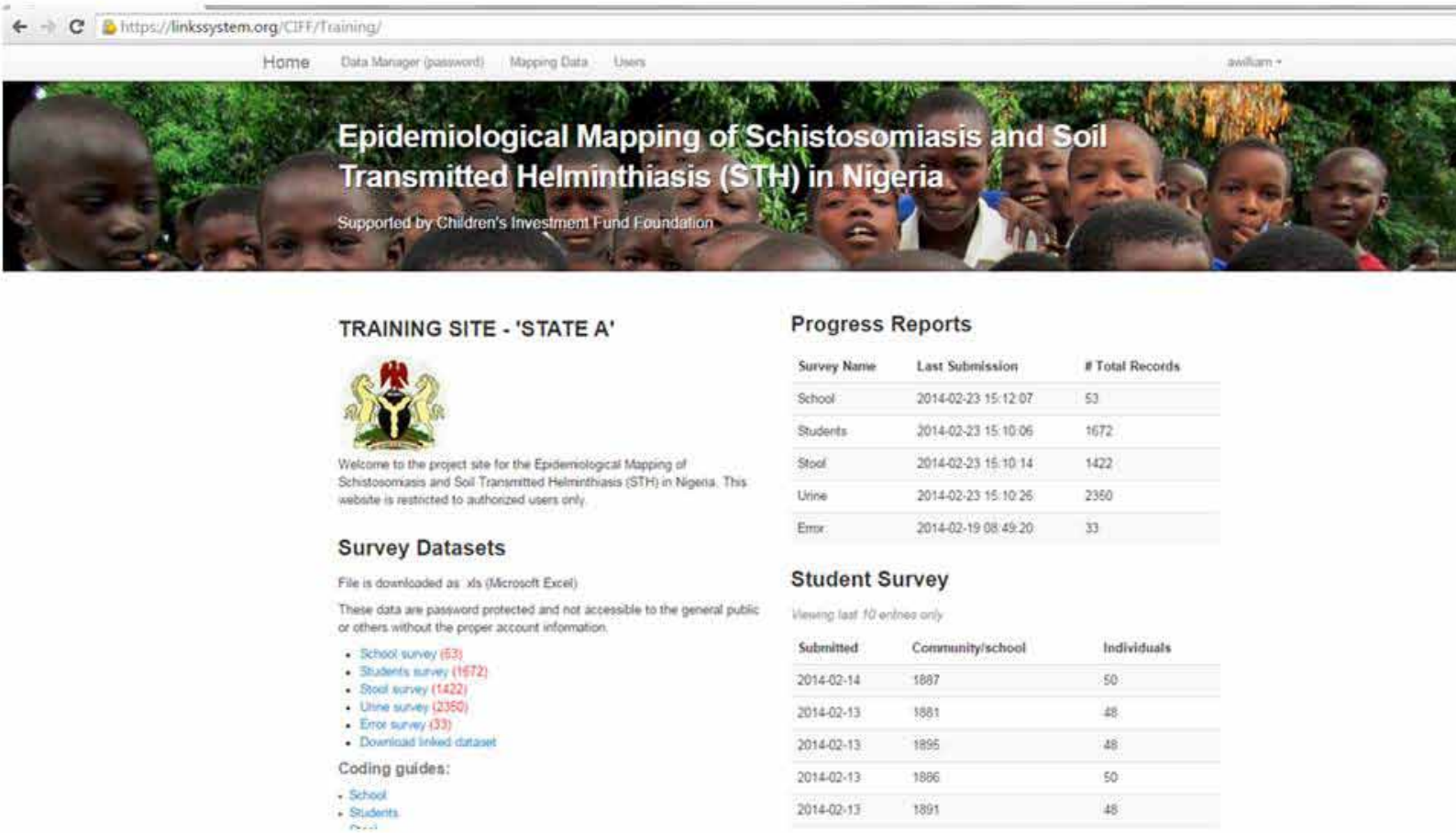
Report on **Epidemiological Mapping of Schistosomiasis and Soil Transmitted Helminthiasis** in 19 States and the FCT, Nigeria.

May, 2015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Home
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Epidemiological Mapping of Schistosomiasis and Soil Transmitted Helminthiasis (STH) in Nigeria
Supported by Children's Investment Fund Foundation
TRAINING SITE - 'STATE A'
Welcome to the project site for the Epidemiological Mapping of Schistosomiasis and Soil Transmitted Helminthiasis (STH) in Nigeria. This website is restricted to authorized users only.
Survey Datasets
File is downloaded as .xls (Microsoft Excel)
These data are password protected and not accessible to the general public or others without the proper account information.
School survey (63)
Students survey (1672)
Stool survey (1422)
Urine survey (2350)
Error survey (33)
Download linked dataset
Coding guides:
School
Students
Progress Reports
Survey Name | Last Submission | # Total Records
School | 2014-02-23 15:12:07 | 53
Students | 2014-02-23 15:10:06 | 1672
Stool | 2014-02-23 15:10:14 | 1422
Urine | 2014-02-23 15:10:26 | 2350
Error | 2014-02-19 08:49:20 | 33
Student Survey
Viewing last 10 entries only
Submitted | Community/school | Individuals
2014-02-14 | 1887 | 50
2014-02-13 | 1881 | 48
2014-02-13 | 1895 | 48
2014-02-13 | 1886 | 50
2014-02-13 | 1891 | 48

Table of Contents

List of Appendix

List of Photos

List of Tables

List of Figures

Acronyms

CDC	Centers for Disease Control and Prevention
CIFF	Children's Investment Fund Foundation
DFID	Department for International Development
FCT	Federal Capital Territory
FMOH	Federal Ministry of Health
GTMP	Global Trachoma Mapping Project
HANDS	Health and Development Support
HKI	Helen Keller International
IBM	International Business Machine
LGA	Local Government Area
LSHTM	London School of Hygiene and Tropical Medicine
MAM	Mass Administration of Medicines
MITOSATH	Mission to Save the Helpless
NBS	National Bureau of Statistics
NGDOs	Non-Governmental Development Organizations
NHMIS	National Health Management Information System
NHREC	National Health Research Ethical Committee
NPC	National Population Commission
NTDs	Neglected Tropical Diseases
PAG	Project Advisory Group
PCT	Preventive Chemotherapy
PHASE	Preventive chemotherapy, Access to clean water, Sanitation improvement and environmental manipulation
QGIS	Quantum Geographic Information System
SCI	Schistosomiasis Control Initiative
SDGs	Sustainable Development Goals
SMOH	State Ministry of Health
SPSS	Statistical Package for Social Science
STHs	Soil Transmitted Helminths
SUBEB	State Universal Basic Education Board
TCC	The Carter Center
TFGH	Task Force for Global Health
UK	United Kingdom
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

Foreword

Schistosomiasis and Soil Transmitted Helminths (STHs) are among the group of Neglected Tropical Diseases (NTDs) that cause chronic infections and ill health in endemic areas. Nigeria is one of the countries that have the highest burden of these NTDs. In the last two years, Nigeria has scaled-up epidemiological mapping for NTDs with the support of partners and stakeholders. There are further plans to scale up Preventive Chemotherapy, Health Education, Access to clean water, Sanitation improvement and Environmental manipulation (PHASE) activities to reduce disease burden.

This report provides epidemiological information on 19 States and the Federal Capital Territory (FCT) that were mapped for schistosomiasis and STHs from November 2013 to May 2015. The Children's Investment Fund Foundation (CIFF) provided funding to map 14 States and the remaining States were supported by Department for International Development (DFID) funded Global Trachoma Mapping Project (GTMP), RTI/ENVISION project and Sightsavers. Findings from the survey showed that all 19 States and the FCT are endemic for schistosomiasis or STHs and in some cases both. This provides vital evidence for improved strategic planning for schistosomiasis and STHs integrated disease control and elimination in Nigeria.

One of the key innovations of this project was transition from use of paper–based questionnaires to electronic data collection tools, the Android–based smart phones and cloud server platform. The electronic-based mapping project provided opportunity for enhanced data collection, timely transmission and reporting as well as data security. The completion of the Schistosomiasis and STHs epidemiological mapping in 19 States and the FCT is an important milestone in the fight against NTDs and has given Nigeria a pride of place in the global NTDs elimination landscape.

I wish to convey the nation's appreciation to the funding organizations and other stakeholders that have worked tirelessly to achieve this feat. I would also like to remind everyone that this is a giant stride in our collective and collaborative effort towards meeting the national and global NTDs elimination goals. The findings from this project provide evidence-based data for decision making in order to appropriately target interventions. It is expected that our children at risk will benefit immensely from this for a brighter future.

I wish to reaffirm the commitment of the Federal Government of Nigeria to the elimination of NTDs in Nigeria and in particular schistosomiasis and STHs.

Engr. Fidelis. N. Nwankwo
Honourable Minister of State for Health

Acknowledgements

The Federal Ministry of Health sincerely acknowledges the immense support and contributions of our NGDO partners especially Sightsavers, HANDS, HKI, TCC and MITOSATH towards the control and elimination of Schistosomiasis and STHs in Nigeria.

Special appreciation goes to the Children's Investment Fund Foundation (CIFF) and partners; Sightsavers, RTI/ENVISION and DFID for their tremendous financial and technical support and humanitarian gesture to conduct the Schistosomiasis and STHs epidemiological mapping in 19 States and the FCT.

We also thank the Project Advisory Group (PAG) and Schistosomiasis Control Initiative (SCI), UK for their advice and useful insight towards the development of the mapping protocol and survey tools.

The Honourable Commissioners for Health in the States and the FCT Secretary for Health are appreciated for their collaboration and support during the mapping activities. We also recognize the effort and contributions of the consultants, technical officers from the Federal and State Ministries of Health and other support personnel at all levels of operation. The management and staff of the 19 States and FCT, State Universal Basic Education Board (SUBEB), the LGAs, participating schools and members of the surveyed communities are most appreciated for their support and cooperation throughout the duration of the exercise.

Our immense thanks go to the school children for their cooperation and enthusiastic participation in the mapping activities.

Dr Bridget Okoeguale
Director, Public Health

Executive Summary

Epidemiological mapping is a prerequisite for Neglected Tropical Diseases (NTDs) Preventive chemotherapy, Access to clean water, Sanitation improvement and Environmental manipulation (PHASE) interventions.

The Children's Investment Fund Foundation (CIFF) as part of its investment in Nigeria provided funding to map schistosomiasis and Soil Transmitted Helminths (STHs) in 347 LGAs in 14 States. This support provided leverage for additional funding to map 86 LGAs in five other States and the Federal Capital Territory (FCT). The coordinated mapping of schistosomiasis and STHs was conducted in 19 States and the FCT of Nigeria from November 2013 to May 2015.

A sample of 50 - 55 children from five randomly selected schools in each of the 433 LGAs in 19 States and four Area Councils of the FCT were examined for schistosomiasis and STHs with generous funding support from CIFF, Sightsavers, Department for International Development (DFID) funded Global Trachoma Mapping Project (GTMP) and the RTI/ENVISION project.

Epidemiological data on both diseases were mapped using a novel technique; the LINKS system developed by the Task Force for Global Health (TFGH). This system uses a collection of open source tools for data collection on Android devices and cloud based data reporting and management. The application of these devices supported the transition from paper-based questionnaires to electronic data collection tools. Also, Water, Sanitation and Hygiene (WASH) information for schools and school children were collected. The Kato-Katz technique, dipsticks (Haemastix), syringe filtration and sedimentation techniques were used to examine stool and urine samples collected from the school children.

The result of this survey revealed that all the States and the FCT were endemic for one or both diseases with an overall prevalence of 9.5% for schistosomiasis and 27% for STHs suggesting low risks of both diseases in the project area. However, the data captured by LGA; the intervention unit showed that prevalence of infections varied from low to high risk. Of the 433 LGAs surveyed the number of LGAs requiring interventions for schistosomiasis and STHs were 359 and 237 respectively. The prevalence of infection was significantly higher in males than in females for both diseases. STHs were more prevalent among the younger age group (5-10years) while schistosomiasis was more prevalent among the older age group (11-16 years). Two percent of the pupils surveyed were co-infected with schistosomes and STHs.

Schistosomiasis and STHs were seen among pupils who claimed to defeacate in the school toilets, around the school compound and outside school environment. The mapping exercise provided insight into disease distribution and intensity in the 19 States and FCT surveyed.

At the end of the exercise, the capacities of the national and state government personnel have been strengthened in implementing and evaluating planned NTD control activities effectively. Working

with the various partners has provided a platform for cross learning, skills sharing and ultimately improved programme coordination.

There were several engagements with the Honorable Commissioners for Health and other stakeholders to advocate for support to the project, present the findings and need for rapid public health action. At the community level awareness on the prevalence of schistosomiasis and STHs were raised to secure their participation.

The mapping of schistosomiasis and STHs in 19 States and the Federal Capital Territory of Nigeria was successfully completed and has achieved all the set objectives. Data generated from this crucial survey provided vital evidence for appropriate and sustainable intervention by Government in collaboration with our highly esteemed NTDs partners. It is the right of every child in Nigeria to enjoy good health and the time to intervene is now.

It is recommended that Governments (Federal, State and LGAs) and stakeholders scale up uninterrupted provision and administration of appropriate medicines which should be implemented alongside other interventions in the PHASE strategy. Plans should be put in place for impact assessment after the third year of consistent Mass Administration of Medicines (MAM).

1.0 Background

1.1 Introduction

Schistosomiasis and Soil Transmitted Helminths (STHs) are Neglected Tropical Diseases (NTD) that cause ill-health and chronic infections in endemic countries, including Nigeria. The country is estimated to have the highest number of people infected with NTDs in Africa; a group of parasitic and bacterial infections that affect the world's poorest populations (WHO 2015; Hotez and Kamath 2009). Nigeria has the highest burden of endemicity of intestinal helminth infections and cases of schistosomiasis. The latter includes intestinal schistosomiasis caused by Schistosoma mansoni and urogenital schistosomiasis caused by Schistosoma haematobium (WHO 2015; Hotez and Kamath 2009). These parasites are known to have detrimental impact on child health as they deplete nutrients in children and adversely affect physical and cognitive development, causing symptoms such as abdominal pain, anaemia, bladder and liver diseases and other health problems which impair growth, reduce school attendance with poor learning outcomes (Lobato et al., 2012).

The exact national distribution and disease burden of schistosomiasis and STHs was largely unknown before the current scale up of epidemiological mapping activities in Nigeria. The national data available were from limited number of epidemiological surveys conducted between 2008 and 2012, among school age children in 207 of the 774 LGAs. Although mapping had not been conducted in all 36 States and the FCT, schistosomiasis and STHs were suspected to be co-endemic in majority of the States.

As part of the ongoing effort to scale up epidemiological mapping activities in Nigeria, the Federal Ministry of Health (FMOH), in collaboration with various partners and stakeholders launched several disease mapping projects nationwide (Appendix 1). Within this effort CIFF provided Eight hundred and eighty nine thousand, five hundred and sixty three pounds sterling (£889,563.00) to map schistosomiasis and STHs in 347 LGAs in 14 States. This support enabled FMOH to standardise a training manual for schistosomiasis and STHs mapping that eased data collection and management. This also led to the development of national mapping protocol and data collection platform used by other donors to support the field data collection. The national protocol was used as a standard and reference document during training of the field personnel and throughout the mapping process. The technical support from Schistosomiasis Control Initiative (SCI) provided further guidance and insight into the design and development of these mapping tools. Other partners leveraged on the support provided by CIFF to map other States. The DFID-funded GTMP mapped Bauchi, Niger and Taraba States; RTI/ENVISION mapped Cross River and Ondo States while Sightsavers mapped Benue State. Technical officers from FMOH, in-country consultants and NGDO partners were trained on the use of Geographic Information System (GIS). The skills acquired were used to capture, store, analyse and manage spatial data and also to develop disease and intervention maps.

1.2 Objectives of the Mapping Project

i. To complete epidemiological mapping of schistosomiasis and STHs in the 347 LGAs in 14 States of Nigeria over an 18 month period

ii. To provide the necessary evidence of disease burden to be used for advocacy to leverage government funding and inform the broader NTD community beyond Nigeria

iii. To develop the capacity of government personnel on epidemiological mapping for schistosomiasis and STHs, and ensure commitment to implement a national deworming programme

1.3 Justification for the Survey

Schistosomiasis and STHs remain a serious public health problem in Nigeria. Assessment of disease prevalence and the geographic distribution are the first steps in planning effective intervention measures for schistosomiasis and STHs.

The completion of epidemiological mapping equally presented a unique opportunity to collect for the first time, a more comprehensive data on the national disease distribution. Specific national information on the prevalence, distribution and disease burden resulting from these NTDs provided a basis for prioritizing control programme strategies in line with the national NTDs Master Plan and the Global Elimination target. The findings of the survey are a useful advocacy tool for leveraging Government resources and accessing global donated NTD medicines. Comprehensive up-to-date maps showing the diseases distribution will facilitate efficient resource utilization and appropriate drugs distribution to target populations.

The benefits of control and elimination of these diseases include reduction of school absenteeism, malnutrition and anaemia leading to improvement of growth, physical and intellectual development and attainment of full potentials by children in Nigeria. It will also contribute to poverty reduction and improved socio-economic wellbeing of families. Giving the strong association between helminthic, other NTDs, economic and human development, it has become essential to give due consideration to eliminating helminths infection as a means to achieve the Sustainable Development Goals (SDGs) in Nigeria (Hotez and Herricks 2015).

2.0. Mapping Methodology

2.1 Study Area

Nigeria is the most populous country in Africa with a projected population of over 170 million, National Population Commission (NPC 2006). Nigeria occupies the area along the West Coast of Africa between latitude 40 and 140 N and longitude 50 and 140 E covering about 923,768 square kilometres and bordered in the North by the Republics of Niger and Chad and in the East by Cameroon while Benin Republic borders it on the West and Atlantic Ocean to the south. Nigeria has a coast line of about 3,122 kilometres. The capital city Abuja is located within the Federal Capital Territory, which is about 713 square kilometres. There are 36 States and the FCT with 774 Local Government Areas (LGAs) in the Federation.

The study area comprised 19 States and the FCT as shown in Figure 1. Altogether the 19 States and the FCT have 456 LGAs and an estimated population of 106,243,198 projected 2006 population (NPC 2006). The survey was conducted in 433 out of the 456 LGAs, 21 were previously mapped and two were not mapped due to security challenges. The Children's Investment Fund Foundation and other partners provided funding support for mapping activities in different States (Figure 2).

2.2. Study Design

State-wide mapping for schistosomiasis and STHs infections was conducted in a coordinated manner using National protocol based on WHO (2010) framework. The survey was cross sectional and purposive at State and LGA levels aimed

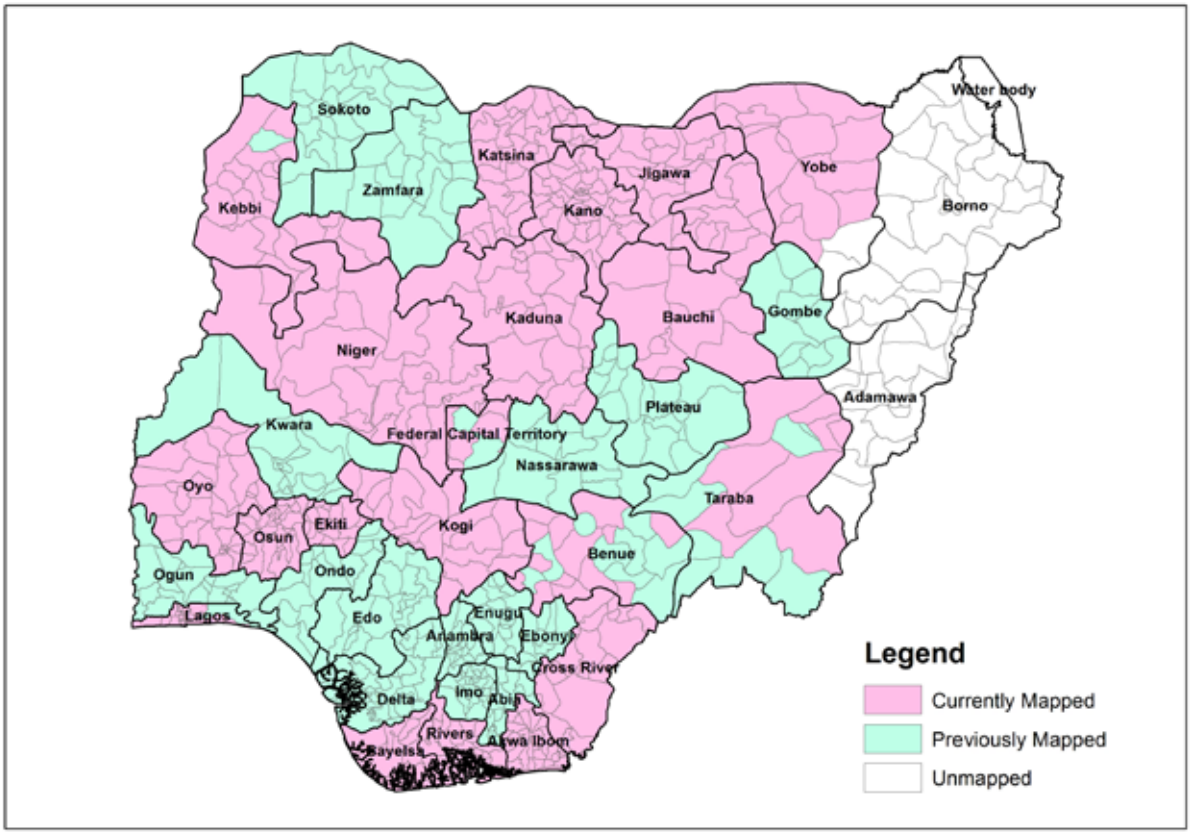


Figure 1: Map of Nigeria showing study area

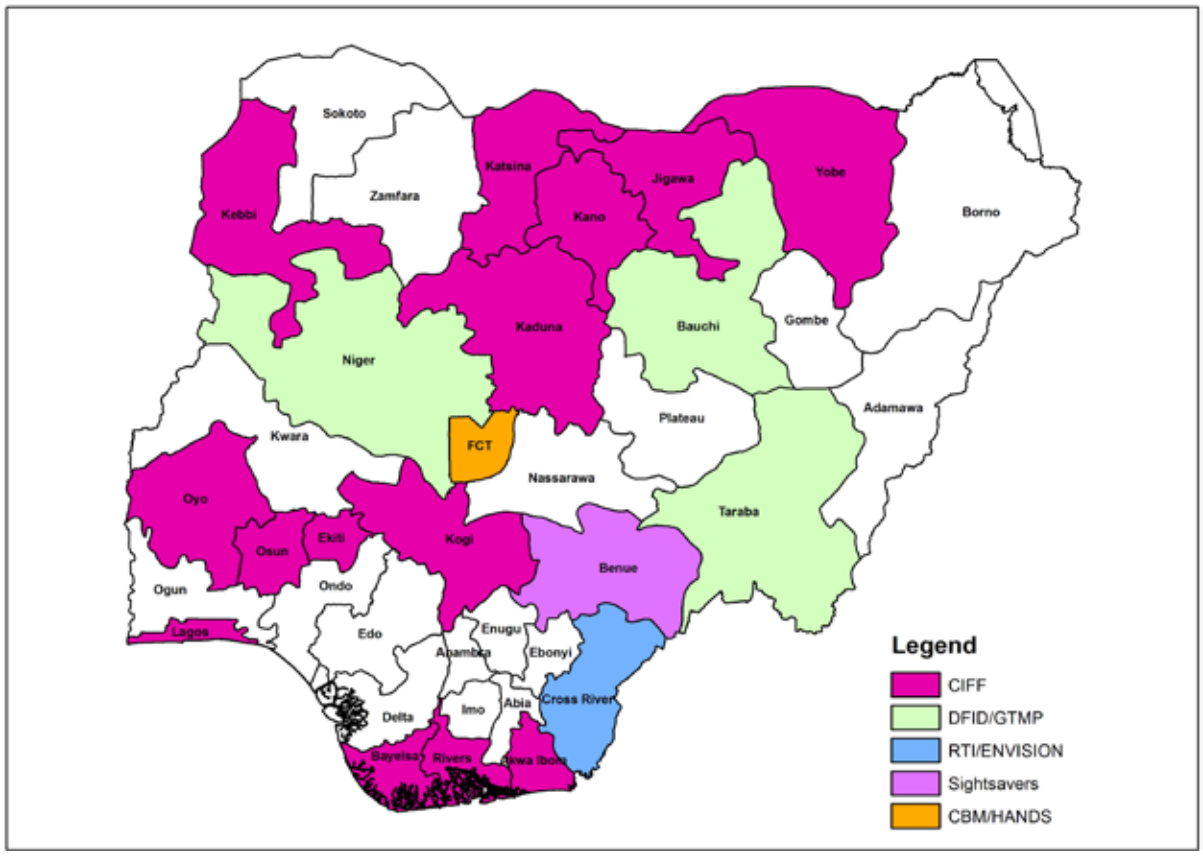


Figure 2: Map of Nigeria showing the study area and funding partners

at completing epidemiological mapping in Nigeria. There was a randomised selection of schools from the sampling frame followed by a randomised systematic selection of children in the schools surveyed. The sampling frame was the list of all primary schools in each ward. A stratified random cluster sampling procedure was used in line with the FMOH protocol on integrated epidemiological mapping and baseline survey for schistosomiasis and STHs (FMOH 2013). Primary schools in northern Nigeria included non-formal schools ("Madrasat"/ Islamic Schools).

The survey was based on standard diagnostic procedures for collection and examination of urine and faecal samples from school age children for the presence of schistosome and intestinal helminth eggs. Enrolled school age children were targeted from the surveyed communities. Males and females were selected on pro rata basis.

2.2.1 Selection of Participating Schools and Children

In all the LGAs of the States surveyed, five schools were randomly selected from different communities; however, schools in areas with large water bodies were prioritised. A sampling frame was developed and used for selection of pupils in each selected school. A range of 50-55 pupils of both sexes from 5 – 16 years old from each school was sampled (Photos 1a & 1b).

Photos 1a & 1b: A cross section of school pupils being selected for sample collection

2.3 School and Community Mobilization and Sensitization

Advocacy visits were paid to the Honourable Commissioners for Health and this was preceded by letters from the FMOH. The State Universal Basic Education Board (SUBEB) personnel mobilised the schools. Letters were also sent from the States Ministry of Health through SUBEB to selected schools and communities. Some States also mobilised the communities through the mass media, including radio and television. Education secretaries, community health educators and districts heads in some communities were also sensitized (Photos 2a & 2b).

Photo 2a: Advocacy visit to Education Secretary.

Photo 2b: Advocacy visit to the Hon. Commissioner for Health

2.4 Training of Personnel

Training of personnel covered the use of the following:

i. Electronic data collection device (LINKS system)

ii. Backup forms (for data verification and validation)

iii. Quantum Geographic Information System (QGIS)

iv. Kato-Katz techniques (for stool analysis)

v. Filtration and sedimentation technique (for urinalysis)

The training was conducted at National, Zonal and State levels. A total of 774 personnel were trained and participated in the mapping exercise (Table 1). A list of the survey team is in Appendix 2.

Table 1: Categories of Personnel Trained for the Survey

S/N	Categories of personnel	Number trained
1	Laboratory scientists	100
2	Laboratory technicians	100
3	Recorders	100
4	LGA Coordinators	433
5	In-country consultants	8
6	NGDO and FMOH personnel	33
Total		774

Trainings at the national level were on the use of LINKS mobile system and QGIS. The LINKS mobile system was developed by the Task Force for Global Health. The system uses a collection of open source tools for data collection on Android powered devices and cloud based data reporting and management. During the training session, the system was field tested and feedback given to the developer which facilitated necessary adjustment on the platform before commencement of project.

The QGIS training was facilitated by a team from the London School of Hygiene and Tropical Medicine (LSHTM), UK. This provided participants with an overview on the use of epidemiological mapping tools to assist in the implementation and evaluation of planned NTD control activities in Nigeria. Participants included FMOH staff, NGDOs, National Bureau of Statistics (NBS) and in-country consultants (Photo 3).

The Training of Trainers (ToT) at zonal level took place in four locations, two in the North (Jigawa and Bauchi States) and two in the South (Lagos and Ekiti States). The ToT in Jigawa State was followed by flag off of the survey by the Honourable Minister of Health. At the flag off event, participants included the State officials: the Honourable Commissioner for Health, Jigawa, trainers of trainers, NGDOs, in-country consultants and FMOH team.

Photo 3: Participants and Facilitators for the Quantum GIS training at Abuja

A training was cascaded for the field teams; comprising staff of State Ministries of Health and Education (including SUBEB) on the mapping methodology and community mobilization. Laboratory staff were trained on sample collection and examination while the recorders were trained on the use of electronic data capturing devices (Photos 4).

Photo 4: Laboratory training session.

Practical sessions and post training tests were also conducted. At the end of each State's training, field teams were selected based on post-training performance. Micro planning meetings were held to discuss schools and community mobilization, survey approach and detailed implementation plans developed.

In each State, a team was constituted of recorders, scientists, technicians, State NTD programme officer, SUBEB representative, in-country consultant, FMOH supervisor and NGDO technical officer (Photo 5). This team was further divided into five sub-teams made up of a recorder, laboratory technician, scientist, a supervisor, a driver and a local guide.

Photo 5: State survey team

2.5 Field Data Collection Process and Uploading into Cloud Server

The electronic data collection tool has five forms; school and child information forms, urine and stool results, and error reporting forms (Appendix 3). These forms were downloaded into the android-based phones used by recorders for data collection in the field and transmission to the cloud server platform (Photo 6 and Appendix 4). Geographical coordinates of each sampled school and community were captured within the school premises in the process of collecting the school information. In order to document the knowledge, attitude and practices of the surveyed population as relates to disease transmission; Water, Sanitation and Hygiene (WASH) parameters were collected. Some of these are hand washing practices and availability of toilet facilities in the schools. Toilet facilities were ascertained and inspected.

The proximity of water bodies to schools and water contact behavioural activities (Photo 7) were documented in all the schools visited through interviews with school Heads and the pupils.

Photo 6: A Recorder inputting student's information to the android phone

Photo 7: Water contact behavioural activities

2.6 Sample Collection and Examination

Midstream urine and stool samples were collected from selected school children using sterile specimen bottles. Physical appearance of the urine samples collected ranged from clear, amber, pale, cloudy and bloody. These samples were tested for haematuria using Combi-9® reagent strip and were examined in the laboratory for schistosome eggs using urine filtration/ sedimentation technique (Lengeler et al., 1993). Stool samples collected from the field were examined for parasite eggs using the Kato-Katz technique (WHO,1991; 2010), as shown in Photos 8 and 9. Quality control was instituted and laboratory results were verified by the consultants and FMOH supervisors to ensure consistency in samples preparation and examination.

Photo 8: Technicians Preparing Kato-Katz in the laboratory.

Photo 9: Technicians conducting urinalysis in the laboratory.

2.7 Data Analyses

Data cleaning by FMOH and NGDOs data managers/technical officers was carried on completion of the mapping activities using specified guidelines. State specific linked datasets from the cloud server were downloaded and cleaned using excel add-in (Ablebit®). This was to validate any observed discrepancy between uploaded data and entries on back-up forms. Statistical analyses were carried out using IBM SPSS® version 20 and Epi Info 7.

Descriptive statistics such as percentages were calculated. Frequencies and prevalence of key indicators were generated and presented in tables, graphs, charts and maps. Chi-square test was used to investigate associations between categorical variables while *Z*-test for proportions was to compare proportions of diseases by gender and age groups. The statistical tests were carried out at 5% level of significance.

2.8 Ethical Clearance

Ethical clearance was obtained from the National Health Research Ethical Committee (NHREC) of the FMOH (Appendix 5). Ethical permissions obtained from the SMOH and SUBEB were conveyed to the schools. Head of schools acknowledged receipt and gave consent for the exercise to be carried out.

3.0 Results

3.1 Demographic data

Schistosomiasis and STHs epidemiological survey was conducted in Nigeria between November, 2013 and May, 2015 in 19 States and the FCT in 433 unmapped LGAs covering 2,160 schools and communities. Samples were collected from 108,472 pupils comprising 57,670 (53.2%) males and 50,802(46.8%) females. The age range of the sampled pupils were between 5-10 years (57,599) and 11-16 years (50,873) Table 2.

3.2 Parasitological Findings

Out of the 108,472 pupils sampled, 10,349 (9.5%) were infected with schistosomes, 29,269 (27.0%) with STHs and 2,163 (2.0%) were co-infected with schistosomes and STHs. In the 19 States and FCT surveyed for schistosomiasis, the highest prevalence occurred in Niger State (26.1%), followed by Kebbi State (21.9%) and FCT (20.3%). Lowest values were recorded in Rivers and Akwa Ibom States with prevalence of 0.1% and 0.3% respectively. The prevalence of STHs was highest in Akwa Ibom State (58.4%) followed by Oyo (47.2%) and Osun (45.2%) and lowest in Yobe (1.4%) and Taraba (5.6%) States. Of the infected, 2,163 (1.99%) co-infected, Niger State had the highest prevalence of 8.96% followed by FCT 4.19%. Rivers State had the lowest prevalence of 0.03% (Table 3 and figure 3).

Table 2: Demographic Characteristics of the Study Population

State	Number Surveyed					
	LGAs (Surveyed/ Total)	School/ Community	Female	Male	5 - 10 Years	11 - 16 Years
Akwa Ibom	31 /31	155	3,839	4,027	4,646	3,220
Bauchi	20/20	100	2,368	2,590	2,771	2,187
Bayelsa	8/8	40	967	976	1,102	841
Benue**	14/23	70	1,561	1,891	2,181	1,271
Cross River	18/18	87	2,399	2,544	3,247	1,696
Ekiti	16/16	75	1,658	1,865	2,144	1,379
FCT**	4/6	20	505	498	520	483
Jigawa	27/27	135	2,954	3,575	3,015	3,514
Kaduna	23/23	115	2,742	3,119	2,987	2,874
Kano	44/44	220	5,106	5,898	5,408	5,596
Katsina	34/34	170	3,901	4,435	3,531	4,805
Kebbi**	20/21	100	1,505	3,349	2,701	2,153
Kogi	21/21	105	2,541	2,731	2,872	2,400
Lagos**	19/20	95	2,437	2,337	1,712	3,062
Niger	25/25	132	3,143	4,054	4,503	2,694
Osun	30/30	149	3,703	3,876	4,737	2,842
Oyo	33/33	165	3,983	4,127	4,488	3,622
Rivers	23/23	115	2,887	2,833	2,399	3,321
Taraba**	8/16	37	892	955	871	976
Yobe*	15/17	75	1,711	1,990	1,764	1,937
Total	433/456	2,160	50,802	57,670	57,599	50,873

** States where some LGAs were previously mapped
* State where some LGAs were not mapped due to insecurity

Table 3: Prevalence of Schistosomiasis, Soil Transmitted Helminths and Co-Infection

State	No of persons examined	Schistosomiasis		STH		Schistosomiasis and STH co-infection
		No.(%) infected	95% CI	No.(%) infected	95% CI	No.(%) infected
Akwa-Ibom	7,866	22 (0.3)	(0.18 – 0.43)	4,590 (58.4)	(57.25 – 59.44)	12(0.15)
Bauchi	4,958	675 (13.6)	(12.67 – 14.6)	496 (10.0)	(9.19 – 10.88)	58 (1.17)
Bayelsa	1,943	17 (0.9)	(0.52 – 1.42)	639 (32.9)	(30.81 – 35.04)	10 (0.51)
Benue	3,452	451 (13.1)	(11.96 – 14.24)	872 (25.3)	(23.82 – 26.75)	135 (3.91)
Cross River	4,943	283 (5.7)	(5.11 – 6.42)	1,209 (24.5)	(23.27 – 25.69)	45 (0.91)
Ekiti	3,523	8 (0.2)	(0.11 – 0.47)	1,084 (30.8)	(29.25 – 32.33)	4 (11)
FCT	1,003	204 (20.3)	(17.92 – 22.99)	193 (19.2)	(16.87 – 21.85)	42 (4.19)
Jigawa	6,529	743 (11.4)	(10.62 – 12.18)	404 (6.2)	(05.62 – 06.81)	66 (1.01)
Kaduna	5,861	811 (13.8)	(12.97 – 14.76)	1,279 (21.8)	(20.77 – 22.90)	122 (2.08)
Kano	11,004	1,531 (13.9)	(13.27 – 14.57)	1,923 (17.5)	(16.78 – 18.21)	307 (2.79)
Katsina	8,336	944 (11.3)	(10.65 – 12.02)	872 (10.5)	(9.82 – 11.14)	127 (1.52)
Kebbi	4,854	1,062 (21.9)	(20.73 – 23.08)	480 (9.9)	(9.07 – 10.77)	85 (1.75)
Kogi	5,272	149 (2.8)	(2.41 – 3.32)	1,481 (28.1)	(26.88 – 29.33)	51 (0.97)
Lagos	4,774	41 (0.9)	(0.63 – 1.18)	1,341 (28.1)	(26.82 – 29.39)	12 (0.25)
Niger	7,197	1,879 (26.1)	(25.1 – 27.14)	2,531 (35.2)	(34.07 – 36.29)	645 (8.96)
Osun	7,579	405 (5.3)	(4.88 – 5.88)	3,426 (45.2)	(44.08 – 46.33)	203 (2.68)
Oyo	8,110	435 (5.4)	(4.88 – 5.88)	3,828 (47.2)	(46.11 – 48.29)	216 (2.66)
Rivers	5,720	7 (0.1)	(0.05 – 0.26)	2,467 (43.1)	(41.84 – 44.43)	2 (0.03)
Taraba	1,847	103 (5.6)	(4.6 – 6.75)	103 (5.6)	(4.60 – 6.75)	12 (0.65)
Yobe	3,701	579 (15.6)	(14.49 – 16.86)	51 (1.4)	(1.04 – 1.82)	9 (0.24)
Total	108,472	10,349 (9.5)	(9.37 – 9.72)	29,269 (27.0)	(26.72 – 27.25)	2,163 (1.99)

** States where some LGAs were previously mapped
* State where some LGAs were not mapped due to insecurity

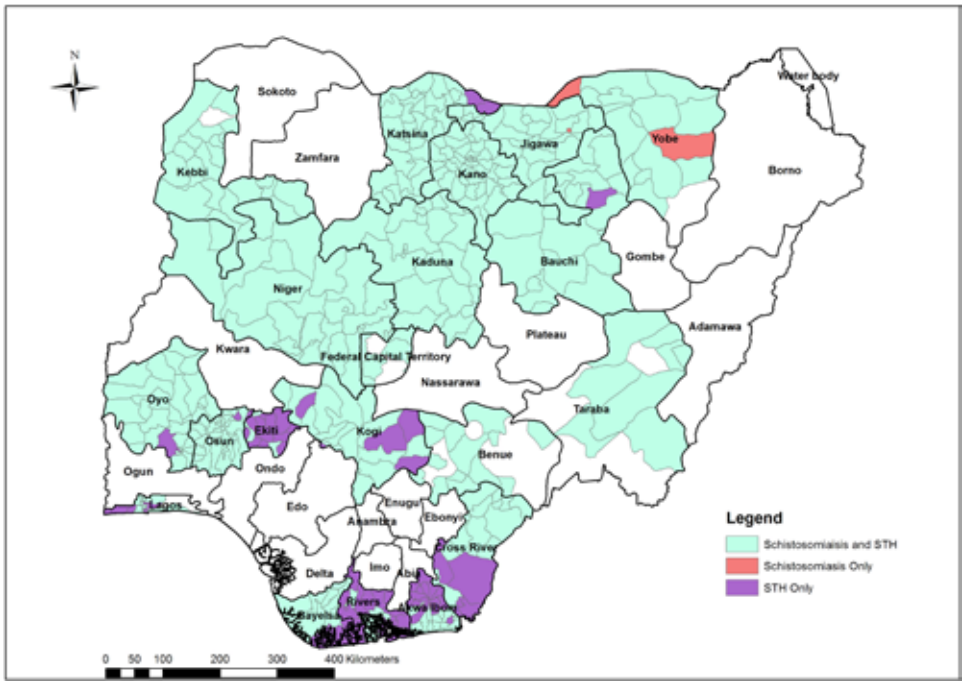


Figure 3:
Schistosomiasis and STHs endemic areas

In the LGAs of each State, it was also found that the range of prevalence of each disease varied (Table 4). With respect to schistosomiasis, LGAs prevalence in four States were in the low risk range, LGAs in 13 States ranged from low to moderate risk while in two States; Niger and Kebbi, the prevalence ranged from low to high as stated in WHO treatment guidelines for schistosomiasis and STHs (Appendix 6). STHs disease prevalence range in the LGAs of the 19 States and FCT surveyed showed wider variation. LGAs in four States were in the clinical case management. In seven States, the LGA prevalence rate ranged from clinical to low risk levels. Only Benue State had all its LGAs at low risk range. Five States had clinical to high risk prevalence levels in the LGAs while two States; Akwa Ibom and Osun had prevalence levels ranging between low and high. Figures 4 and 5 show the prevalence of schistosomiasis and STHs respectively.

Table 4: Range of Schistosomiasis and STHs Prevalence by State

State	No of LGAs Surveyed	Prevalence Range (%)	
		Schistosomiasis	STHs
Akwa Ibom	31	0.0 - 1.2	25.1 -91.4
Bauchi	20	0.0 - 33.9	1.6 - 19.3
Bayelsa	8	0.0 -3.4	14.9 - 59.2
Benue	14	1.4 - 24.8	20.2 - 36.8
Cross River	18	0 - 32.8	12.5 - 50.2
Ekiti	16	0.0 - 2.5	15.8 - 48.9
FCT	4	7.5 - 27.9	16.1 - 25.5
Jigawa	27	0.5 -31.7	0 - 15.4
Kaduna	23	1.5 - 44.2	4.2 - 40.0
Kano	44	1.2 39.0	5.6 - 34.0
Katsina	34	0 - 28.9	0.8 - 40.6
Kebbi	20	0.8 - 68.3	3.8 - 22.0
Kogi	21	0 - 21.4	16.2 - 39.0
Lagos	19	0 - 3.2	0 - 44.8
Niger	25	2.8 - 51.6	13.7 - 64.7
Osun	30	0 - 16.2	24 - 71.1
Oyo	33	0 - 19.6	16.7 - 67.7
Rivers	23	0 - 0.8	17.6 - 85.9
Taraba	8	1.0 - 11.1	1.6 - 12.9
Yobe	15	1.2 - 39.6	0 - 3.3

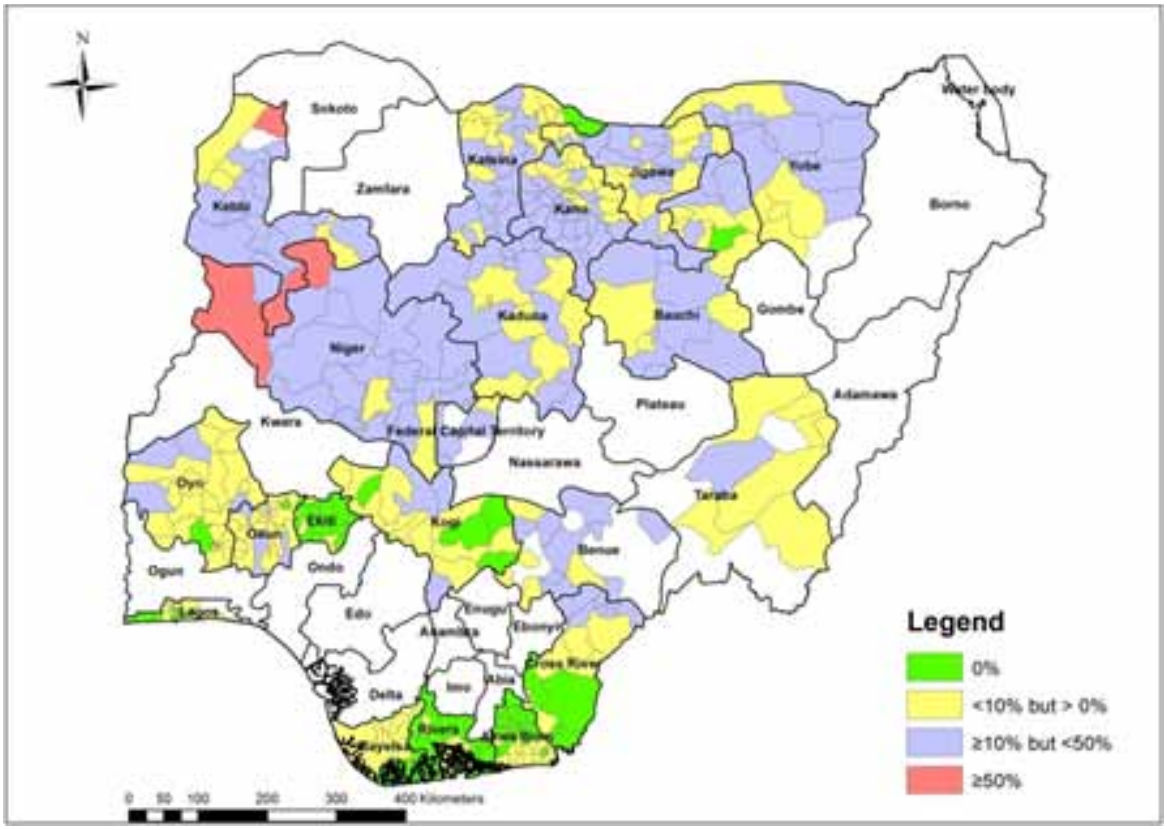


Figure 4:
Prevalence of Schistosomiasis by LGA

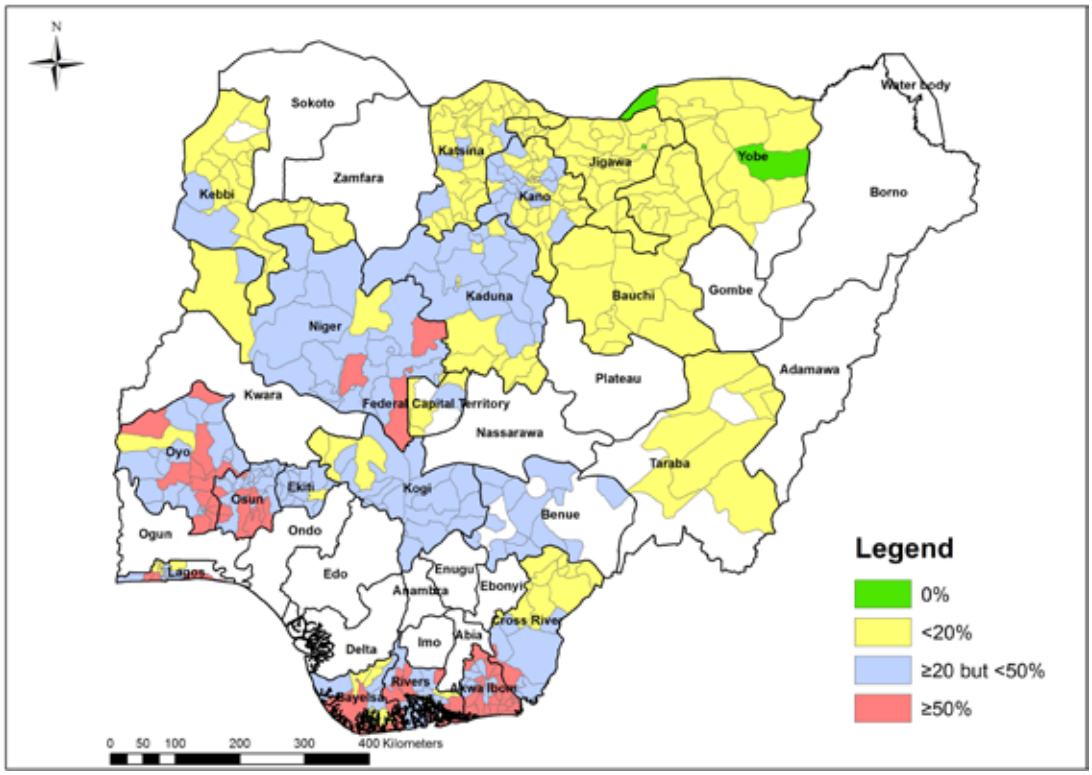


Figure 5:
Prevalence of STHs by LGA

3.2.1 Schistosomiasis Result

Schistosoma haematobium (82%) was the predominant species in the survey compared to Schistosoma mansoni (18%) as shown in Figure 6. Of the total pupils examined, 8.1% were positive for S. haematobium with highest prevalence occurring in Kebbi (21.7%) followed by Niger (19.6%) and Yobe (15.6%) States. For S. mansoni, 1.8% pupils were positive, FCT and Niger States ranked highest with prevalence of 10.5% and 9.4% respectively while Yobe State had no S. mansoni. Akwa Ibom, Lagos, Katsina and Rivers States had 0.1% prevalence each (Figures 6, 7 and 8).

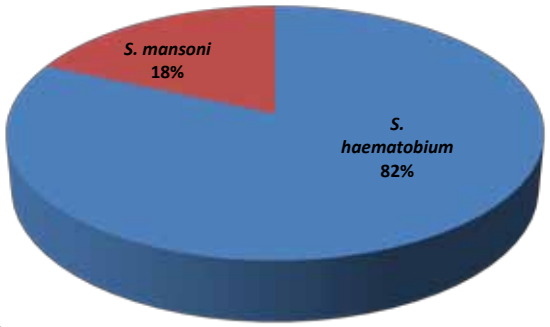


Figure 6:
Proportion of S. haematobium and S. mansoni in the study area

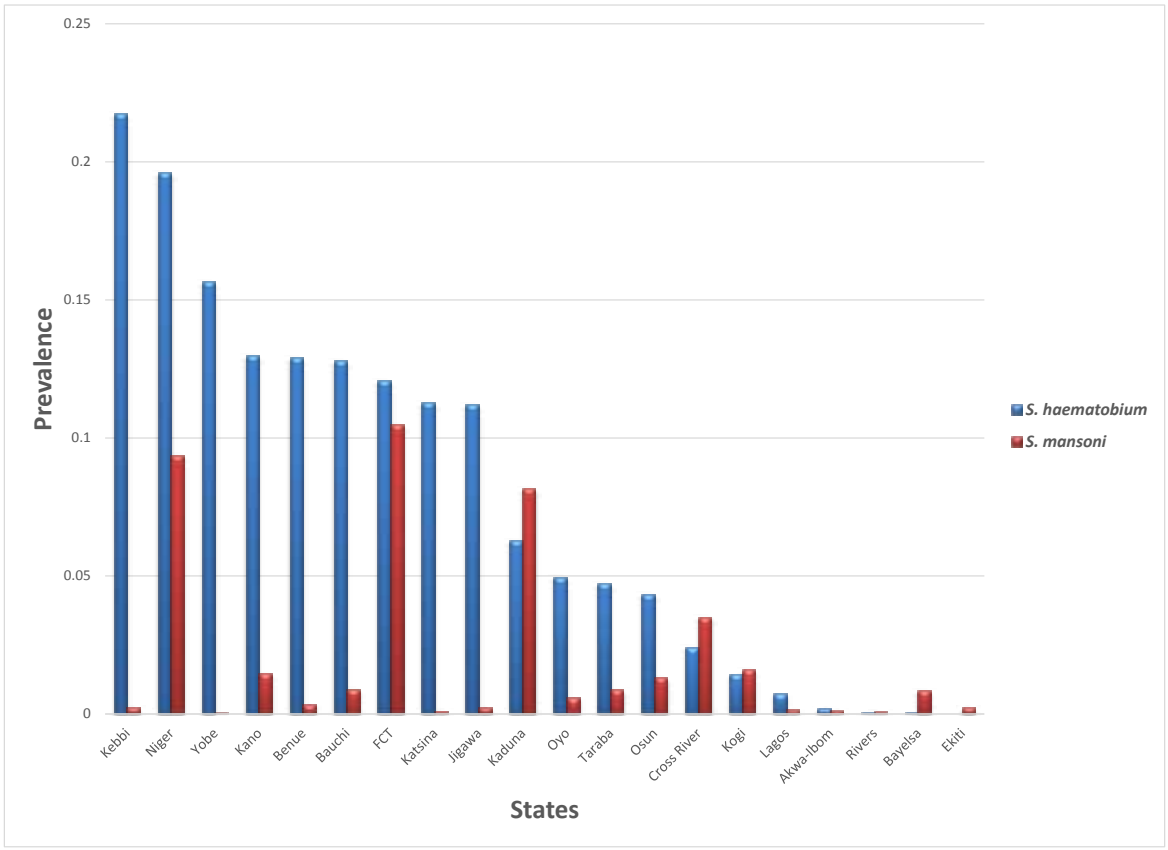
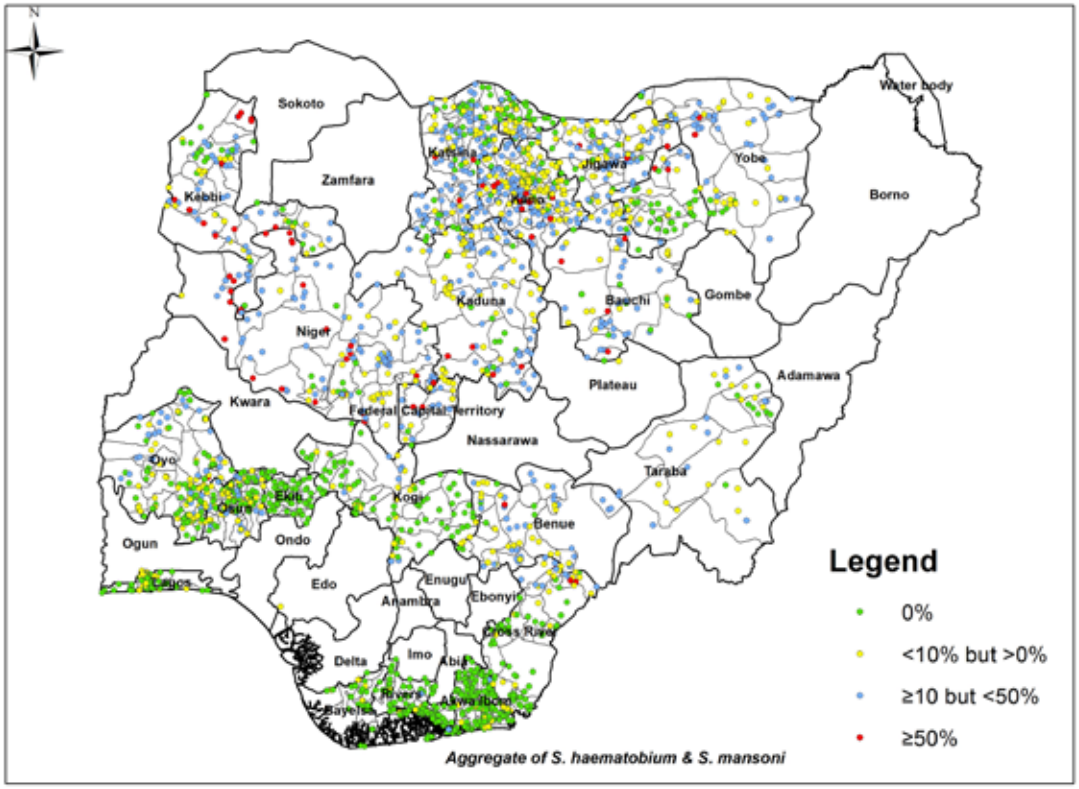
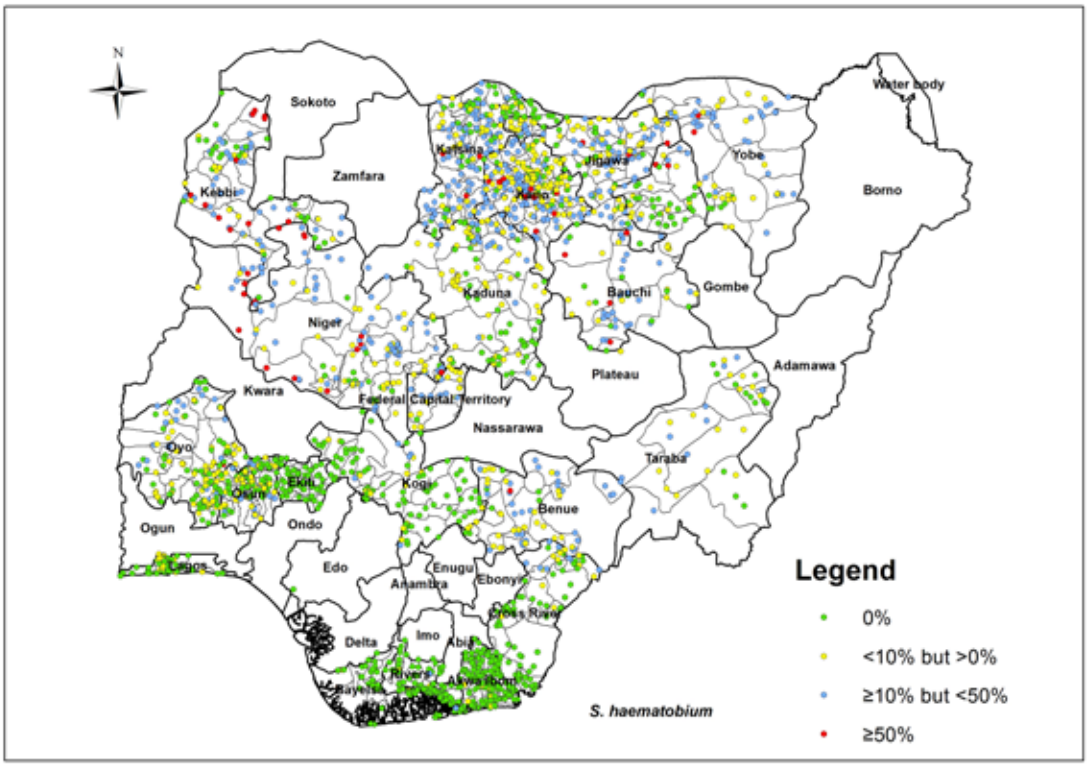


Figure 7:
Prevalence of S. haematobium and S.mansoni by State


N
Sokoto
Zamfara
Kebbi
Katsina
Jigawa
Yobe
Borno
Water body
Kano
Kaduna
Bauchi
Gombe
Niger
Plateau
Adamawa
Kwara
Federal Capital Territory
Nassarawa
Taraba
Oyo
Ekiti
Osun
Kogi
Benue
Ondo
Ogun
Edo
Enugu
Anambra
Ebonyi
Cross River
Delta
Imo
Abia
Rivers
Akwa Ibom
Bayelsa
Legend
0%
<10% but >0%
≥10 but <50%
≥50%
Aggregate of S. haematobium & S. mansoni


N
Sokoto
Zamfara
Kebbi
Katsina
Jigawa
Yobe
Borno
Water body
Kano
Kaduna
Bauchi
Gombe
Niger
Plateau
Adamawa
Kwara
Federal Capital Territory
Nassarawa
Taraba
Oyo
Ekiti
Osun
Kogi
Benue
Ondo
Ogun
Edo
Enugu
Anambra
Ebonyi
Cross River
Delta
Imo
Abia
Rivers
Akwa Ibom
Bayelsa
Legend
0%
<10% but >0%
≥10% but <50%
≥50%
S. haematobium

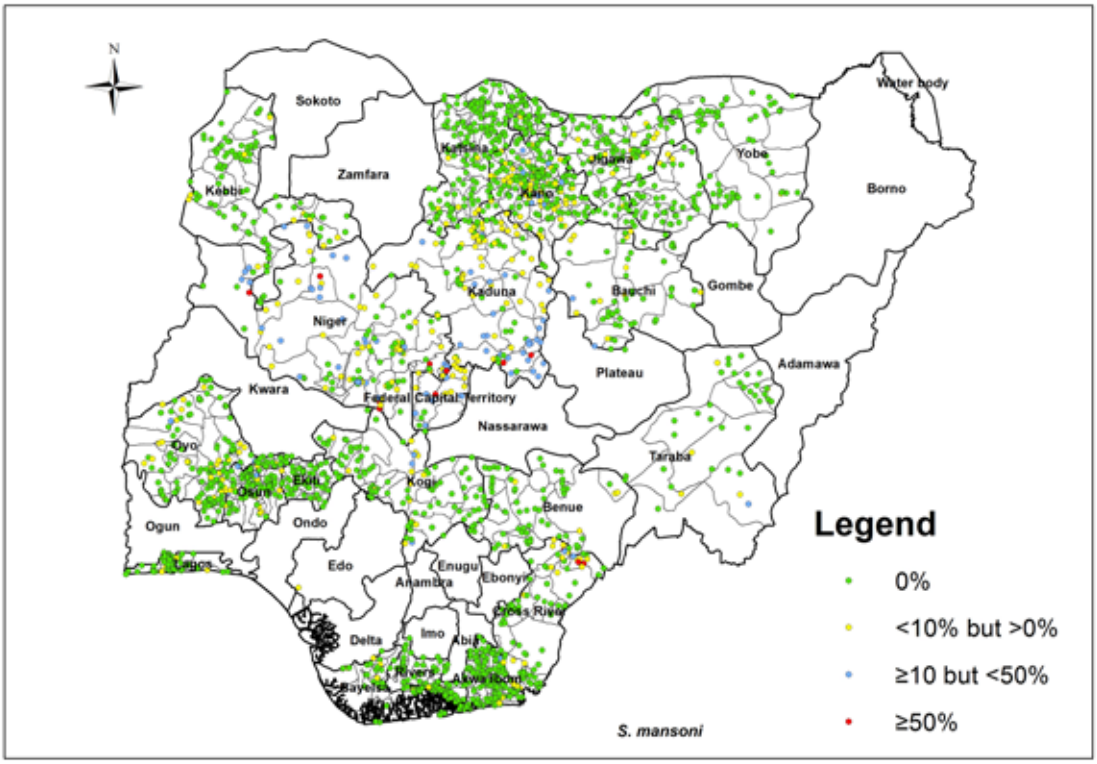


Figure 8:
Schistosomiasis Point Prevalence maps

3.2.2 Soil Transmitted Helminths (STHs) Results

All three STHs species Ascaris lumbricoides, Hookworm and Trichuris trichiura were observed in the present survey. The most prevalent species was hookworm (47%), A. lumbricoides (42%) and T. trichiura (11%). All the 19 States and FCT surveyed showed presence of A. lumbricoides and Hookworm infections. Only Yobe State had no prevalence of T. trichiura. Osun State followed by Oyo and Akwa Ibom States had the highest prevalence of A. lumbricoides with 40.9%, 35.9% and 31.9% respectively. Hookworm infection was highest in Akwa Ibom State with 40.3% followed by Niger State with 32.6% and the lowest in Yobe State with 0.7%. Rivers State recorded highest prevalence in Trichuris infection with 19.1% and followed closely by neighbouring Bayelsa State with 15.5% (Figure 9, 10 and 11). Of the 4.0% that had multiple STHs infection, Akwa Ibom State had highest prevalence of 20.8%. The lowest prevalence of 0.04% was recorded in Kebbi State.

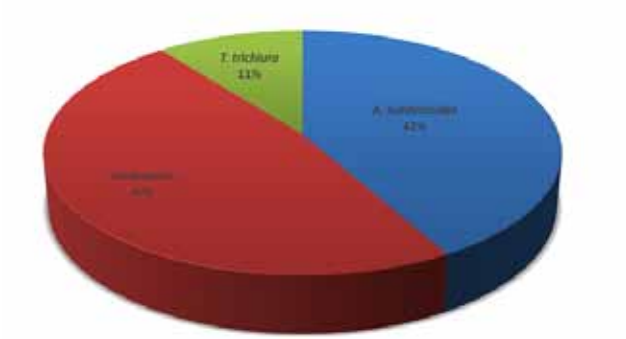


Figure 9:
Proportion of the three species of STHs in the Study Area

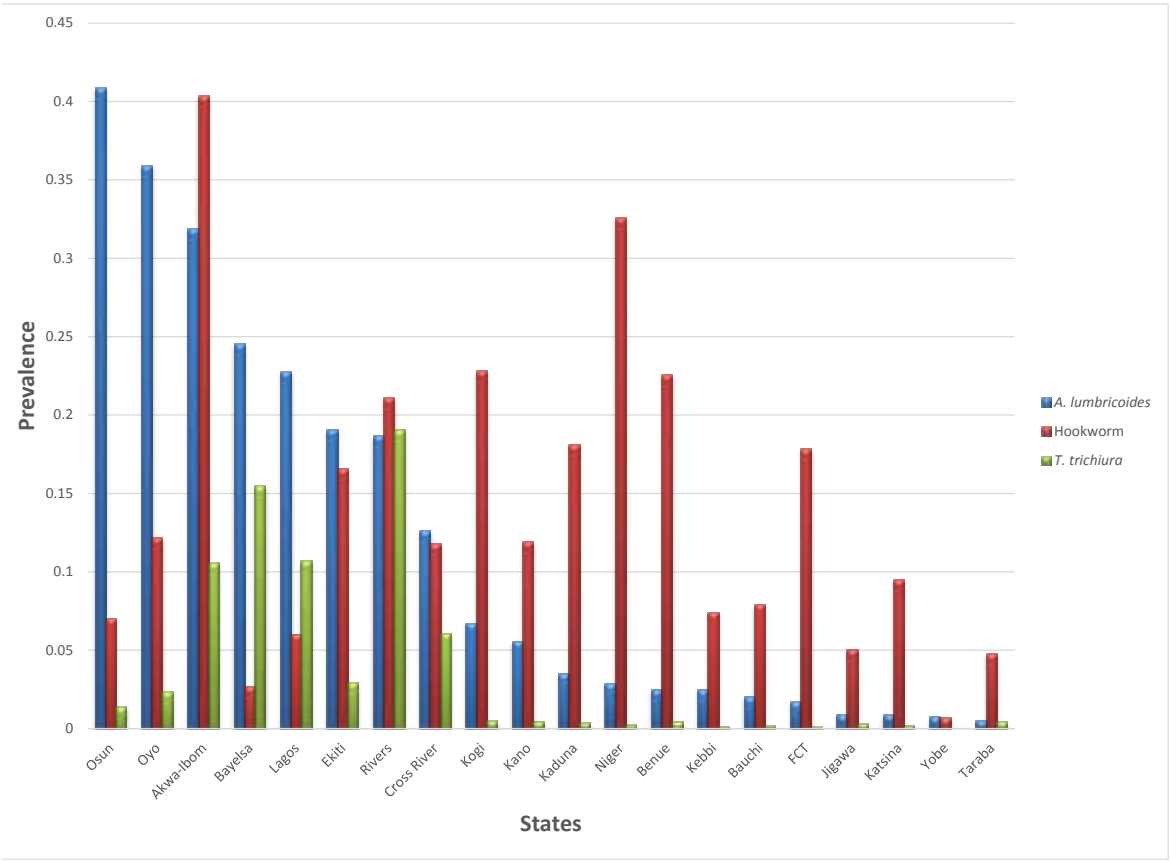
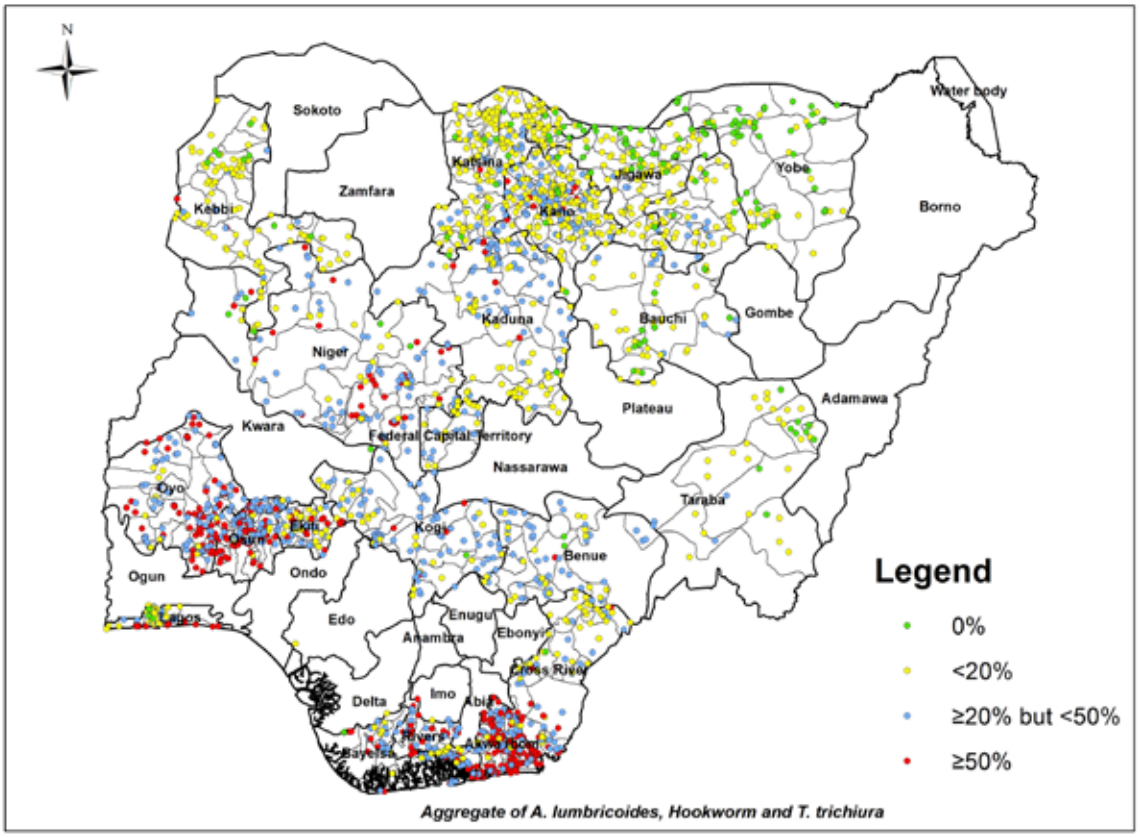
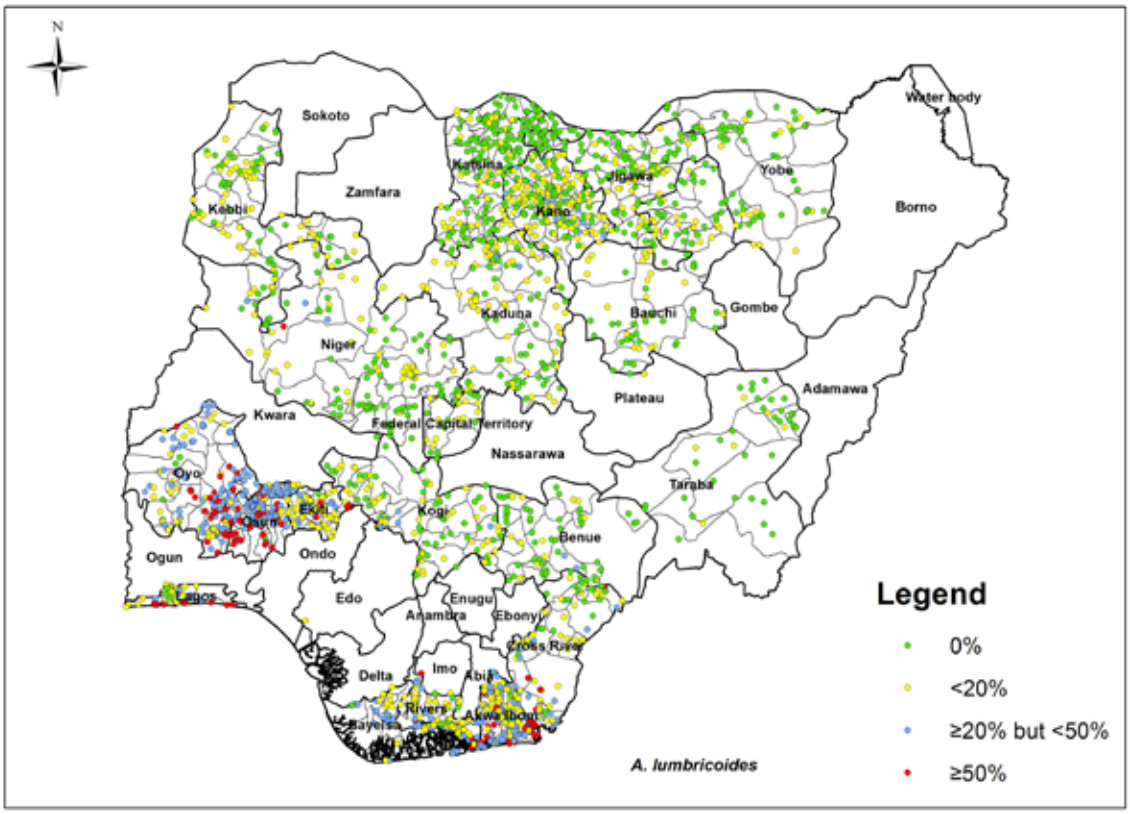


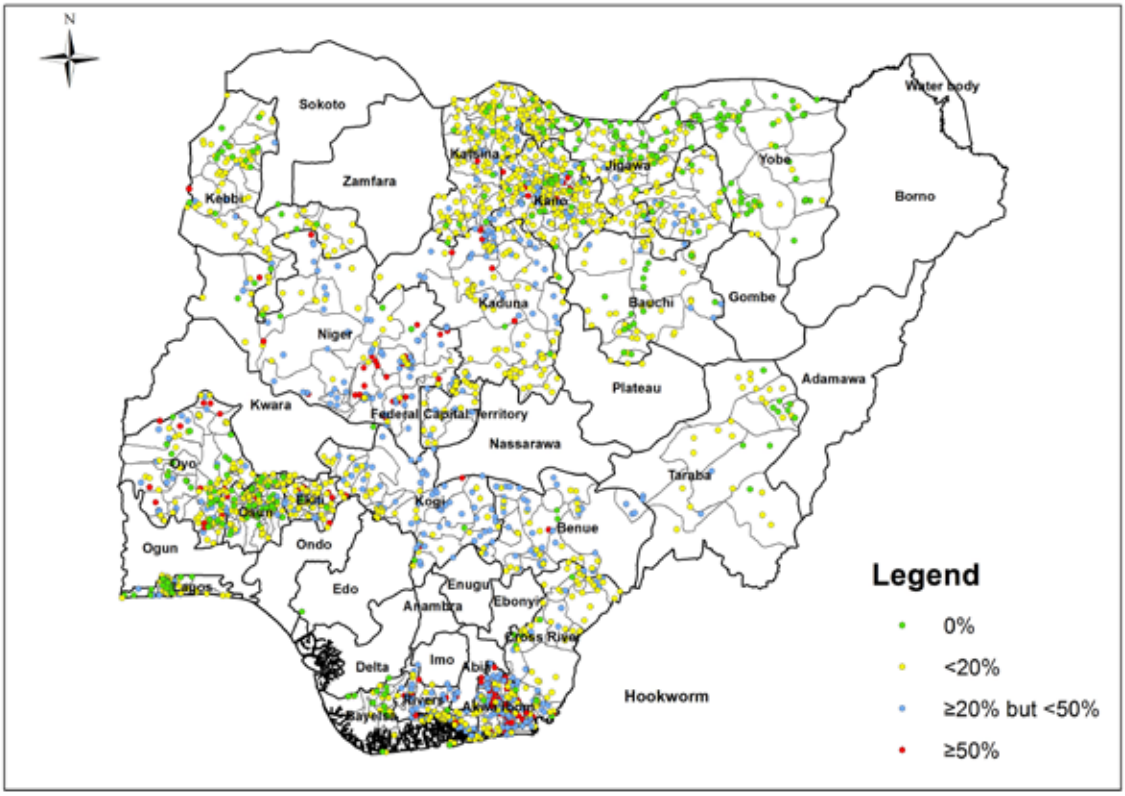
Figure 10:
Prevalence of A. lumbricoides, Hookworm and T. trichiura



Aggregate of A. lumbricoides, Hookworm and T. trichiura



A. lumbricoides



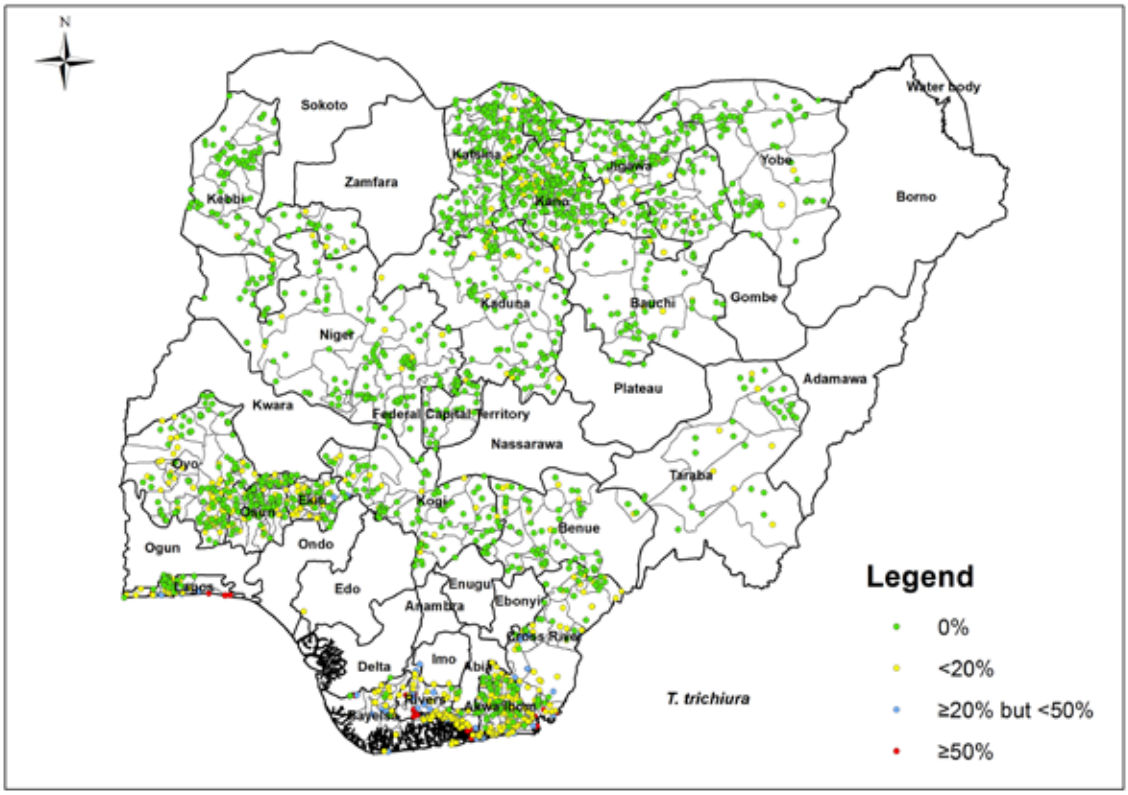


Figure 11:
STHs Point Prevalence maps

3.2.3 Prevalence of schistosomiasis and STH by Sex

Of the total pupils infected with schistosomiasis, 65% were males and 35% females. Niger State had highest prevalence of infection both in males (29.4%) and females (21.9%). Rivers State had the least infection in both sexes (Figure 12 and 13). There is a statistical significant association with schistosomiasis infection by sex (χ^2 = 957.37, P<0.05).

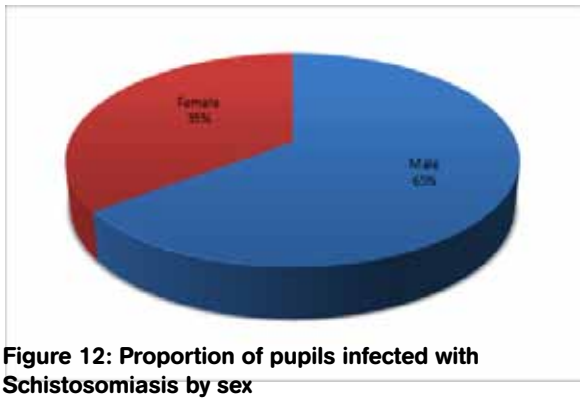


Figure 12: Proportion of pupils infected with Schistosomiasis by sex

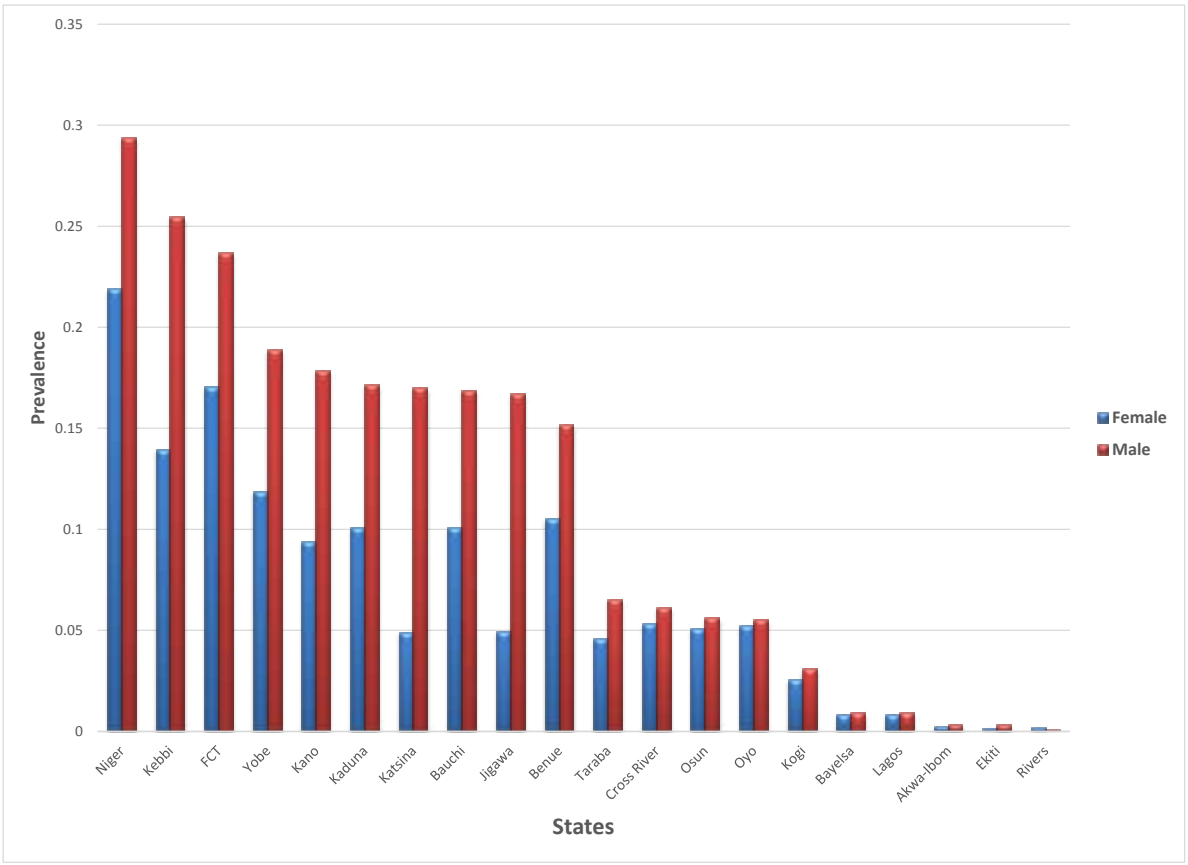


Figure 13: Prevalence of Schistosomiasis by sex

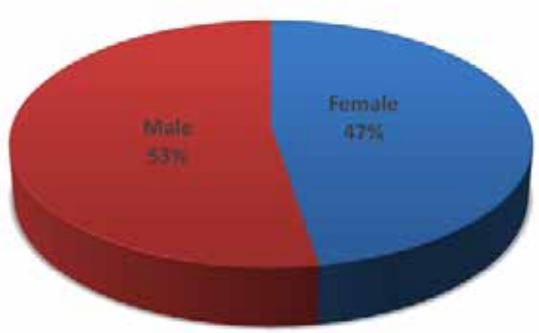


Figure 14: Proportion of Pupils infected with STHs by sex

STHs were found to be more prevalent among the 5-10 years age group (51%) as compared to the 11-16 years age group (49%). Akwa Ibom had the highest prevalence for both age groups; 56.2% for 5-10 years and 61.5% for 11-16 years. The lowest prevalence was found in Yobe State with 1.4% and 1.3% for both age groups respectively (Figures 18 and 19). There was statistically significant difference between the age groups (χ^2 = 11.12, P<0.05).

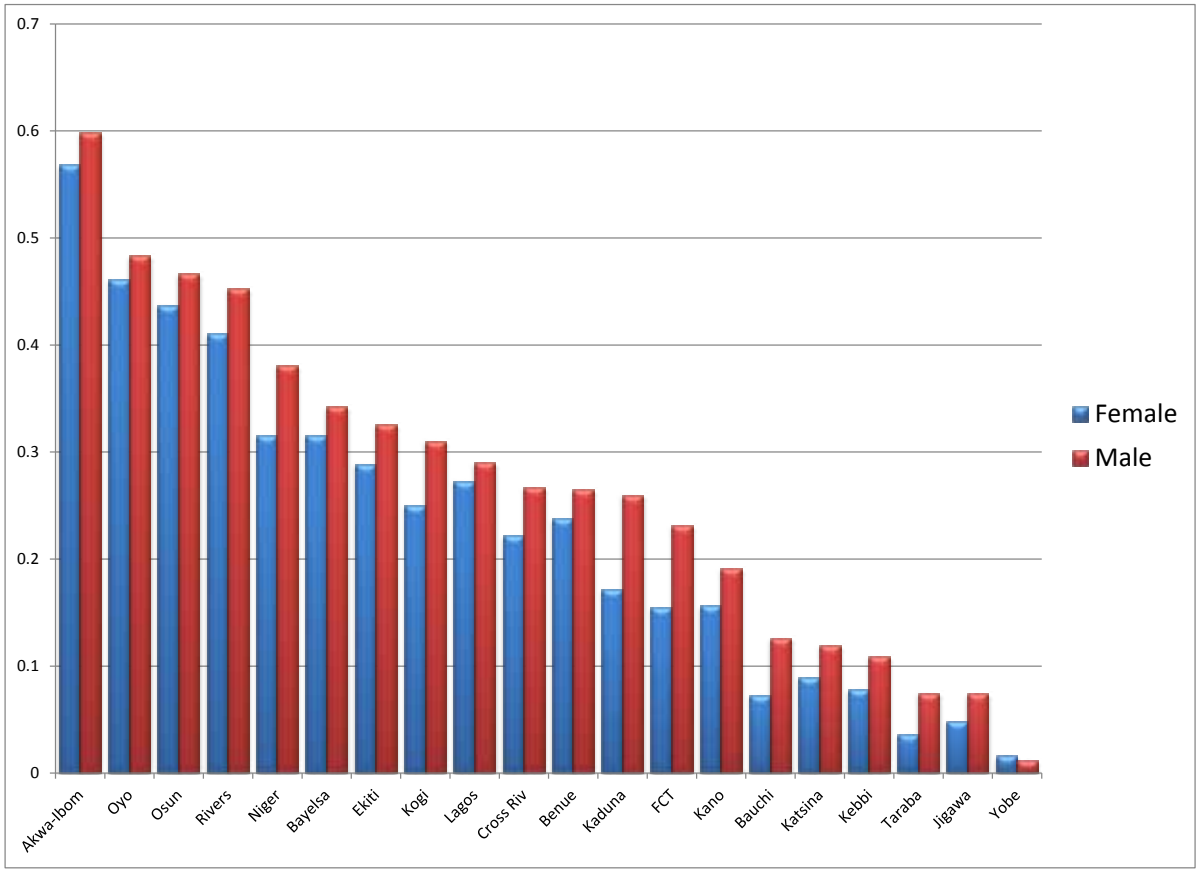


Figure 15: Prevalence of STHs by sex

3.2.4 Prevalence of schistosomiasis and STH by Age group

Schistosomiasis was found to be more prevalent among the 11-16 years age group (55%) as compared to the 5-10 years age group (45%) as shown in figure 16. In both age groups examined, Niger State had the highest prevalence of schistosomiasis with 24.1% and 29.4% for 5-10 and 11-16 years respectively. The lowest prevalence of 0.04% and 0.2% were recorded in Rivers State for both age groups respectively (Figure 17). Statistically, it was also observed that there was significant difference between prevalence of disease of the age groups (χ^2 = 139.48, P<0.05).

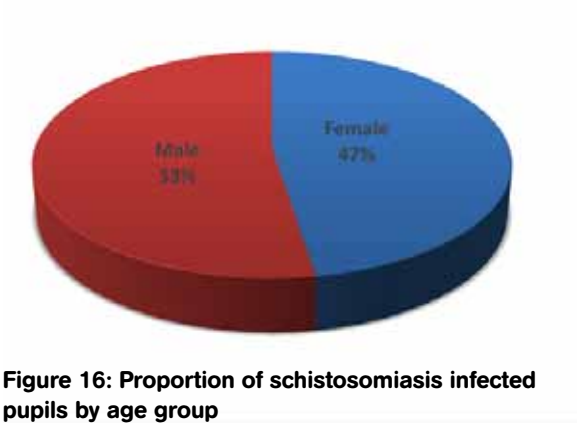


Figure 16: Proportion of schistosomiasis infected pupils by age group

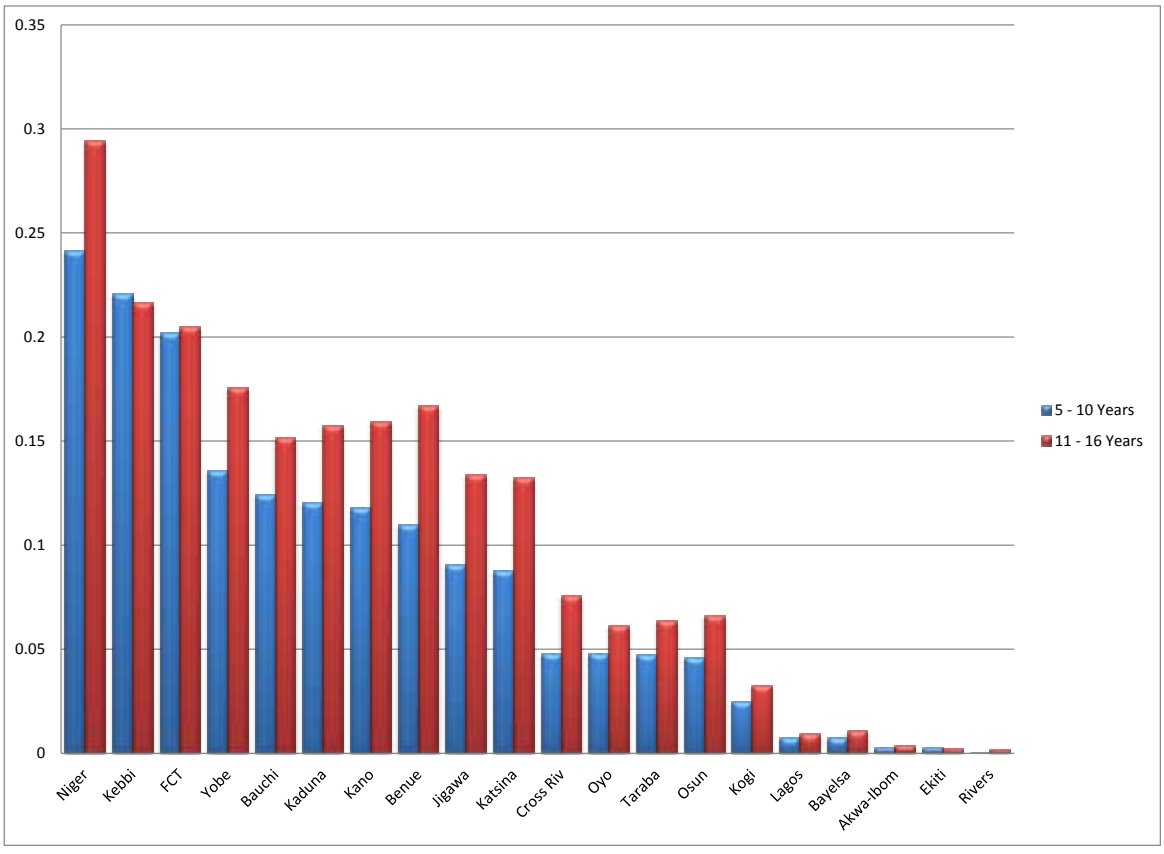


Figure 17: Prevalence of schistosomiasis by age group

STHs were found to be more prevalent among the 5-10 years age group (51%) as compared to the 11-16 years age group (49%). Akwa Ibom had the highest prevalence for both age groups; 56.2% for 5-10 years and 61.5% for 11-16 years. The lowest prevalence was found in Yobe State with 1.4% and 1.3% for both age groups respectively (Figures 18 and 19). There was statistically significant difference between the age groups (χ^2 = 11.12, P<0.05).

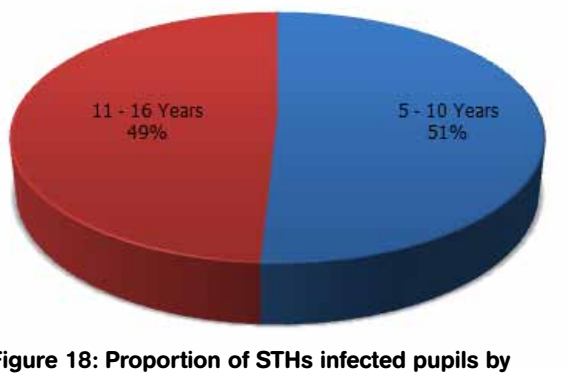


Figure 18: Proportion of STHs infected pupils by age group

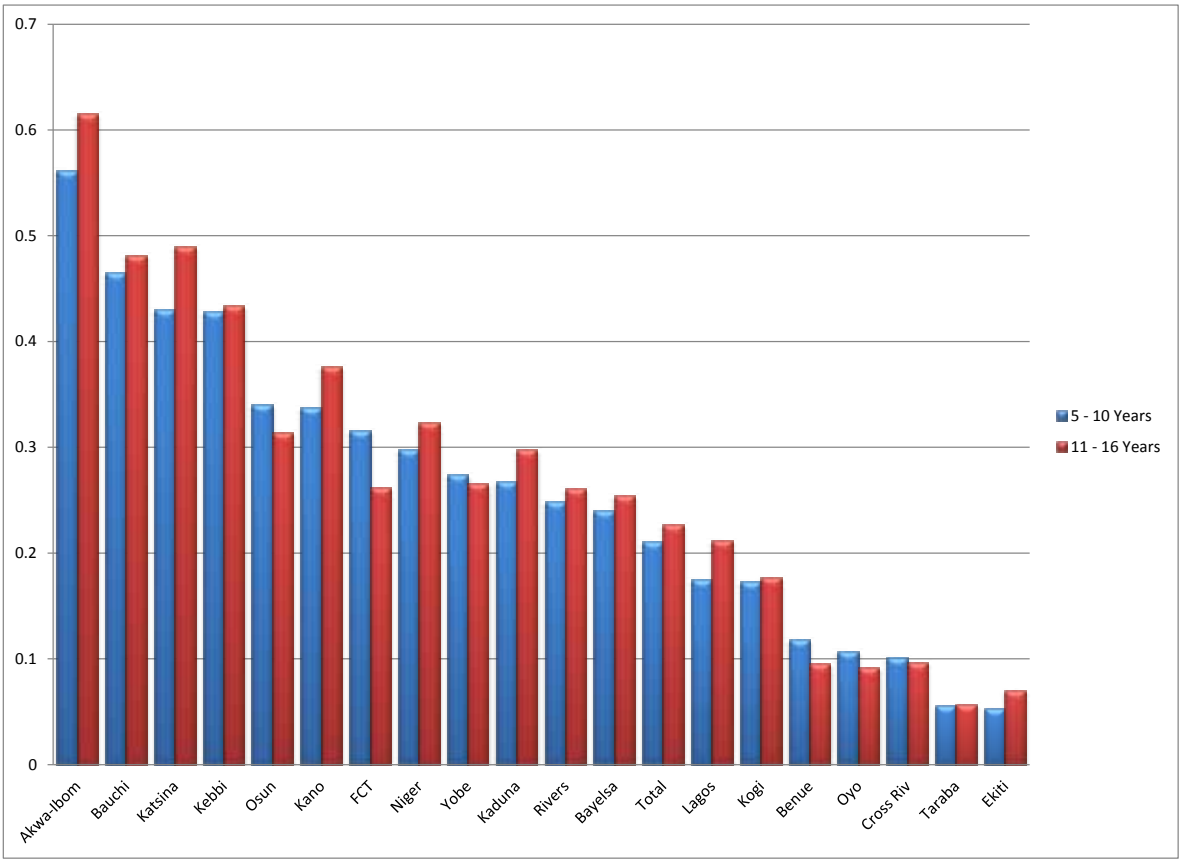


Figure 19: Prevalence of STHs infected pupils by age group

3.2.5 Intensity of Infection

The intensity levels (expressed as numbers of eggs per ml of urine or gram of faeces) of the various species of parasites recorded in this mapping survey are shown in table 5. The result shows that there were generally more cases of light and moderate intensities of infection. Heavy intensity levels were nearly equal for S. haematobium (24.31%) and S. mansoni (23.48%). However, heavy intensity of S. haematobium was higher in males (25.02%) than females (22.64%). Conversely, females (25.41%) recorded cases of heavy intensity of S. mansoni than males (22.01%). The intensity levels of S. haematobium showed statistical significant difference ($P<0.05$) with respect to sex in this survey.

For the STHs, hookworm (2.94%) recorded more cases of heavy infection followed by A. lumbricoides (1.40%) and T. trichuria (0.50%) had the least. The intensity levels of A. lumbricoides showed statistical significant difference ($P<0.05$) with respect to sex in this survey.

Table 5: Parasite intensity in eggs per gram (epg) of faeces or per 10 ml of urine

Parasite species	Level of intensity	Number (%) of intensity of infection		
		Male	Female	Total
S. haematobium	Light Infection (<50 eggs/ml)	4,605 (74.98)	2,033 (77.36)	6,638 (75.69)
	Heavy Infection (50 eggs/ml)	1,537 (25.02)	595 (22.64)	2,132 (24.31)
S. mansoni	Light Infection (1 – 99 epg)	461 (41.09)	325 (38.42)	786 (39.94)
	Moderate Infection (100-399 epg)	414 (36.90)	306 (36.17)	720 (36.59)
	Heavy Infection (>400 epg)	247 (22.01)	215 (25.41)	462 (23.48)
A. lumbricoides	Light Infection (1-4,999 epg)	5,721 (76.28)	5,061 (74.42)	10,782(75.39)
	Moderate Infection (5,000-49,999 epg)	1,681 (22.41)	1,638 (24.08)	3,319 (23.21)
	Heavy Infection (>50,000 epg)	98 (1.31)	102 (1.50)	200 (1.40)
Hookworm	Light Infection (1-1,999 epg)	8,883 (92.70)	6,143 (92.03)	15,026 (92.42)
	Moderate Infection (2,000-3,999 epg)	443 (4.62)	311 (4.66)	754 (4.64)
	Heavy Infection (>4,000 epg)	257 (2.68)	221 (3.31)	478 (2.94)
T. trichiura	Light Infection (1-999 epg)	1,684 (88.45)	1,484 (86.43)	3,168 (87.49)
	Moderate Infection (1,000-9,999 epg)	212 (11.13)	223 (12.99)	435 (12.01)
	Heavy Infection (>10,000 epg)	8 (0.42)	10 (0.58)	18 (0.50)

3.3 Implication of Findings on Intervention

Results of the survey showed that of 433 LGAs mapped, 359 (83%) required interventions for schistosomiasis (Appendix 7). Furthermore, in eight States and FCT, all the LGAs mapped (180) require treatment.

Rivers State has the least number of LGAs (26%) requiring treatment. A total of 202 LGAs fall within the low risk category, 153 moderate and four LGAs were high risk category. The four LGAs in the high risk category are found in Niger (2) and Kebbi (2) States (Table 6 and Figure 20).

Table 6: LGAs requiring Intervention for Schistosomiasis

State	No of LGAs mapped	Number of LGAs requiring Intervention			
		Low Risk (<10%)	Moderate Risk (10 - 49.9%)	High Risk ≥50%	Total number (%) of LGA requiring intervention
Akwa Ibom	31	15	0	0	15 (48)
Bauchi	20	8	11	0	19 (95)
Bayelsa	8	6	0	0	6 (75)
Benue	14	5	9	0	14 (100)
Cross-River	18	6	5	0	11 (61)
Ekiti*	16	3	0	0	3 (19)
FCT	4	1	3	0	4 (100)
Jigawa	27	14	13	0	27 (100)
Kaduna	23	9	14	0	23 (100)
Kano	44	19	25	0	44 (100)
Katsina	34	13	18	0	31 (91)
Kebbi	20	5	13	2	20 (100)
Kogi	21	13	3	0	16 (76)
Lagos	19	13	0	0	13 (68)
Osun	30	24	4	0	28 (93)
Oyo	33	27	4	0	31 (94)
Rivers	23	6	0	0	6 (26)
Taraba	8	7	1	0	8 (100)
Yobe	15	6	9	0	15 (100)
Niger	25	2	21	2	25 (100)
Total	**433**	**202**	**153**	**4**	**359 (83)**

* Ekiti was not mapped for S. haematobium in this survey

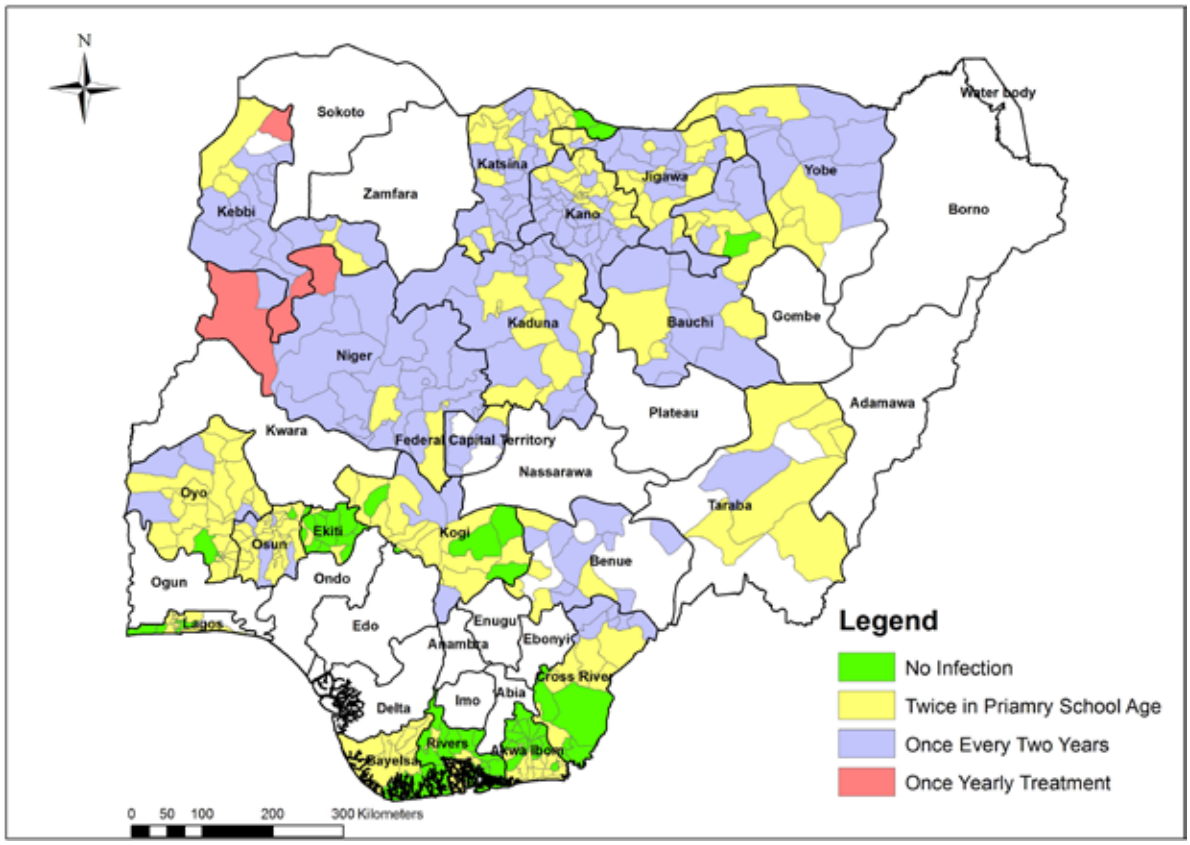


Figure 20: Intervention planning map for Schistosomiasis in 19 States and FCT.

A total of 237(55%) LGAs require some form of intervention for STHs as shown in Table 7 and Figure 21. All the LGAs mapped in Akwa Ibom, Benue and Osun States (75 LGAs) qualify for intervention. However, no LGA was found to qualify for intervention in Bauchi, Jigawa, Taraba and Yobe States. Case-based management is required in 191 LGAs of the surveyed States, 177 LGAs fall within the low risk and 60 LGAs in the high risk categories (Appendix 7).

Table 7: LGAs requiring Intervention for Soil Transmitted Helminths (STHs)

State	No of LGAs mapped	Number of LGAs requiring Intervention			
		Case-based Mgt (<20%)	Low Risk (20 - 49.9%)	High Risk (≥50%)	Total No. (%) of LGA requiring intervention
Akwa Ibom	31	0	9	22	31 (100)
Bauchi	20	20	0	0	0 (0)
Bayelsa	8	3	3	2	5 (63)
Benue	14	0	14	0	14 (100)
Cross-River	18	9	8	1	9 (50)
Ekiti	16	1	15	0	15 (94)
FCT	4	3	1	0	1 (25)
Jigawa	27	26	0	0	0 (0)
Kaduna	23	9	14	0	14 (61)
Kano	44	27	17	0	17 (39)
Katsina	34	30	4	0	4 (12)
Kebbi	20	18	2	0	2 (10)
Kogi	21	3	18	0	18 (86)
Lagos	19	15	3	0	3 (16)
Osun	30	0	20	10	30 (100)
Oyo	33	1	19	13	32 (97)
Rivers	23	2	11	9	20 (87)
Taraba	8	8	0	0	0 (0)
Yobe	15	13	0	0	0 (0)
Niger	25	3	19	3	22 (88)
Total	433	191	177	60	237 (55)

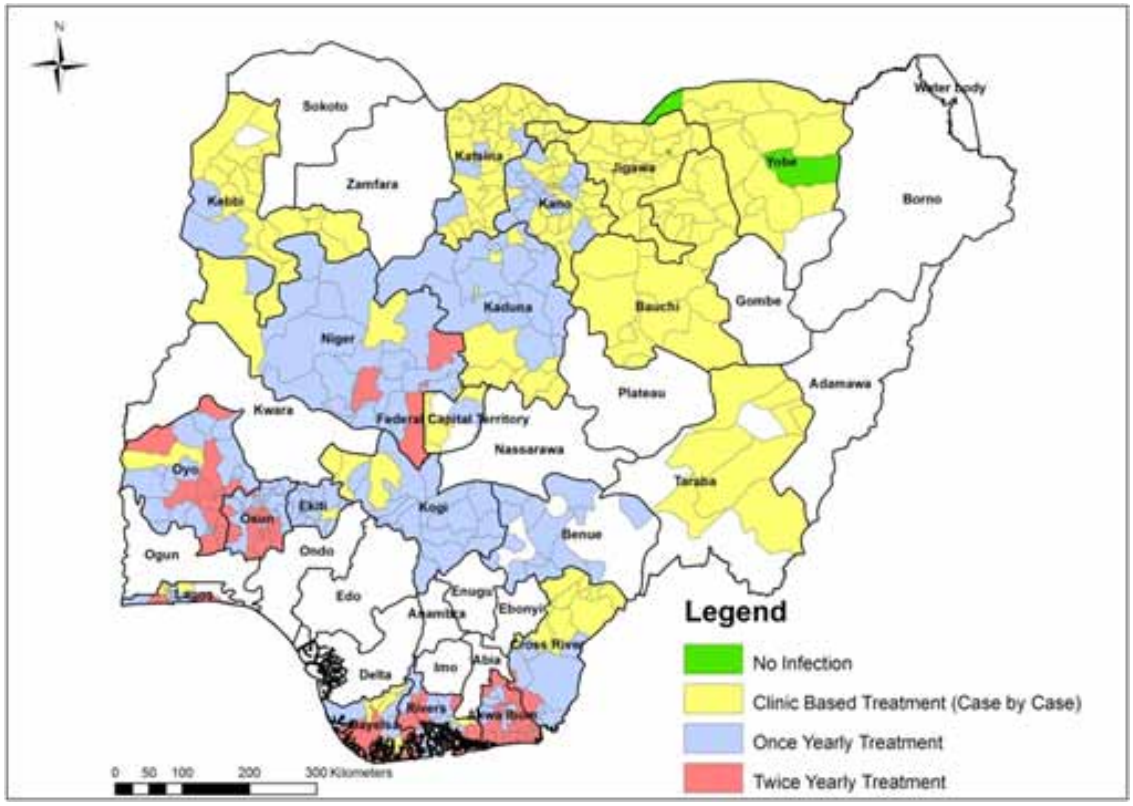


Figure 21: Intervention planning map for STHs in 19 States and the FCT

3.4 Defeacation practices and water contact activities

Table 8 shows prevalence of schistosomiasis and STHs in relation to place of defeacation by pupils surveyed. The highest prevalence for schistosomiasis and STHs was among respondents who defecated around the school compound (11.1% and 31.0% respectively). The second highest prevalence occurred among those who defecate outside school environment (10.7% for schistosomiasis and 26.5% for STHs). The State level prevalence is as shown on Appendix 8.

Table 9 and Appendix 9 showed that all respondents had some form of contact with water. The activities include bathing, fishing, washing, swimming, playing, fetching water, crossing water and others. The prevalence of schistosomiasis was highest among those who perform swimming activity (17.0%) followed by those who play in water (11.3%). For STHs the highest prevalence was among those who bath (34.3%) and those who fish (33.9%).

Table 8: Prevalence of schistosomiasis and STHs in relation to places of defeacation.

Defeacation Practices	No of Persons Examined	Schistosomiasis	STHs
		No (%) Infected	No (%) Infected
In the School Toilet	45,726	3,501 (7.66)	11,314 (24.74)
Around school Compound	29,847	3,319 (11.12)	9,250 (30.99)
Outside School Environment	32,899	3,529 (10.73)	8,705 (26.46)
Total	**108,472**	**10,349 (9.54)**	**29,269 (26.98)**

Table 9: Prevalence of Schistosomiasis in relation to water contact activities

Water Contact Activities	No of Respondents	Schistosomiasis	STHs
		No (%) of Persons Infected	No (%) of Persons Infected
Bathing	13,835	1,351(9.8)	4,739 (34.3)
Washing	20,689	2,106 (10.2)	6,160 (29.8)
Fishing	3,535	349 (9.9)	1,199 (33.9)
Crossing Water	3,253	279 (8.6)	917 (28.2)
Fetching Water	14,804	1,124 (7.6)	4,481 (30.3)
Playing	14,364	1,624 (11.3)	3,223 (22.4)
Swimming	6,590	1,119 (17.0)	1,970 (29.9)
Others	31,402	2,397 (7.6)	6,580 (21.0)
Total	**108,472**	**10,349 (9.5)**	**29,269 (27.0)**

4.0 Discussions

4.1 Discussion of Results

The results of the Schistosomiasis and STHs epidemiological mapping in the 19 States and FCT provided insight to the disease distribution and intensity by age group and sex for pupils in the surveyed area.

There are 456 LGAs in the 19 States but 21 LGAs (in Benue, FCT, Lagos, Kebbi and Taraba) had previously been mapped by government and partners. The intention of this survey was to complete the mapping in the remaining 435 LGAs; however, two LGAs in Yobe State could not be mapped due to insecurity.

The findings on schistosomiasis revealed that the overall prevalence was within the low risk range (9.5%), although data captured by LGA showed high levels of prevalence in some LGAs within some States. High salinity waters may not support the viability of freshwater snail hosts of schistosomes and may account for the low prevalence observed in Rivers, Akwa Ibom, Bayelsa and Lagos States that border the Atlantic and have brackish water bodies. The finding of this present survey agrees with other studies by Osama, 2009; Leveque et al, 1978; Kefford and Nugegoda (2005). However, in Cross River also a coastal State, five LGAs had moderate risk. These LGAs are situated in the northern part of the State bordering Benue State where the infection was also moderate. The low prevalence in Ekiti State could be explained by the deworming programme for schistosomiasis which was launched in 2010 although treatment has not been consistent over the years.

Regarding STHs, the overall prevalence rate was low, but LGA rates in some State were greater than 50% which is WHO classification for high risk (WHO, 2011). Most of the LGAs with high risk were found in States in the southern part of the country except Niger State in the North Central zone. The survey showed higher prevalence of STHs than schistosomiasis which was in contrast to findings in similar studies in Zimbabwe where schistosomiasis was 22.7% and STHs 5.5% (Midzi et al., 2014)

Prevalence of infection shows the parasites burden in the population while intensity estimates the worm burden per host. The ability of a parasite to elicit disease symptoms depends on its intensity in the host and a combination of other factors such as the physiological state of the host and the presence of other parasites. Although cases of heavy intensity were few in this survey, those of moderate and light infections were quite high and could graduate into heavy intensity if they remain untreated. Studies have demonstrated a relationship between the initial worm burden and growth after treatment (Mohammed et al., 2002). Children with higher worm burden were observed to gain less weight than those with lower worm burden.

Co-infection of schistosomiasis and STHs was observed in all the States sampled except in Rivers State. The range of the prevalence of schistosomiasis and STHs in the LGAs of the States was in agreement with the findings from other studies that schistosomiasis is a focal disease even in one State where its prevalence varied from LGA to LGA (FMOH 2013). Conversely, STH are ubiquitous and the low prevalence range in Jigawa and Yobe States could be attributed to on-going annual Lymphatic Filariasis treatment with Albendazole in some parts of the State in the last five years. The range provided information on the LGAs requiring intervention as well as the type of treatment required.

Schistosoma haematobium was more prevalent than S. mansoni in the present survey and agrees with similar studies in Nigeria. Some States such as Kebbi, Niger and Yobe with very high prevalence of S. haematobium may be linked to presence of freshwater bodies and dams dotting such areas. These dams and other natural water bodies support irrigation and provide recreational facilities for school age children who frequent these sources for different activities that can lead to exposure to infection. The water bodies often are the only source of water for domestic uses and also serve as social centres for the communities. Dams and other freshwater bodies have been implicated in epidemiology of schistosomiasis in Nigeria and Africa (Steinmann et al., 2006). Nigeria is still endemic for schistosomiasis and scale-up provision of infrastructure especially potable water may reduce contact with infected waters and further support the elimination programme of the government.

Ascaris, hookworms and Trichuris are prevalent in Nigeria and associated with poor infrastructure and unsanitary habits. The presence of multiple infections with these STHs in school age children has been observed in similar studies globally including Nigeria (Worrell et al., 2013, Ojurongbe et al., 2014). These impose high burden on the infected pupils causing chronic morbidity, cognitive impairment and school absenteeism (Lobato et al., 2012). The high prevalence of Ascaris and hookworms observed in Osun, Oyo, Akwa-Ibom, Bayelsa and other rain forest zone States may be attributed to favourable climatic conditions of adequate moisture and relative humidity and poor sanitary condition which enhance transmission. In contrast, a State like Yobe in northern savannah zone where there is low moisture content had very low prevalence.

Males were significantly more susceptible to schistosome infections than females as observed in this survey. This has been linked to increased and prolonged water contact activities by males such as swimming, fishing and bathing especially during the peak hours of cercariae shedding by snail hosts which are risk factors in exposure to infection. The females are engaged in lower risk activities of washing and fetching water which usually occur in the early mornings and late evenings when cercariae shedding is low (Anya & Okoronkwo 1991). Moreover there is limited exposure of the body during these activities.

The high prevalence of schistosomiasis among pupils 11 – 16 years old is suggestive of possible frequent water contact activities in this age group. Pupils of this age range frequent water bodies for recreational activities like swimming than those in the younger ages (Worrell, et al. 2013). This is exemplified by the fact that in Niger State where the prevalence of schistosomiasis was high, it occurred more in this age group (11 – 16 years), particularly, along the major water points in the State. Age-related activities and behaviour, frequency of exposure and development of immunity are known to play important role in the distribution of schistosomiasis and STHs infections (Daniel et al., 2007).

Conversely, higher prevalence of STHs was recorded in younger age group (5 - 10 years). The statistical significance with respect to age group is a clear indication that pupils within this age group are more exposed to the sources of infection than the older ones. High infection rates with STHs have been attributed to poor sanitary conditions and hygiene, low nutritional status (Otubanjo and Mafe, 2002), climatic conditions such as temperatures and soil

factors such as salinity (Bosompem, 2004). A proposed causal link between hygiene and intestinal parasitic infections (Allison and Larson 2002) features water contact-base activities and direct consumption of contaminated water as major sources of infections.

4.2 Implications of Findings

The implication of the findings of this survey for treatment intervention for schistosomiasis at the LGAs' level is presented at three prevalence categories (WHO, 2011): high-risk areas (where prevalence of infection in school-age children is 50%), moderate-risk areas (where prevalence of infection in school-age children is >10% but <50%) and low-risk areas (where prevalence of infection in school-age children is <10%). The estimated population at risk in the 19 States and FCT is 24,195,603 persons for schistosomiasis.

This categorization of treatment intervention is required for planning purposes. The level of prevalence of infection in an area is used to determine the frequency of treatment. By this, four LGAs in this survey required annual treatment of all school-age children and adults considered to be at risk. One hundred and fifty-three LGAs require treatment once every two years for all school age children and adults considered to be at risk. Two hundred and two LGAs are qualified for two treatment intervention during their primary schooling years. An estimated 21,257,368 persons are at risk of STHs infections in the 19 States and FCT.

WHO (2011) however, presents only two categories for the STHs (high-risk and low-risk areas). Sixty LGAs fall within the high-risk areas while 177 LGAs were within the low-risk areas. The implication is twice yearly treatment for school age children in these 60 LGAs. In addition, treatment should also be administered to other at-risk individuals including pre-school age children, women of child-bearing age and adults in high risk occupation. This shows the magnitude of treatment intervention required for control and elimination purposes.

In addition to preventive chemotherapy, interventions should include the implementation of other components of the PHASE strategy. The findings of low numbers of LGAs requiring intervention in Rivers State may be partly due to the recent scale up/development of schools infrastructure and improvement in sanitary conditions of the schools.

The places of defeacation were categorised into three; in the school toilet, around school compound and outside school environment. The results showed that pupils using any of the three places for defeacation were infected with either or both parasites. However, the prevalence was lowest among those pupils who defaecated in the school toilet. Adebote et al., (2005), reported high prevalence of helminth ova in faeces deposited at different locations near human habitations and concluded that poor personal hygiene and environmental sanitation, which can occur as a consequence of indiscriminate defaecation and the use of human excreta as fertilizer on farms and vegetable gardens (Umoh et al. 2001), may result in spread of helminth infections.

4.3 Some Key Achievements of the Project

- The CIFF investment supported the strengthening of the office of the National Coordinator for Schistosomiasis and STHs Control Programme. This has ensured a well-equipped and functional office for proper coordination of the programme in Nigeria.
- The capacity of health workers was developed/strengthened across the tiers of Government to respond to NTDs programme direction in the country. It also created opportunity to showcase multi-sectoral approach and collaboration for result.
- The support was able to leverage additional funding ($80,000) from RTI/ENVISION to map additional LGAs in 2 States (Cross Rivers and Ondo) where mapping had not been completed.
- Sightsavers also funded ($25,715) for the completion of the mapping of schistosomiasis and STHs in Benue State.
- There was also the mapping of other States (Bauchi, Taraba and Niger) with DFID funding from the DFID/GTMP.
- The investment has also helped Nigeria to realign its control/elimination road map with the WHO recommended timeline for NTDs.

5.0. Challenges/Constraints

There were some challenges encountered during the mapping project. They have been grouped into five categories as follows:

5.1 Logistics

- Lack of counterpart funding from the State which led to inadequate mobilization and sensitization of the schools and communities.
- Inefficient logistics including project vehicles in some States for project monitoring and implementation.
- Distances between selected schools were sometimes far hence the teams arrived their second schools late. This was worse if the two schools are in the riverine areas.
- Unanticipated fuel scarcity and high cost of fuel in some of the States impacted on overall project schedule and cost.

5.2 Mobilisation/Misconception

Inadequate mobilisation of some of the host communities coupled with misconceptions in some areas about handling of human wastes led to delays and in some cases rejection by respondent to participate. Some team members were also harassed and manhandled by communities who questioned the implication of taking their children's specimen away from the village.

5.3 Communication/Technology Challenges

- Challenges of communication reduced the level of communication between the supervisors/consultants and the teams during the field work. It was very important to track the team leaders and have real-time information on the progress of work.
- Difficulties with uploading of information in the phone were experienced. In some areas, other internet service providers had comparative advantage over MTN which was solely used by the programme.

5.4 Access challenges to schools in some LGAs

The Terrain in some LGAs made the schools difficult to reach and a team ends up visiting only one school is a day and not two as in
the plan. Some teams had to cross the ocean to reach the riverine areas and mapping took up to two days per school in some cases. Also, some children did not resume promptly from the first term school vacation which had just ended before the commencement of the mapping exercise causing delays in completion of the mapping exercise in some States.

5.5 Security Challenges

Insecurity in some parts of the country and the concomitant nationwide political campaigns during the period of this exercise were reasons for some of the delays in securing approvals to commence the project in some States. Residents were displaced in some LGAs and the school children were not available for the survey in other areas. These unforeseen situations hindered timely achievement of set targets of the mapping project.

6.0. Recommendations

Having successfully conducted the mapping of schistosomiasis and STHs in 19 States and FCT, there is ample evidence for appropriate intervention. It is recommended that the FMOH should carry out the following:

1. Disseminate the results of the mapping survey at all levels including WHO and other global NTDs medicines donors using appropriate channels
2. Strengthen collaboration with relevant sectors and partners (FMOH, SMOH, SUBEB and other Partners) to commence the implementation of PHASE in all endemic LGAs
3. Establish electronic platform at the FMOH office for data transmission, storage and analysis with respect to future schistosomiasis and STH interventions.
4. Enhanced Advocacy, mobilization and multi-sectoral approach to ensure maximum community participation.
5. Leverage funding support from Government at all levels, NGDOs and corporate organisations using the results of the mapping.
6. Provide field operational vehicles at the national office for supportive supervision and monitoring of project implementation.

7.0 Conclusion

The mapping of schistosomiasis and STHs in 19 States and the Federal Capital Territory of Nigeria was successfully completed and has achieved all the set objectives. Data generated from this crucial survey provided vital evidence for appropriate and sustainable intervention by Government in collaboration with our highly esteemed NTDs partners. It is the right of every child in Nigeria to enjoy good health and the time to intervene is now.

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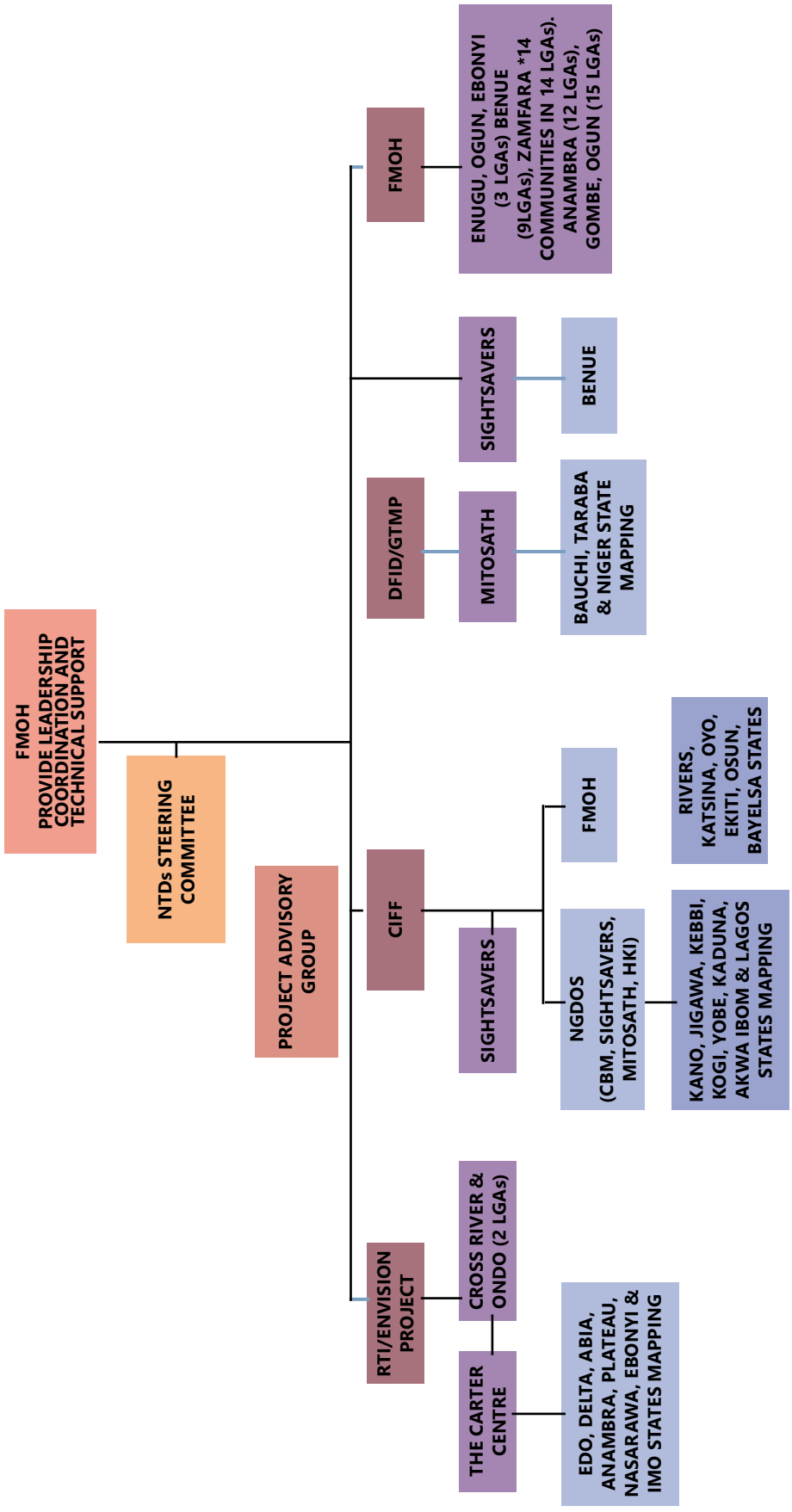
Appendix



Appendix 1: Coordinated Mapping of Schistosomiasis & STH in Nigeria: Project Organogram

Appendix 2: Survey Teams

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Mr. Nwoye Ikenna	Dr. Chukwudozie Chukwunonso
Mr. Adegunju Rotimi	Mr. Daguleng Ibrahim
Mrs. Rita O. Urude	Mr. Emmanuel Ibeku.C.
Miss. Omolola Iwayemi Olojede	Dr. Daramola Olakunle
Mrs. Nwafor Leticia	Mr. Shilo Paul
Mr. Afe Lawrence	Mr. Ren Whyte
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Mr.Basmah Sulaiman	Mr.Ibrahim Ado Ahmed
Mr.Ibrahim Abdullahi	Ms.Halisa Ashiru G.
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Mr. Umaru Nasiru	Mr. Ahmed Ibrahim
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Mr. Abume Terzungwe	Mr. Thomas Terwase
Mrs. Betty Jande	
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Mr. Nasiru Jibrin	Mr. Abdurahaman Danjuma
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Mr. Sani Ibrahim	Mr. Mohammed Abubakar
Mr. Yakubu Chiroma	Mr. Sofian Audi
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Ms. Ijeoma Achu	Mr. Manaseh Dakyen

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Mr. Nuhu Sambo	Mr. Nyako Finare
Mr. Salihu Bako	Mr. Alpha Dimas
Mr. Hammed Mogaji	
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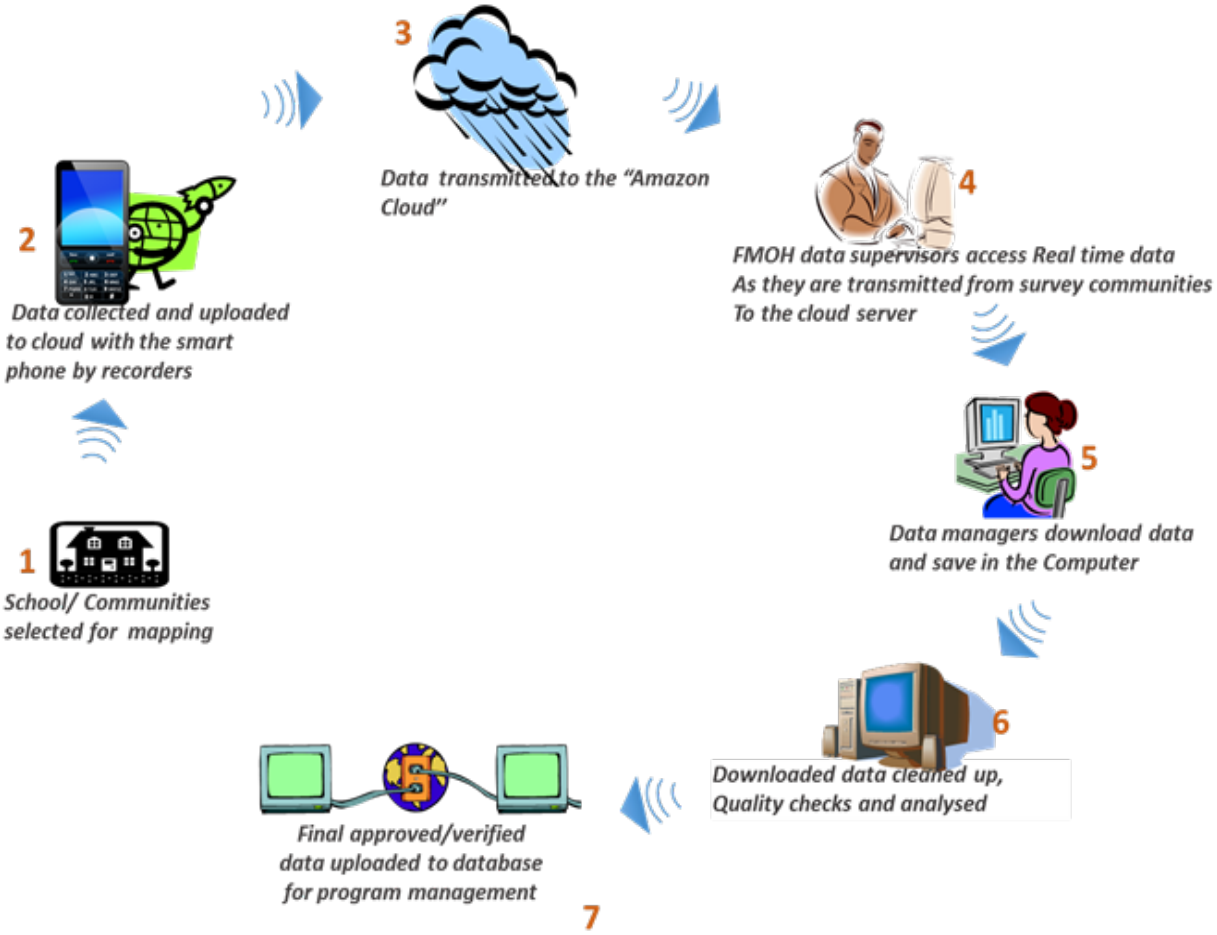
Mrs. Emmanuel. B .E	Mrs. Alade .M .Irene
Mrs. Tajudeen Wosilat	Mrs. Onuoha. O .F
Mrs. Fumilayo Da-Silva	Ms. Adebia Bosede. B
Mr. Adesanmi Bayo	Mrs. Oyebanji .O.I
Mr. Ogundero G.O	Mr. Akinwamide George
Mr. Olofinlade Bode	Ms. Adeoumi Esther
Mr. Akinyemi Taiwo	Mrs, Ayeni Bukola
Mr. Oluyole Oke	Mr. Aluko .K
Mr. Oladipo Olusanya .S	Mr. Obayemi. F
KADUNA STATE	
Mr. AbdulKarim Dauda	Mr. Alhassan Abdullahi
Mr. Haruna Damina	Mr. Adamu Mohammed
Mr. Jonah	Mr. Mariam Abdulkadril
Mr. Jonah M. Gado	Mr. Bature
Mr. Maikudi Yakubu	Mr. Suleiman Ibrahim
Mrs. Margret Kure	Mrs. Mary Victor
Mr. Shittu Ladan Abdullahi	Mr. Mohammed
Mr. Safiyanu Mohammed	Mr. Abba Mangai
Mr. Tanko	Mr. Barau
OTHERS	
Mr. Ifeanyi Nwude	Mr. Famokun Adekunle
Mr. Chinedu Dike	Mr. Pat-Nebe Okwudili. C.
Mr. Ajiji Joseph	Mr. Offor Solomon
Mrs. Blessing Dike	Mr. Akpe Oluchi. E
Mr. Dike Geofrey. C	Mr. Eke Daniel Obinna
Miss. Obiora Chika	Mr. Saleh Usman
Mr. Obumneme Chigbo	Mr. Emmanuel William
Mrs. Funmilayo Olaniyan	Mr. Ezeobi. C. Daniel

Appendix 3: Flow Diagram of the Android Based Electronic Data Management



Appendix 4: Ethical Clearance

National Health Research Ethics Committee of Nigeria (NHREC)

Promoting Highest Ethical and Scientific Standards for Health Research in Nigeria

Federal Ministry of Health

NHREC Protocol Number NHREC/01/01/2007-18/07/2014
NHREC Approval Number NHREC/01/01/2007-25/11/2014c
Date: 25th November, 2014

RE: INTEGRATED EPIDEMIOLOGICAL MAPPING AND BASELINE SURVEY OF NTDS (LYMPHATIC FILARIASIS, SCHISTOSOMIASIS AND SOIL TRANSMITTED HELMINTHS) IN NIGERIA

Health Research Ethics Committee (HREC) assigned number: NHREC/01/01/2007

Name of Principal Investigator: Dr. Uwaezuoke Onyebuchi

Address of Investigator: Department of Public Health
Federal Ministry of Health
Cell Phone: +2348089023030
E-mail: happywaez@yahoo.com

Date of receipt of valid application: 18-07-2014
Date when final determination of research was made: 25-11-2014

Notice of Expedited Review and Approval

This is to inform you that the research described in the submitted protocol, the consent forms, other participant information materials have been reviewed and given expedited committee approval by the National Health Research Ethics Committee.

This approval dates remain as in the initial approval from 25/11/2014 to 24/11/2015. If there is delay in starting the research, please inform the HREC so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. *All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study.* **If this is a multi-year research, endeavour to submit your annual report to the HREC early in order to obtain renewal of your approval and avoid disruption of your research.**

The National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the HREC. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification.

Signed

Clement Adebamowo BMChB Hons (Jos), FWACS, FACS, DSc (Harvard)
Chairman, National Health Research Ethics Committee of Nigeria (NHREC)

Department of Health Planning, Research & Statistics
Federal Ministry of Health
11th Floor, Federal Secretariat Complex Phase III
Ahmadu Bello Way, Abuja

Tel: +234-09-523-8367
E-mail: chairman@nhrec.net, secretary@nhrec.net,
deskofficer@nhrec.net,
URL: http://www.nhrec.net,

Appendix 5: Treatment guideline for schistosomiasis/STH

Category	Disease	Prevalence (by parasitological methods)	Action	
High-risk	**Schistosomiasis**	≥50%	Treat all school-age children once per year	Also treat adults considered to be at risk
Moderate-risk	Schistosomiasis	≥10% but <50%	Treat all school-age children once every two years	Also treat adults considered to be at risk
Low-risk	Schistosomiasis	<10%	Treat all school-age children twice during their primary schooling	Praziquantel should be available in dispensaries and clinics
High-risk	STH	≥50%	Treat all school-age children twice per year	Also treat: • preschool children • women of childbearing age, including pregnant women in the 2nd and 3rd trimesters and lactating women • adults in high risk occupations
Low risk	STH	≥20% but <50%	Treat all school-age children once per year	Also treat: • preschool children • women of childbearing age, including pregnant women in the 2nd and 3rd trimesters and lactating women • adults in high risk occupations
	STH	<20%	Case-by case management of those infected	

Source: WHO/CTD/SIP/98.1

Appendix 6: LGAs Requiring Interventions

State	LGA Name	Schistosomiasis			STH		
		Low	Moderate	High	Low	High	Case Mgt
Akwa-Ibom	Itu	-	-	-	-	✓	-
Akwa-Ibom	Uruan	-	-	-	-	✓	-
Akwa-Ibom	Urue-Offong/Oruko	-	-	-	-	✓	-
Akwa-Ibom	Ibesikpo Asutan	-	-	-	-	✓	-
Akwa-Ibom	Ini	-	-	-	-	✓	-
Akwa-Ibom	Nsit-Ibom	-	-	-	✓	-	-
Akwa-Ibom	Uyo	-	-	-	✓	-	-
Akwa-Ibom	Oruk Anam	-	-	-	-	✓	-
Akwa-Ibom	Ikot Ekpene	-	-	-	✓	-	-
Akwa-Ibom	Ikono	-	-	-	✓	-	-
Akwa-Ibom	Essien Udim	-	-	-	✓	-	-
Akwa-Ibom	Ika	-	-	-	✓	-	-
Akwa-Ibom	Abak	-	-	-	-	✓	-
Akwa-Ibom	Ibiono Ibom	-	-	-	-	✓	-
Akwa-Ibom	Etim Ekpo	-	-	-	✓	-	-
Akwa-Ibom	Obot Akara	-	-	-	-	✓	-
Akwa-Ibom	Udung-Uko	✓	-	-	-	✓	-
Akwa-Ibom	Mbo	✓	-	-	-	✓	-
Akwa-Ibom	Ibeno	✓	-	-	-	✓	-
Akwa-Ibom	Okobo	✓	-	-	-	✓	-
Akwa-Ibom	Oron	✓	-	-	-	✓	-
Akwa-Ibom	Ikot Abasi	✓	-	-	-	✓	-
Akwa-Ibom	Onna	✓	-	-	-	✓	-
Akwa-Ibom	Eastern Obolo	✓	-	-	-	✓	-
Akwa-Ibom	Mkpat-Enin	✓	-	-	-	✓	-
Akwa-Ibom	Esit Eket	✓	-	-	-	✓	-
Akwa-Ibom	Ukanafun	✓	-	-	✓	-	-
Akwa-Ibom	Nsit-Atai	✓	-	-	-	✓	-
Akwa-Ibom	Nsit-Ubium	✓	-	-	-	✓	-
Akwa-Ibom	Etinan	✓	-	-	✓	-	-
Akwa-Ibom	Eket	✓	-	-	-	✓	-
Bauchi	Warji	-	✓	-	-	-	✓
Bauchi	Bauchi	-	✓	-	-	-	✓
Bauchi	Shira	-	✓	-	-	-	✓
Bauchi	Misau	-	-	-	-	-	✓
Bauchi	Ningi	-	✓	-	-	-	✓
Bauchi	Alkaleri	-	✓	-	-	-	✓
Bauchi	Itas_Gadau	-	✓	-	-	-	✓
Bauchi	Gamawa	-	✓	-	-	-	✓
Bauchi	Tafawa Balewa	-	✓	-	-	-	✓

State	LGA Name	Schistosomiasis			STH		
		Low	Moderate	High	Low	High	Case Mgt
Bauchi	Zaki	-	✓	-	-	-	✓
Bauchi	Bogoro	-	✓	-	-	-	✓
Bauchi	Ganjuwa	-	✓	-	-	-	✓
Bauchi	Katagum	✓	-	-	-	-	✓
Bauchi	Kirfi	✓	-	-	-	-	✓
Bauchi	Giade	✓	-	-	-	-	✓
Bauchi	Jama'are	✓	-	-	-	-	✓
Bauchi	Darazo	✓	-	-	-	-	✓
Bauchi	Dambam	✓	-	-	-	-	✓
Bauchi	Dass	✓	-	-	-	-	✓
Bauchi	Toro	✓	-	-	-	-	✓
Bayelsa	Brass	-	-	-	-	✓	-
Bayelsa	Nembe	-	-	-	-	-	✓
Bayelsa	Southern Ijaw	✓	-	-	-	✓	-
Bayelsa	Ekeremor	✓	-	-	✓	-	-
Bayelsa	Yenagoa	✓	-	-	✓	-	-
Bayelsa	Ogbia	✓	-	-	✓	-	-
Bayelsa	Sagbama	✓	-	-	-	-	✓
Bayelsa	Kolokuma/Opokuma	✓	-	-	-	-	✓
Benue	Gwer East	-	✓	-	✓	-	-
Benue	Agatu	✓	-	-	✓	-	-
Benue	Guma	-	✓	-	✓	-	-
Benue	Oju	-	✓	-	✓	-	-
Benue	Gwer West	-	✓	-	✓	-	-
Benue	Ukum	-	✓	-	✓	-	-
Benue	Apa	-	✓	-	✓	-	-
Benue	Ado	✓	-	-	✓	-	-
Benue	Vandeikya	-	✓	-	✓	-	-
Benue	Obi	-	✓	-	✓	-	-
Benue	Konshisha	✓	-	-	✓	-	-
Benue	Ogbadibo	✓	-	-	✓	-	-
Benue	Ohimini	✓	-	-	✓	-	-
Benue	Tarka	-	✓	-	✓	-	-
Cross River	Bakasi	-	-	-	✓	-	-
Cross River	Akpabuyo	-	-	-	✓	-	-
Cross River	Biase	-	-	-	✓	-	-
Cross River	Akamkpa	-	-	-	✓	-	-
Cross River	Calabar South	-	-	-	✓	-	-
Cross River	Calabar Municipal	-	-	-	✓	-	-
Cross River	Obanliku	-	✓	-	-	-	✓
Cross River	Ogoja	-	✓	-	-	-	✓

State	LGA Name	Schistosomiasis			STH		
		Low	Moderate	High	Low	High	Case Mgt
Cross River	Obudu	-	✓	-	-	-	✓
Cross River	Yala	-	✓	-	-	-	✓
Cross River	Yakurr	✓	-	-	✓	-	-
Cross River	Odukpani	✓	-	-	-	✓	-
Cross River	Etung	✓	-	-	✓	-	-
Cross River	Ikom	✓	-	-	-	-	✓
Cross River	Boki	✓	-	-	-	-	✓
Cross River	Obubra	✓	-	-	-	-	✓
Cross River	Abi	-	-	-	-	-	✓
Cross River	Bekwara	-	✓	-	-	-	✓
Ekiti	Ekiti South West	-	-	-	✓	-	-
Ekiti	Ikole	-	-	-	✓	-	-
Ekiti	Ekiti East	-	-	-	✓	-	-
Ekiti	Ijero	-	-	-	✓	-	-
Ekiti	Ilejemeje	-	-	-	✓	-	-
Ekiti	Efon Alaaye	-	-	-	✓	-	-
Ekiti	Irepodun /Ifelodun	-	-	-	✓	-	-
Ekiti	Ikere	-	-	-	✓	-	-
Ekiti	Ido Osi	-	-	-	✓	-	-
Ekiti	Ado-Ekiti	-	-	-	✓	-	-
Ekiti	Oye	-	-	-	✓	-	-
Ekiti	Gbonyin	-	-	-	-	-	✓
Ekiti	Emure	-	-	-	✓	-	-
Ekiti	Ekiti West	✓	-	-	✓	-	-
Ekiti	Ise Orun	✓	-	-	✓	-	-
Ekiti	Moba	✓	-	-	✓	-	-
FCT	Abuja Municipal Area Council	-	✓	-	✓	-	-
FCT	Kwali	-	✓	-	-	-	✓
FCT	Abaji	-	✓	-	-	-	✓
FCT	Bwari	✓	-	-	-	-	✓
Jigawa	Jahun	-	✓	-	-	-	✓
Jigawa	Garki	-	✓	-	-	-	✓
Jigawa	Auyo	-	✓	-	-	-	✓
Jigawa	Gwaram	-	✓	-	-	-	✓
Jigawa	Birnin Kudu	-	✓	-	-	-	✓
Jigawa	Kazaure	-	✓	-	-	-	✓
Jigawa	Miga	-	✓	-	-	-	✓
Jigawa	Kiri Kasamma	-	✓	-	-	-	✓
Jigawa	Sule Tankarkar	-	✓	-	-	-	✓
Jigawa	Gagarawa	-	✓	-	-	-	✓
Jigawa	Kaugama	-	✓	-	-	-	✓

State	LGA Name	Schistosomiasis			STH		
		Low	Moderate	High	Low	High	Case Mgt
Jigawa	Maigatari	-	✓	-	-	-	✓
Jigawa	Babura	-	✓	-	-	-	✓
Jigawa	Kiyawa	✓	-	-	-	-	✓
Jigawa	Ringim	✓	-	-	-	-	✓
Jigawa	Gwiwa	✓	-	-	-	-	✓
Jigawa	Kafin Hausa	✓	-	-	-	-	✓
Jigawa	Dutse	✓	-	-	-	-	✓
Jigawa	Taura	✓	-	-	-	-	✓
Jigawa	Buji	✓	-	-	-	-	✓
Jigawa	Roni	✓	-	-	-	-	✓
Jigawa	Yankwashi	✓	-	-	-	-	✓
Jigawa	Biriniwa	✓	-	-	-	-	✓
Jigawa	Gumel	✓	-	-	-	-	✓
Jigawa	Guri	✓	-	-	-	-	✓
Jigawa	Malam Madori	✓	-	-	-	-	✓
Jigawa	Hadejia	✓	-	-	-	-	-
Kaduna	Kudan	-	✓	-	✓	-	-
Kaduna	Sabon Gari	-	✓	-	✓	-	-
Kaduna	Soba	-	✓	-	✓	-	-
Kaduna	Giwa	-	✓	-	✓	-	-
Kaduna	Chikun	-	✓	-	✓	-	-
Kaduna	Sanga	-	✓	-	-	-	✓
Kaduna	Makarfi	-	✓	-	-	-	✓
Kaduna	Birnin Gwari	-	✓	-	✓	-	-
Kaduna	Zaria	-	✓	-	-	-	✓
Kaduna	Kauru	-	✓	-	✓	-	-
Kaduna	Ikara	-	✓	-	✓	-	-
Kaduna	Jema'a	-	✓	-	-	-	✓
Kaduna	Kachia	-	✓	-	-	-	✓
Kaduna	Kaura	-	✓	-	-	-	✓
Kaduna	Kaduna South	✓	-	-	✓	-	-
Kaduna	Jaba	✓	-	-	-	-	✓
Kaduna	Kubau	✓	-	-	✓	-	-
Kaduna	Kagarko	✓	-	-	-	-	✓
Kaduna	Igabi	✓	-	-	✓	-	-
Kaduna	Kajuru	✓	-	-	✓	-	-
Kaduna	Zangon Kataf	✓	-	-	✓	-	-
Kaduna	Lere	✓	-	-	✓	-	-
Kaduna	Kaduna North	✓	-	-	-	-	✓
Kano	Rimin Gado	-	✓	-	✓	-	-
Kano	Tudun Wada	-	✓	-	-	-	✓

State	LGA Name	Schistosomiasis			STH		
		Low	Moderate	High	Low	High	Case Mgt
Kano	Tofa	-	✓	-	✓	-	-
Kano	Kabo	-	✓	-	✓	-	-
Kano	Doguwa	-	✓	-	-	-	✓
Kano	Shanono	-	✓	-	✓	-	-
Kano	Madobi	-	✓	-	✓	-	-
Kano	Sumaila	-	✓	-	✓	-	-
Kano	Karaye	-	✓	-	✓	-	-
Kano	Minjibir	-	✓	-	-	-	✓
Kano	Kura	-	✓	-	✓	-	-
Kano	Kiru	-	✓	-	✓	-	-
Kano	Warawa	-	✓	-	✓	-	-
Kano	Rogo	-	✓	-	✓	-	-
Kano	Kunchi	-	✓	-	✓	-	-
Kano	Bagwai	-	✓	-	✓	-	-
Kano	Kibiya	-	✓	-	-	-	✓
Kano	Bunkure	-	✓	-	✓	-	-
Kano	Rano	-	✓	-	-	-	✓
Kano	Garko	-	✓	-	-	-	✓
Kano	Wudil	-	✓	-	-	-	✓
Kano	Garun Mallam	-	✓	-	-	-	✓
Kano	Takai	-	✓	-	-	-	✓
Kano	Gwarzo	-	✓	-	-	-	✓
Kano	Bebeji	-	✓	-	-	-	✓
Kano	Kano Municipal	✓	-	-	-	-	✓
Kano	Nasarawa	✓	-	-	-	-	✓
Kano	Dambatta	✓	-	-	-	-	✓
Kano	Dawakin Tofa	✓	-	-	-	-	✓
Kano	Dala	✓	-	-	-	-	✓
Kano	Gezawa	✓	-	-	✓	-	-
Kano	Bichi	✓	-	-	-	-	✓
Kano	Gwale	✓	-	-	-	-	✓
Kano	Makoda	✓	-	-	-	-	✓
Kano	Tarauni	✓	-	-	-	-	✓
Kano	Fagge	✓	-	-	-	-	✓
Kano	Ajingi	✓	-	-	-	-	✓
Kano	Dawakin Kudu	✓	-	-	-	-	✓
Kano	Gaya	✓	-	-	-	-	✓
Kano	Gabasawa	✓	-	-	✓	-	-
Kano	Tsanyawa	✓	-	-	✓	-	-
Kano	Kumbotso	✓	-	-	-	-	✓
Kano	Albasu	✓	-	-	-	-	✓

State	LGA Name	Schistosomiasis			STH		
		Low	Moderate	High	Low	High	Case Mgt
Kano	Ungogo	✓	-	-	-	-	✓
Katsina	Kafur	-	✓	-	-	-	✓
Katsina	Kusada	-	✓	-	-	-	✓
Katsina	Mani	-	✓	-	-	-	✓
Katsina	Dan Musa	-	✓	-	-	-	✓
Katsina	Matazu	-	✓	-	-	-	✓
Katsina	Kankia	-	✓	-	-	-	✓
Katsina	Musawa	-	✓	-	-	-	✓
Katsina	Dutsin Ma	-	✓	-	✓	-	-
Katsina	Faskari	-	✓	-	✓	-	-
Katsina	Safana	-	✓	-	-	-	✓
Katsina	Bindawa	-	✓	-	-	-	✓
Katsina	Bakori	-	✓	-	-	-	✓
Katsina	Kankara	-	✓	-	-	-	✓
Katsina	Dandume	-	✓	-	-	-	✓
Katsina	Rimi	-	✓	-	-	-	✓
Katsina	Kaita	-	✓	-	-	-	✓
Katsina	Malumfashi	-	✓	-	-	-	✓
Katsina	Katsina LGA	-	✓	-	-	-	✓
Katsina	Zango	-	-	-	-	-	✓
Katsina	Baure	-	-	-	-	-	✓
Katsina	Mashi	✓	-	-	-	-	✓
Katsina	Mai'Adua	✓	-	-	-	-	✓
Katsina	Ingawa	✓	-	-	✓	-	-
Katsina	Danja	✓	-	-	✓	-	-
Katsina	Funtua	✓	-	-	-	-	✓
Katsina	Charanchi	✓	-	-	-	-	✓
Katsina	Batsari	✓	-	-	-	-	✓
Katsina	Daura	✓	-	-	-	-	✓
Katsina	Sabuwa	✓	-	-	-	-	✓
Katsina	Kurfi	✓	-	-	-	-	✓
Katsina	Batagarawa	✓	-	-	-	-	✓
Katsina	Jibia	✓	-	-	-	-	✓
Katsina	Dutsi	✓	-	-	-	-	✓
Katsina	Sandamu	✓	-	-	-	-	✓
Kebbi	Koko/Bese	-	✓	-	-	-	✓
Kebbi	Ngaski	-	-	✓	-	-	✓
Kebbi	Danko/Wasagu	-	✓	-	-	-	✓
Kebbi	Shanga	-	✓	-	-	-	✓
Kebbi	Dandi	-	✓	-	✓	-	-
Kebbi	Bagudo	-	✓	-	✓	-	-

State	LGA Name	Schistosomiasis			STH		
		Low	Moderate	High	Low	High	Case Mgt
Kebbi	Yauri	-	✓	-	-	-	✓
Kebbi	Gwandu	-	✓	-	-	-	✓
Kebbi	Maiyama	-	✓	-	-	-	✓
Kebbi	Suru	-	✓	-	-	-	✓
Kebbi	Augie	-	-	✓	-	-	✓
Kebbi	Birnin Kebbi	-	✓	-	-	-	✓
Kebbi	Jega	-	✓	-	-	-	✓
Kebbi	Aleiro	-	✓	-	-	-	✓
Kebbi	Fakai	-	✓	-	-	-	✓
Kebbi	Sakaba	✓	-	-	-	-	✓
Kebbi	Bunza	✓	-	-	-	-	✓
Kebbi	Arewa	✓	-	-	-	-	✓
Kebbi	Zuru	✓	-	-	-	-	✓
Kebbi	Kalgo	✓	-	-	-	-	✓
Kogi	Mopa-Muro	-	-	-	✓	-	-
Kogi	Lokoja	-	✓	-	✓	-	-
Kogi	Omala	-	-	-	✓	-	-
Kogi	Ibaji	-	✓	-	✓	-	-
Kogi	Dekina	-	-	-	✓	-	-
Kogi	Kogi LGA	-	✓	-	✓	-	-
Kogi	Olamaboro	-	-	-	✓	-	-
Kogi	Ogori/Magongo	-	-	-	✓	-	-
Kogi	Yagba West	✓	-	-	-	-	✓
Kogi	Ankpa	✓	-	-	✓	-	-
Kogi	Idah	✓	-	-	✓	-	-
Kogi	Bassa	✓	-	-	✓	-	-
Kogi	Okehi	✓	-	-	✓	-	-
Kogi	Okene	✓	-	-	✓	-	-
Kogi	Ofu	✓	-	-	✓	-	-
Kogi	Ijumu	✓	-	-	✓	-	-
Kogi	Kabba/Bunu	✓	-	-	-	-	✓
Kogi	Yagba East	✓	-	-	-	-	✓
Kogi	Igalamela Odolu	✓	-	-	✓	-	-
Kogi	Ajaokuta	✓	-	-	✓	-	-
Kogi	Adavi	✓	-	-	✓	-	-
Lagos	Ojo	-	-	-	-	✓	-
Lagos	Apapa	-	-	-	✓	-	-
Lagos	Badagry	-	-	-	✓	-	-
Lagos	Lagos Island	-	-	-	✓	-	-
Lagos	Shomolu	-	-	-	✓	-	-
Lagos	Mushin	-	-	-	-	-	✓

State	LGA Name	Schistosomiasis			STH		
		Low	Moderate	High	Low	High	Case Mgt
Lagos	Ibeju-Lekki	✓	-	-	-	✓	-
Lagos	Amuwo-Odofin	✓	-	-	-	✓	-
Lagos	Eti Osa	✓	-	-	✓	-	-
Lagos	Ajeromi-Ifelodun	✓	-	-	✓	-	-
Lagos	Lagos Mainland	✓	-	-	✓	-	-
Lagos	Surulere, Lagos State	✓	-	-	-	-	✓
Lagos	Ifako-Ijaiye	✓	-	-	-	-	✓
Lagos	Agege	✓	-	-	-	-	✓
Lagos	Kosofe	✓	-	-	✓	-	-
Lagos	Ikorodu	✓	-	-	-	-	✓
Lagos	Ikeja	✓	-	-	-	-	✓
Lagos	Oshodi-Isolo	✓	-	-	-	-	✓
Lagos	Alimosho	✓	-	-	-	-	✓
Niger	Chanchaga	-	✓	-	✓	-	-
Niger	Munya	-	✓	-	-	✓	-
Niger	Tafa	-	✓	-	-	-	✓
Niger	Bosso	-	✓	-	✓	-	-
Niger	Rijau	-	-	✓	✓	-	-
Niger	Rafi	-	✓	-	-	-	✓
Niger	Magama	-	✓	-	✓	-	-
Niger	Borgu	-	-	✓	-	-	✓
Niger	Agaie	-	✓	-	✓	-	-
Niger	Wushishi	-	✓	-	✓	-	-
Niger	Edati	-	✓	-	✓	-	-
Niger	Katcha	-	✓	-	✓	-	-
Niger	Mashegu	-	✓	-	✓	-	-
Niger	Mokwa	-	✓	-	✓	-	-
Niger	Gurara	-	✓	-	✓	-	-
Niger	Agwara	-	✓	-	✓	-	-
Niger	Bida	-	✓	-	✓	-	-
Niger	Mariga	-	✓	-	✓	-	-
Niger	Shiroro	-	✓	-	✓	-	-
Niger	Lavun	-	✓	-	✓	-	-
Niger	Suleja	-	✓	-	✓	-	-
Niger	Paikoro	-	✓	-	✓	-	-
Niger	Kontogora	-	✓	-	✓	-	-
Niger	Gbako	✓	-	-	-	✓	-
Niger	Lapai	✓	-	-	-	✓	-
Osun	Atakunmosa East	-	✓	-	-	✓	-
Osun	Ife North	-	✓	-	-	✓	-
Osun	Ejigbo	-	✓	-	✓	-	-

State	LGA Name	Schistosomiasis			STH		
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Osun	Boluwaduro	-	-	-	✓	-	-
Osun	Olorunda	-	✓	-	✓	-	-
Osun	Ifedayo	-	-	-	✓	-	-
Osun	Irewole	✓	-	-	-	✓	-
Osun	Osogbo	✓	-	-	✓	-	-
Osun	Oriade	✓	-	-	✓	-	-
Osun	Ife Central	✓	-	-	✓	-	-
Osun	Ilesha West	✓	-	-	✓	-	-
Osun	Aiyedaade	✓	-	-	✓	-	-
Osun	Ifelodun	✓	-	-	✓	-	-
Osun	Ife South	✓	-	-	-	✓	-
Osun	Ilesa East	✓	-	-	✓	-	-
Osun	Aiyedire	✓	-	-	✓	-	-
Osun	Obokun	✓	-	-	□	-	-
Osun	Isokan	✓	-	-	-	✓	-
Osun	Odo Otin	✓	-	-	✓	-	-
Osun	Ola Oluwa	✓	-	-	✓	-	-
Osun	Boripe	✓	-	-	✓	-	-
Osun	Atakunmosa West	✓	-	-	-	✓	-
Osun	Iwo	✓	-	-	-	✓	-
Osun	Egbedore	✓	-	-	✓	-	-
Osun	Ede South	✓	-	-	-	✓	-
Osun	Ife East	✓	-	-	-	✓	-
Osun	Ila	✓	-	-	✓	-	-
Osun	Ede North	✓	-	-	✓	-	-
Osun	Irepodun	✓	-	-	✓	-	-
Osun	Orolu	✓	-	-	-	✓	-
Oyo	Ibadan North West	-	-	-	✓	-	-
Oyo	Ido	-	-	-	✓	-	-
Oyo	Iwajowa	-	✓	-	✓	-	-
Oyo	Ogo Oluwa	-	✓	-	-	✓	-
Oyo	Saki West	-	✓	-	-	✓	-
Oyo	Saki East	-	✓	-	✓	-	-
Oyo	Ibadan North East	✓	-	-	✓	-	-
Oyo	Ibadan South East	✓	-	-	✓	-	-
Oyo	Ibadan South West	✓	-	-	✓	-	-
Oyo	Ibadan North	✓	-	-	✓	-	-
Oyo	Lagelu	✓	-	-	-	✓	-
Oyo	Akinyele	✓	-	-	-	✓	-
Oyo	Oyo West	✓	-	-	-	✓	-
Oyo	Afijio	✓	-	-	-	✓	-

State	LGA Name	Schistosomiasis			STH		
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Oyo	Oluyole	✓	-	-	-	✓	-
Oyo	Kajola	✓	-	-	✓	-	-
Oyo	Ona Ara	✓	-	-	-	✓	-
Oyo	Itesiwaju	✓	-	-	✓	-	-
Oyo	Atisbo	✓	-	-	-	-	✓
Oyo	Ogbomosho North	✓	-	-	✓	-	-
Oyo	Atiba	✓	-	-	-	✓	-
Oyo	Olorunsogo	✓	-	-	✓	-	-
Oyo	Ibarapa Central	✓	-	-	✓	-	-
Oyo	Ogbomosho South	✓	-	-	✓	-	-
Oyo	Ibarapa East	✓	-	-	✓	-	-
Oyo	Ori Ire	✓	-	-	✓	-	-
Oyo	Surulere, Oyo	✓	-	-	✓	-	-
Oyo	Ibarapa North	✓	-	-	✓	-	-
Oyo	Irepo	✓	-	-	-	✓	-
Oyo	Orelope	✓	-	-	✓	-	-
Oyo	Oyo East	✓	-	-	-	✓	-
Oyo	Iseyin	✓	-	-	-	✓	-
Oyo	Egbeda	✓	-	-	-	✓	-
Rivers	Abua/Odual	-	-	-	-	✓	-
Rivers	KHANA	-	-	-	-	✓	-
Rivers	Okrika	-	-	-	✓	-	-
Rivers	Andoni	-	-	-	-	✓	-
Rivers	Opobo/Nkoro	-	-	-	-	✓	-
Rivers	AHOADA WEST	-	-	-	✓	-	-
Rivers	Ogba/Egbema/Ndoni	-	-	-	✓	-	-
Rivers	Emohua	-	-	-	-	✓	-
Rivers	GOKANA	-	-	-	-	✓	-
Rivers	BONNY	-	-	-	-	✓	-
Rivers	Akuku Toru	-	-	-	✓	-	-
Rivers	Ikwerre	-	-	-	✓	-	-
Rivers	Ogu Bolo	-	-	-	✓	-	-
Rivers	Tai	-	-	-	✓	-	-
Rivers	Etche	-	-	-	✓	-	-
Rivers	Omuma	-	-	-	-	✓	-
Rivers	OYIGBO	-	-	-	-	-	✓
Rivers	AHOADA EAST	✓	-	-	-	✓	-
Rivers	DEGEMA	✓	-	-	✓	-	-
Rivers	Asari Toru	✓	-	-	✓	-	-
Rivers	Port Harcourt	✓	-	-	-	-	✓
Rivers	ELEME	✓	-	-	✓	-	-

State	LGA Name	Schistosomiasis			STH		
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Rivers	Obio/Akpor	✓	-	-	✓	-	-
Taraba	Gassol	-	✓	-	-	-	✓
Taraba	Bali	✓	-	-	-	-	✓
Taraba	Gashaka	✓	-	-	-	-	✓
Taraba	Donga	✓	-	-	-	-	✓
Taraba	Lau	✓	-	-	-	-	✓
Taraba	Zing	✓	-	-	-	-	✓
Taraba	Karim-Lamido	✓	-	-	-	-	✓
Taraba	Yorro	✓	-	-	-	-	✓
Yobe	Karasuwa	-	✓	-	-	-	✓
Yobe	Bursari	-	✓	-	-	-	✓
Yobe	Nguru	-	✓	-	-	-	✓
Yobe	Geidam	-	✓	-	-	-	✓
Yobe	Jakusko	-	✓	-	-	-	✓
Yobe	Yunusari	-	✓	-	-	-	✓
Yobe	Damaturu	-	✓	-	-	-	✓
Yobe	Bade	-	✓	-	-	-	✓
Yobe	Tarmuwa	-	✓	-	-	-	-
Yobe	Fune	✓	-	-	-	-	✓
Yobe	Nangere	✓	-	-	-	-	✓
Yobe	Fika	✓	-	-	-	-	✓
Yobe	Yusufari	✓	-	-	-	-	✓
Yobe	Potiskum	✓	-	-	-	-	✓
Yobe	Machina	✓	-	-	-	-	-


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