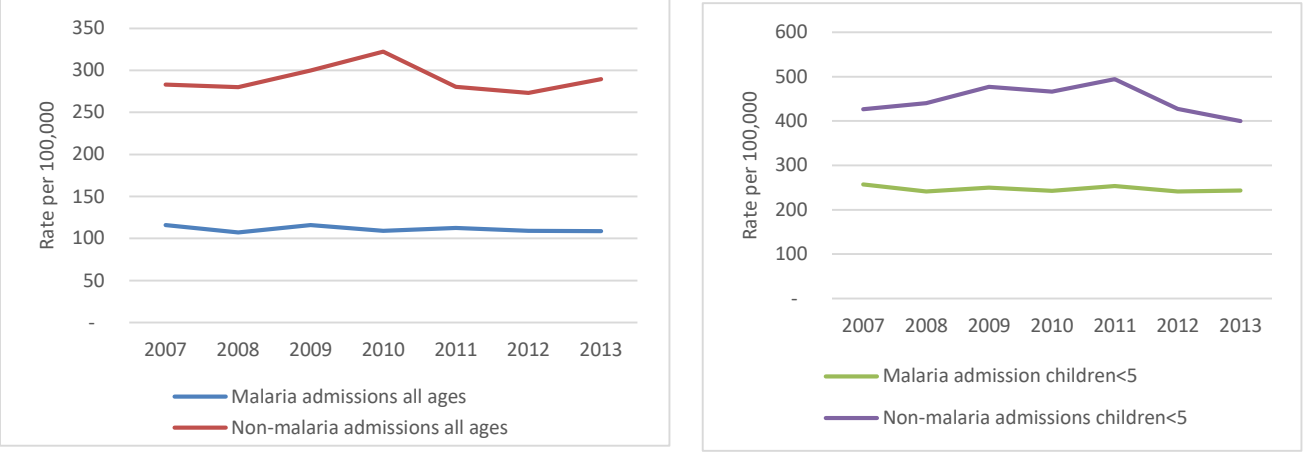


Figure 3.6: Malaria test positivity rate, microscopy and malaria rapid test.

Trend of Malaria Admissions vs non-malaria

At the national level generally among all age groups, records of admissions into hospitals due to malaria seemed to plateau from 2007 to 2013 while non malaria admission record showed similar pattern with slight increase in 2010(figure 3.7). The study however showed that among children under 5, the decrease in hospital admission due to non-malaria cases is more than the decrease due to malaria cases. Hospital admission due to other cause among children under 5 showed steady decrease from 2011.



a) b)

Figure 3.7: Rate of hospital admission due to malaria and non-malaria cases among a) general population and b) children under 5 years of age

Trend in Malaria Death

Nigeria recorded steady decrease in malaria mortality from 2007 to 2013; the decrease cut across all age groups (figure 3.8 and 3.9). Decrease in mortality was reported among non-malaria diseases but the rate of decrease in malaria mortality is remarkable.

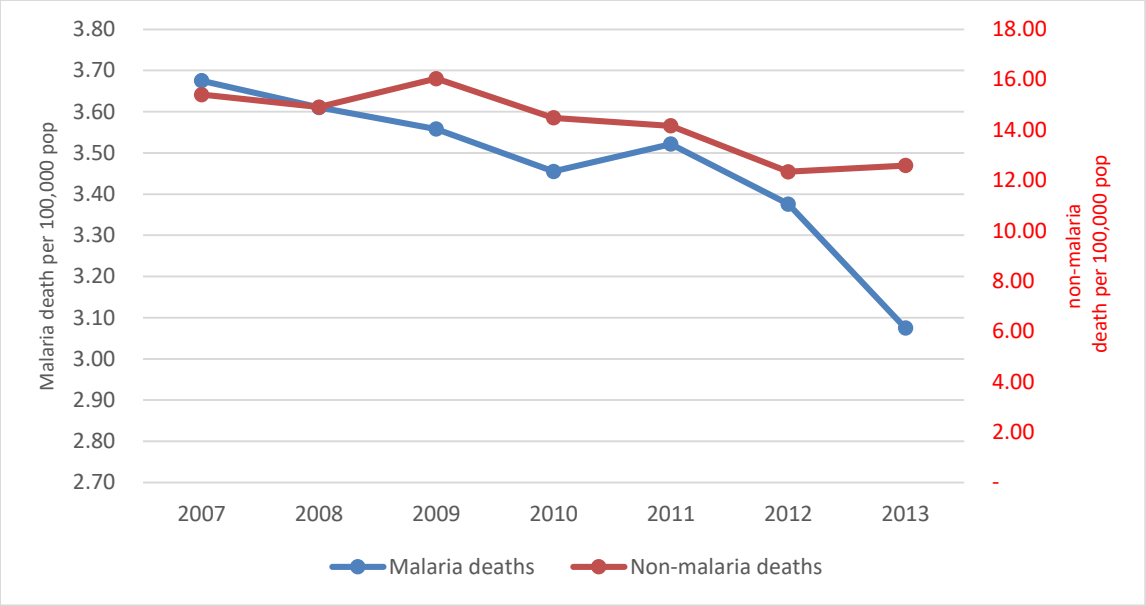


Figure 3.8: Trend in Malaria death, all ages, 2007 to 2013

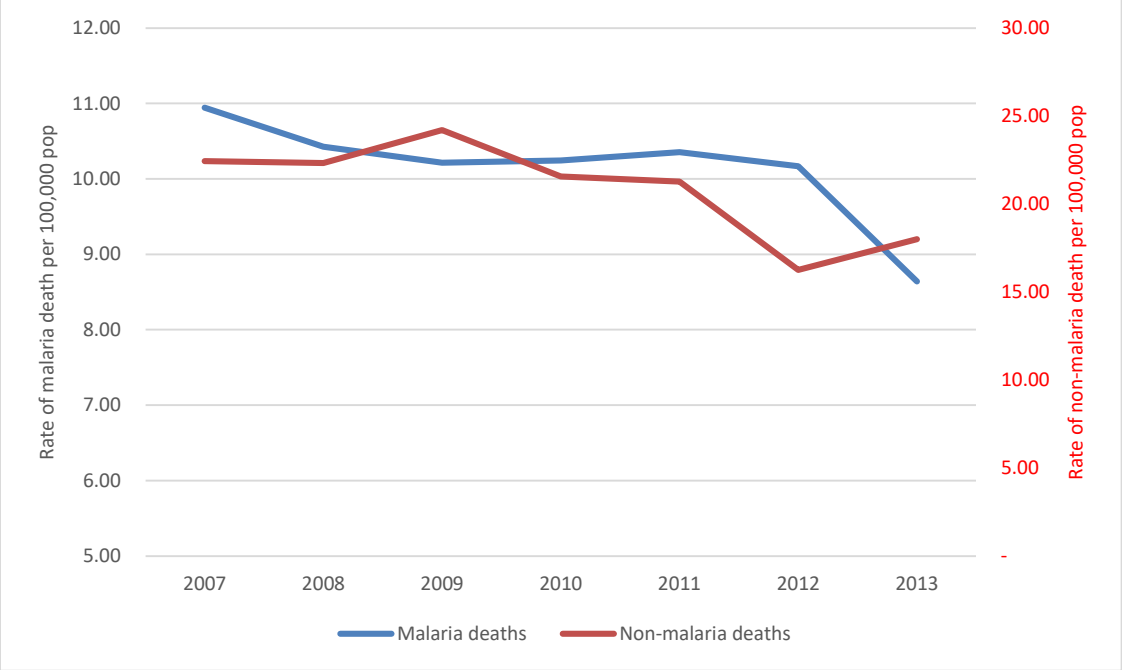


Figure 3.9: Trend in Malaria death, children under 5, 2007 to 2013

Trend in Anaemia cases and death

Anaemia cases has gradually declined among children under 5; death due to anaemia has also declined among all age groups though the decline was sharper among children under 5 (figure 3.10).

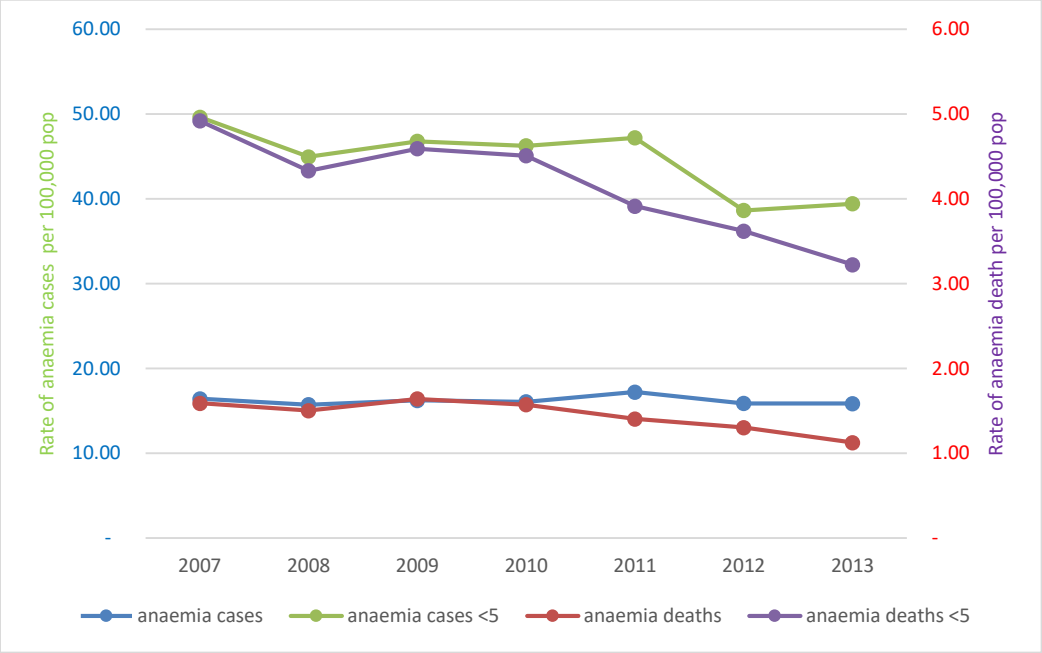


Figure 3.10: Trend in Anaemia cases and death; all ages and children under 5

Comparing data in 2013 to pre-intervention period (2007 – 2010)

Table 3.1 gives a brief summary of the changes in malaria and non-malaria indicators among the general population and children under 5. Data in 2013 was compared to average data during the pre-intervention period and the observed changes shown. This was not subjected to analytical test.

Outpatient malaria cases seemed to increase among both groups though the rate of increase was higher among children under 5 (33%) than among the general population (19%). The limitations mentioned earlier in this report should be weighed before reaching a conclusion here.

This is more so as the admission and death due to malaria has decreased (negative figure indicates a decrease). The decrease reported due to malaria death is similar in both the general population and among children under 5; -18%.

Table 3.2: Percentage change in malaria and non-malaria related indicators from pre to post-intervention period, by age

			Observed rates and changes		
Age group	Indicator		Observed values in 2013	Pre-intervention average (2007-2009)	Observed change in 2013 (vs. average 2007-2009)
Children under 5	Malaria	Outpatient malaria cases	2,112	1592	33%
		Malaria admissions	243	250	-3%
		Malaria deaths	9	11	-18%
	Non-malaria	Non-malaria outpatient cases	3594	3529	2%
		Non-malaria inpatient cases	400	448	-11%
		Non-malaria deaths	18	23	-22%
All ages	Malaria	Outpatient malaria cases	4730	3986	19%
		Malaria admissions	398	400	-1%
		Malaria deaths	16	19	-18%
	Non-malaria	Non-malaria outpatient cases	3786	3158	20%
		Non-malaria inpatient cases	290	288	1%
		Non-malaria deaths	13	15	-19%

4. DISCUSSION

The study has provided useful information despite the low response rate of data at the secondary health facilities experienced across the states in the Federation. The results should be interpreted with caution as generalization to the whole country is made with the limited number of health facility data available.

Available data on interventions showed good coverage but insufficient universal coverage. Consistent large scale interventions are needed to reach universal coverage in Nigeria, NMEP and partners have to be strategic in geographic location of partners' support and timing of interventions to ensure universal coverage of interventions. Lessons learned from previous implementation of partners' supports should inform both NMEP and partners on new funding support. The involvement of state governments and demand for accountability may also improve better record keeping at all levels to measure impacts at state level. This is more so as the 2015 Malaria Indicator Survey has state level malaria prevalence at household level.

Data from hospitals in Nigeria showed steady decrease in malaria cases from 2007 to 2012 but a sharp increase was observed in 2013. This was surprising and further studies may be needed to find out the cause. Similar trend was observed among children under 5. Though LLINs distribution slowed down in 2012 and 2013 as only 8 states had mass distribution of LLINs and national coverage had dropped to 30%. This however does not explain the sharp rise in malaria cases observed in 2013. It is also widely known that national support had focused more efforts on the primary health facilities where it is believed majority of the people seek care compared to the secondary health facilities. These were however not included in this assessment because of lack of historical data and limited inpatient services.

The Nigerian health information management system was also known to be very weak until recent breakthrough in 2013; strengthening the system had been more successful within the primary health care facilities than the secondary and tertiary health facilities. However, documentation and reporting to the states' Hospital Management Boards and Medical Services had also improved gradually in public secondary health facilities across the country in recent years. This may account for the increase in absolute cases observed. There was no variation observed across the eco-zones, this shows a national problem which the NMEP and partners have to work closely with relevant authorities to further strengthen malaria reporting from these facilities.

It is important to note that malaria death however showed marked reductions over time. This is because death is such an unpleasant experience and the event is more likely to be documented and reported. The large scale distribution of almost 60 million nets and

availability of ACTs after the initial delay in all public health facilities over a period of 5 years across the country, may have contributed to the reduction in malaria mortality. This is in addition to other infant and child health interventions such as integrated management of childhood illnesses and nutrition interventions though these have not been implemented on a large scale as the malaria program. In fact, the overall child mortality rate (from 83 to 64) and under five mortality rate (from 162 to 128) have decreased in 2013[9] compared to what obtained in 2008[10].

Admission due to malaria among the general population and children under 5 reduced slightly over time. This showed malaria cases are mainly uncomplicated and treated as outpatient over the years, it presumes there was no increase in severe malaria cases, the decrease was consistent in the general population over time. However, a slight increase was observed among children under 5 from 2011 to 2013. This may be attributed to improved capacity for early recognition and appropriate management of malaria cases especially at community and lower levels of health care. Severe malaria is a condition where many of the child's organs and systems are compromised necessitating admissions and immediate managements such as maintaining a patent vein, introducing intravenous medication, fluids and blood transfusion; preventing metabolic and respiratory acidosis; making oxygen available and ensuring good nursing care.

The downward trend in overall malaria death is consistent among the general population and children under 5. Further statistical analysis will show to what extent deaths have been averted in Nigeria due to malaria. The consistent intervention such as training and re-training of health care providers and donor support for malaria commodities such as LLINs, ACTs and RDTs should continue to sustain the gains reported. Similar results have been shown in many African countries south of the Sahara (Chanda et al, 2012; Aregawi et al., 2011).

Malaria is closely associated with anaemia because of the destruction of the erythrocytes (Ehrhardt et al., 2006), sequestration (Amante et al., 2010; MacPherson et al, 1985), rosetting (Dondorp, 2005) and cytoadherence (Ockenhouse et al., 1991). Nationally and among children under 5, anaemia death declined over time though the decline was more pronounced among children under 5. This has some peculiar implications in that there would be less blood needed for transfusion of anaemia due to

[9] National Demographic Health Survey 2013

[10] National Demographic Health Survey 2008

severe malaria and less pressure on the health system for blood transfusion which can be diverted to meet other needs within the system.

Testing for malaria before treatment has become a norm in most health facilities as at the time of compiling this report, however, this was not the case in 2013. Nigeria introduced the RDTs kits initially in 6 states before scaling up on a very large scale in 2009. This report showed malaria test positivity remained high across all ecological zones. This is disturbing and requires further investigations to actually find out the true burden of malaria. High positivity rate may be due to lack skills among laboratory scientists doing malaria microscopy and lack of confidence in RDT result by other health workers using it. The low laboratory data response rate (37%) also suggests concerted efforts is needed to strengthen data documentation and reporting in Nigerian laboratories.

Nationally, the decline in mortality due to non-malaria death among the general population and children under 5 is worth commenting on, it depicts a general improvement in health status of the population. This is also in line with other population based studies which showed a decrease in infant, child, under 5 and maternal mortality rates from 2008 to 2013.The reported malaria deaths are lower than non-malaria death when pre-intervention period (2007-2009) is compared with 2013. This suggests the need to scale up other child health interventions such as iCCM and nutrition interventions to sustain the gains. Detail by ecological zones is shown in the annex.

Although other reports gave an account of impact of a combination of malaria interventions on morbidity and mortality, either nationally or on all age groups (Nyarango et al, 2006), a school of thought (Some et al, 1997) considers routine surveillance data as being inadequate for appraising impact of malaria control programmes using instead parasite prevalence surveys for the evaluation of stated impact (Keating et al., 2009).

5. CONCLUSION AND RECOMMENDATIONS

The first general objective of this exercise was achieved; facility-based inpatient and outpatient malaria data have been used to document trends in malaria infection from 2003 to 2013. However, the study cannot effectively use available data to demonstrate the use of routine malaria surveillance and logistic data for programme management and evaluation of malarial interventions in Nigeria. Observed data showed no evidence of a decrease in trend of malaria morbidity in the 7-year period spanning 2007 to 2013. However, malaria mortality showed observed decline. There was an overall 18% reduction in malaria mortality between the same stipulated period. Over the study

period, there was decline in number of inpatient malaria cases requiring admission in the hospitals at national level and among children under 5.

It is somewhat difficult to measure to what extent the scale-up of malaria control interventions have had impact on malaria cases and deaths. The data is grossly insufficient.

Going forward, the following recommendations may guide further evaluation of impact of interventions;

a) The NMEP should institute stronger data management at the secondary health facility level and decentralise data collection by strengthening continuous state participation in monitoring impact of malaria interventions if Nigeria want to continue to use RIA as a means of program evaluation.
b) Extending RIA to private and tertiary health facilities; and primary health centres may also give a more holistic reflection of the malaria control.
c) RIA should also build into its methodology, the ability to use data from other sources such as Malaria Parasite Sentinel Surveillance data.
d) Parasitological testing for all fever cases is very important as only parasitological confirmed cases could show true trend. NMEP and partners should increase access for parasitological testing of all fever cases.
e) Improved parasite surveillance especially at the tertiary and secondary health facility level and monitor documentation including regular electronic reporting so that subsequent studies need not start fresh collection of data on site.
f) NMEP and partners to further consolidate on existing anti-malaria interventions and strive to provide these at universal coverage.

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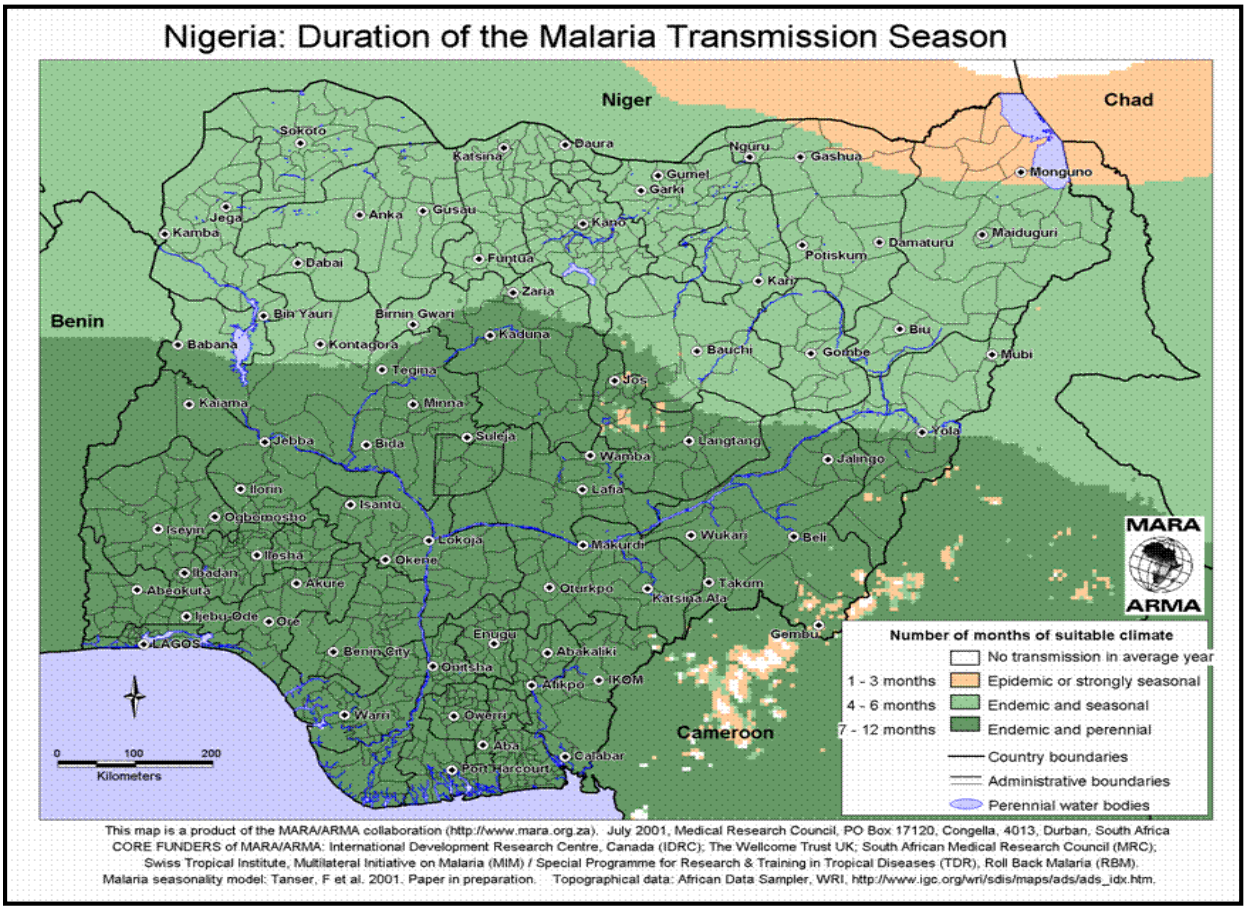
7. ANNEXES

Annex 1. Map of Nigeria showing duration of malaria transmission season.



Annex 2: States within various ecological zones

Sn	Ecological zone	States	Planned HF to be visited	Actual HFs visited
1	Sahel	Sokoto	23	23
2		Zamfara	18	18
3		Katsina	21	21
4		Jigawa	14	14
5		Kano	36	33
6		Yobe	11	11
7		Borno	38	35
8		Kebbi	15	15
9		Bauchi	22	22
10		Gombe	18	18
11	Sudan Savannah	Niger	14	14
12		Kaduna	32	29
13		Plateau	26	22
14		FCT	21	19
15		Nasarawa	21	22
16		Adamawa	19	18
17	Guinea Savannah	Kwara	30	30
18		Kogi	29	29
19		Oyo	36	32
20		Osun	58	58
21		Ekiti	20	20
22		Benue	26	24
23		Taraba	16	16
24		Lagos	29	29
25		Ogun	30	30
26	Equatorial Forest	Ondo	18	18
27		Edo	30	30
28		Enugu	48	46
29		Ebonyi	14	14
30		Imo	13	13
31		Abia	15	14
32		Akwa Ibom	50	49
33		Cross River	22	21
34		Anambra	26	26
35	Mangrove	Bayelsa	27	27
36		Rivers	38	34
37		Delta	61	59
	Total		985	953

Annex 3: Malaria and Anaemia Deaths among children under 5 by Ecological Zones

Annex 4: Survey Instrument – attached as NMEP RIA Tool