



Republic of Rwanda
Ministry of Health



Rwanda Malaria and Neglected Tropical Diseases

Annual Report 2023/2024



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Foreword

The Ministry of Health and Rwanda Biomedical Centre (RBC) would like to take this opportunity to express our deep gratitude and sincere thanks to everyone (Partners and Stakeholders) who contributed to the compilation of this FY 2023-2024 Annual Report of the Malaria and Other Parasitic Diseases Division (MOPDD) in Rwanda.

This report has been developed based on Health Management Information System (HMIS) and Program Data and program activity reports from July 2023 to June 2024. It presents a comprehensive picture of the prevention, control, and management of Malaria and Neglected Tropical Diseases (NTDs) in Rwanda and is structured based on the National Malaria and NTDs Strategic Plans.

Actions needed to control Malaria and NTDs burden in Rwanda require partnership and close collaboration between stakeholders in environmental control programs and strengthening the surveillance systems across all sectors at national and decentralized levels. These programs must be conducted using an innovative and evidence-based package of interventions for prevention, treatment, and support for patients, community health workers, and the communities where these strategies are implemented.

I would like to acknowledge the efforts of the dedicated staff in the various institutions of the Government of Rwanda who worked tirelessly to complete this report. We remain entirely grateful for the inputs and support provided by our Partners in Malaria and NTDs Response.

Special thanks to the members of the Civil Society Organizations, Local and International Non-Governmental, Bilateral Organizations as well as the Rwandan Government institutions who fully supported the implementation of Malaria and NTDs control activities during this reporting period.

I would also like to thank all members of the Malaria and NTDs Technical Working Groups who reviewed and validated the content of this report. We thank you all for your support in the fight against Malaria and NTDs in Rwanda.



Digitally
signed by
MOH(Minister)

Dr Sabin NSANZIMANA

Minister of Health

List of Abbreviations

ACT	Artemisinin-based Combination Therapy
AL	Artemether Lumefantrine
ANC	Ante-Natal Care
CDC	Center for Disease Control
CHW	Community Health Worker
CPDS	Coordinated Procurement and Distribution System
DQA	Data Quality Audit
EPI	Expanded Program on Immunization
EQA	External Quality Assurance
FY	Fiscal Year
GF	Global Fund
GoR	Government of Rwanda
HBM	Home Based Management
HBMA	Home Based Management in Adults
HMIS	Health Management Information System
HSSP IV	Third Health Sector Strategic Plan IV
iCCM	Integrated Community Case Management of Malaria
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Net
IVM	Integrated Vector Management
LLINs	Long-Lasting Insecticide Nets
MDA	Mass Drug Administration
MoH	Ministry of Health
MOPDD	Malaria and Other Parasitic Diseases Division
MSP	Malaria Strategic Plan



MTEF	Mid-Term Expenditure Framework
NRL	National Reference Laboratory
NSP	National Strategic Plan
NTD	Neglected Tropical Diseases
PCR	Polymerase Chain Reaction
PMI	President's Malaria Initiative
PSM	Procurement and Supply chain Management
QC	Quality Control
QMIA	Quality Management Improvement Approach
RBM	Roll Back Malaria
RDT	Rapid Diagnostic Test
SBC	Social Behavior Change
SCH	Schistosomiasis
SOP	Standard Operating Procedure
STH	Soil-Transmitted Helminthiasis
TWG	Technical Working Group
UC	Universal Coverage
WHO	World Health Organization

Executive Summary

The Malaria, Neglected Tropical Diseases and Other Parasitic Diseases Division (MOPDD) is a technical division in charge of coordinating all national efforts in Malaria, Neglected Tropical Diseases (NTDs) and Other Parasitic Diseases (OPDs) Prevention, Diagnosis and Treatment countrywide.

With sustained malaria control interventions, the Malaria Annual Parasite Incidence (API) reduced from 47 cases per 1,000 persons per year in FY 2022-2023 to 45 cases per 1,000 in FY2023-2024 (2% reduction) while the Slide Positivity Rate (SPR) remained at 14%. Furthermore, 27 of 30 districts maintained the Annual Parasite Incidence (API) below 100 cases per 1000 in FY2023-24.

Uncomplicated malaria cases dropped from 622,900 cases to 613,415 cases from FY 2022/2023 to FY 2023-2024 (1 % reduction) with currently 57% of these cases managed at the community level.

Compared to the last FY 2022/2023, severe malaria cases increased to 1,969 in FY2023-2024 (50% increase).

The number of deaths due to malaria increased from 51 in FY 2022-2023 to 67 in FY2023-2024 (23% increase).

In the context of malaria prevention, a total of 236,522 ITNs were distributed in 480 boarding schools while 309,412 ITNs were distributed to pregnant women over 317,534 attending the first visit of antenatal care (97%) and 331,227 ITNs were distributed to children under one year over 340,172 who attended MR1 (97%).

In response to malaria upsurge in IRS Districts, a total of 470,823 ITNs were distributed in Bugesera, Gisagara, and Nyagatare targeting hot spot sectors.

Blanket Indoor Residual Spraying (IRS) was sustained in 12 districts in the FY 2023-2024 while focal IRS was conducted in 15 high-burden sectors of Rusizi, Gicumbi, Nyamagabe, Nyaruguru, and Gasabo Districts. This ensured to achieve a coverage of 99.8% of the total targeted structures and helped to protect 5,724,307 people.

Introduction

Malaria and NTDs represent major public health problems in Rwanda and are considered among the leading causes of morbidity and mortality. Rwanda has made significant strides in controlling these diseases through the implementation of various control interventions including (1) Mass and routine distribution of Long-Lasting Insecticide Nets (LLINs), (2) Indoor Residual Spraying (IRS) in high endemic districts and hot spot sectors, (3) adoption of mandatory laboratory confirmation of malaria before the treatment, use of artemisinin-based combination therapies (ACTs) in the treatment of uncomplicated malaria cases, national scale-up of community-based management and improvement in routine surveillance, monitoring, and evaluation platforms, Mass Drug Administration (MDA) targeting Soil-Transmitted Helminthiasis (STH) and Schistosomiasis (SCH). Despite these combined efforts, Malaria and NTDs still represent a public health concern in Rwanda with millions of people affected every year.

The Rwanda Malaria and NTDs Strategic Plans build on National Policies and Strategies such as the Health Sector Strategic Plan IV (HSSP IV) which recognizes malaria and NTDs as major diseases that contribute to health and economic related burden. The vision of the Malaria and NTDs Strategic Plans is for Rwanda to become free from malaria and NTDs to contribute to socioeconomic development. Reduction of malaria and NTDs burden will be achieved by strengthening and implementing appropriate control interventions and delivering quality health services. Achievement of Rwanda free from Malaria and NTDs vision will require a concerted and collaborative effort between the Government of Rwanda (GoR) and other partners.

Today, Malaria and NTDs control efforts are being implemented at all levels through evidence-based interventions to reduce the burden of both diseases in the population. This consists of effective implementation of high impact interventions, including countrywide MDA for NTDs chemoprophylaxis, LLINs mass and routine distribution, IRS using an effective insecticide in targeted high malaria endemic districts, early diagnosis and treatment at health facility and community level, environmental



management, Surveillance/Monitoring and Evaluation and Social Behavior Change Communication (SBCC).

The following report details malaria and NTDs control activities implemented from July 2023 to June 2024. These activities have been coordinated by the Malaria and Other Parasitic Diseases Division (MOPDD) of the Rwanda Biomedical Centre (RBC) with support from other GoR institutions, Health Facilities and Community Health Workers (CHWs) and implementing partners under the leadership of RBC, the Ministry of Health (MoH) and Partners.

Malaria Program Results per Strategic Plan Framework

Goal: By 2024, reduce malaria morbidity and mortality by at least 50% of the 2019 levels

Objective 1: By 2024, at least 85% of population at risk will be effectively protected with preventive interventions

Objective 2: All suspected malaria cases are promptly tested and treated in line with the national guidelines

Objective 3: By 2024, strengthen surveillance and reporting in order to provide complete, timely and accurate information for appropriate decision making at all levels

Objective 4: Strengthen coordination, collaboration, procurement & supply management and effective program management at all levels

Objective 5: By 2024, 85% of the population at risk will have correct and consistent practices and behaviors towards malaria control interventions.

Key Achievements

During the fiscal year 2023/2024, the funding and execution of Indoor Residual Spraying (IRS) enabled the spraying of over 1,557,490 structures/houses (coverage rate of 99.8%) across 12 districts as a blanket coverage, along with targeted IRS in hotspot sectors of Rusizi, Nyamagabe, Nyaruguru, Gicumbi, and Gasabo. This effort provided protection to a total population of 5,724,307 in high malaria-endemic areas, including 675,872 children under the age of five and 65,173 pregnant women.

Key Challenges

Delays in the procurement processes and IRS operational funds transfers impacted on the right timing of IRS campaign in targeted districts and hotspot sectors (IRS campaign implemented during/after the peak of malaria transmission).

Malaria upsurge in some sectors within IRS districts

Way forward

Improve the procurement and fund transfer processes for timely IRS implementation.

There is a need to conduct a further investigation to understand the risk factors associated with malaria upsurge despite sustained blanket IRS and ITN distribution

Objective 1: By 2024, At Least 85% of Population Will Be Effectively Protected with Malaria Preventive Interventions

Strategy 1. Sustain and Expand IRS in High Malaria Incidence Districts

Introduction

Vector control interventions are crucial for the effective control of malaria and other vector-borne diseases. The World Health Organization (WHO) identifies two core vector-control interventions that have been implemented in Rwanda: Indoor Residual Spraying (IRS) and Long-Lasting Insecticidal Nets (LLINs). IRS involves applying residual insecticide to the interior surfaces of houses, targeting mosquitoes that rest indoors¹.

To ensure maximum efficacy, IRS is conducted with high coverage of targeted structures, ideally before the peak malaria transmission seasons.

First introduced in Kigali City's three districts in 2007, IRS was extended to rural districts with a high malaria burden by 2011.

Since 2008, these core interventions have been progressively supplemented with additional innovative measures. These include larval source management using bio-larvicides, environmental management, the use of mosquito repellents, and the introduction of larvivorous fish in water dams. These measures aim to address the aquatic stages of mosquito life cycles, reducing the vector population before it reaches maturity. To ensure the sustainability and success of these efforts, Integrated Vector Management (IVM) was introduced in Rwanda. IVM is based on five key pillars: (i) advocacy and social mobilization to engage communities, (ii) collaboration among various sectors and partners, (iii) capacity building to enhance local expertise, (iv) an integrated approach that combines different interventions, and (v) evidence-based decision-making to guide strategies and interventions.

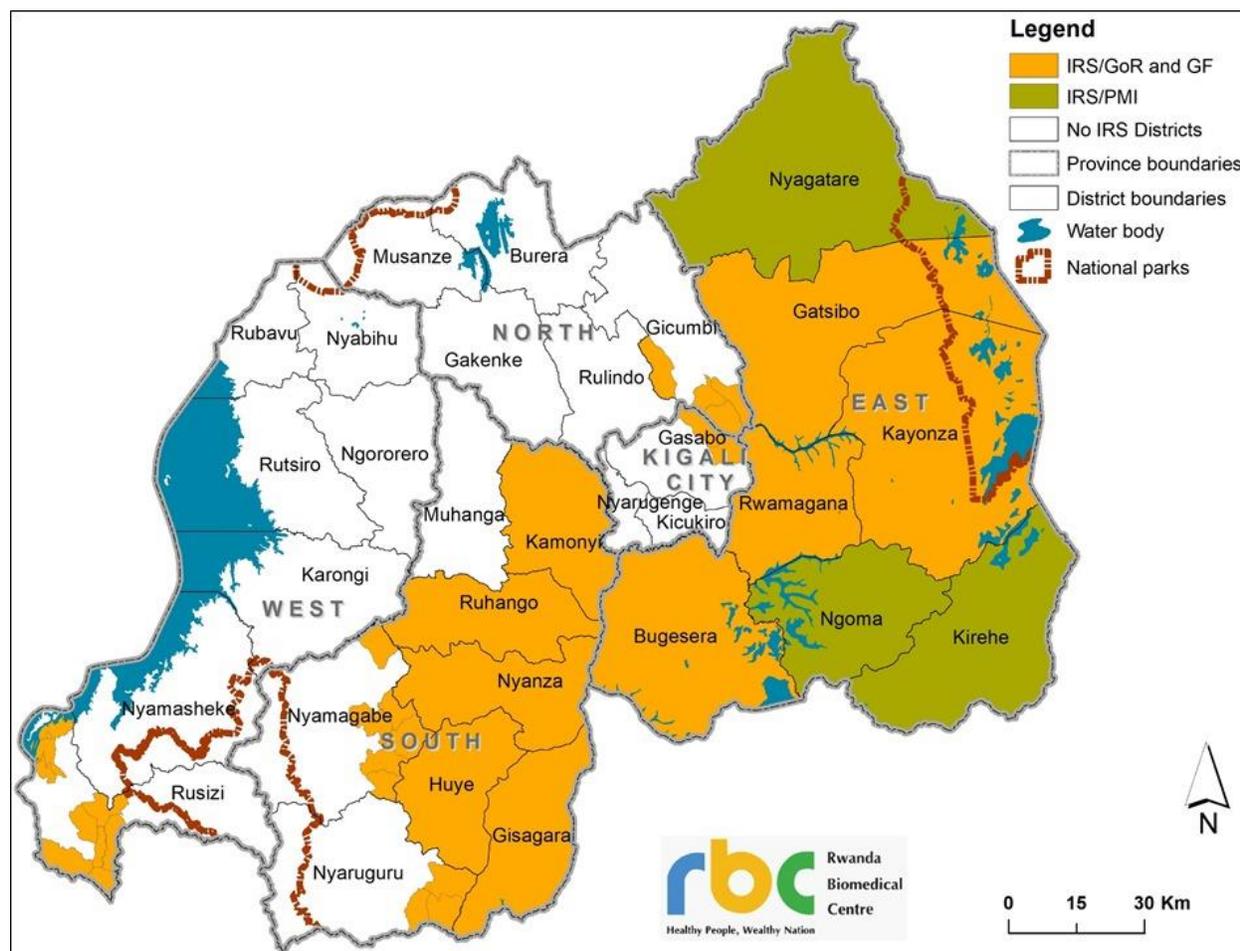
¹ WHO 2018, Malaria terminology, Global Malaria Programme, **Geneva-Switzerland. 38 pp**

To support this approach, entomological surveillance is conducted annually to gather local evidence on vector bionomics, ecology, and transmission patterns. This surveillance includes monitoring mosquito species composition and density, assessing biting and resting behavior, evaluating vector susceptibility to insecticides, and determining the infection rate of mosquitoes with the Plasmodium parasite. Additionally, the entomological inoculation rate is estimated each fiscal year. The coverage, usage, quality, and durability of vector-control products and interventions are also regularly monitored in collaboration with key partners to ensure continued effectiveness in controlling malaria.

2. Indoor Residual Spraying

During the FY 2023-2024, 17 districts were sprayed. 12 districts were fully covered and 5 with a focal IRS. Three out of the 17 districts (Nyagatare, Kirehe, and Ngoma) were supported by the PMI/VectorLink project implemented by Abt Associates. The remaining 14 districts received support from The Global Funds and Rwanda Government (GF/GoR) with blanket coverage of IRS: Bugesera, Gatsibo, Kayonza, Rwamagana in Eastern Province; Gisagara, Huye, Nyanza, Ruhango, Kamonyi, an additional 15 sectors with high malaria burden received focal IRS (Figure 1) with nine sectors (Gikundamvura, Gitambi, Bugarama, Nyakabuye, Muganza, Kamembe, Nkanka, Gihundwe and Nzahaha) in Rusizi district, Western Province, six sectors in Nyamagabe District (Cyanika, Gasaka, Kamegeri, Kibumbwe, Mbazi, Musange), three sectors in Nyaruguru District (Ngera, Ngoma and Nyagisozi) in Southern Province, four sectors in Gicumbi District (Bukure, Giti, Mutete, and Rwamiko) in Northern Province) and two sectors in Gasabo District (Gikomero and Rutunga) in the City of Kigali.

Figure 1: Indoor Residual Spraying Districts



Over the FY 2023-2024, a total number of 1,557,490 out of 1,560,794 structures were sprayed making a coverage rate of 99.8%. The PMI/VectorLink project sprayed 363,305 out of 364,890 structures found with a coverage of 99.6% while the support from GF/GoR covered 1,194,185 out of 1,195,904 found structures with a coverage of 99.9%.

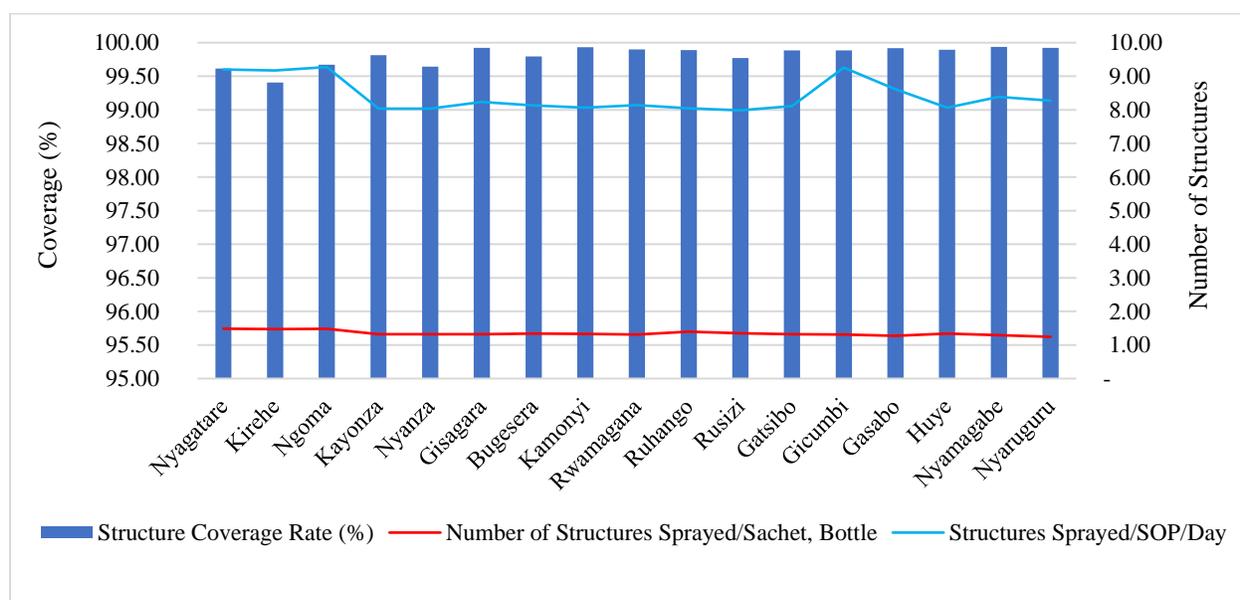
The support from the GF/GoR represented 76.7% and 23.3% from PMI/VectorLink Project. In the targeted districts, the IRS intervention was performed with blanket coverage in a total of 12 districts (153/153 administrative sectors) and focal IRS in five districts (24/85 administrative sectors) implemented in Rusizi (50% of the total sectors), Gicumbi (19%), Gasabo (13%), Nyamagabe (35%) and Nyaruguru (21%) (table 1). In terms of rooms covered, 5,436,449 were sprayed from 5,518,125 rooms found with a coverage

of 98.5%. The total population protected was 5,724,307 out of 5,736,667 targeted populations with an estimated population coverage of 99.8% in IRS districts.

Among the population protected, 65,173 were pregnant women (1.1%) and 675,872 were children below five years (11.8%). The total insecticide used was 1,100,264 of Fludora Fusion and 42,592 Actellic 300CS. The quantity of 245,394 sachets of Fludora Fusion procured by PMI, while the quantity of 854,870 of Fludora Fusion and 42,592 bottles of Actellic were procured by GOR/GF (Table 2).

In terms of performance, one sprayer operator (SOP) performed an average of 8.3 structures per day, with 9.2 and 8.0 structures/SOP/Day in districts supported by PMI and GF/GoR respectively. The highest performance was observed in Ngoma District with 9.3 structures sprayed per SOP per day. The average rooms per sprayed structure were 3.5 and ranging from 3.1 in Ruhango and 4.2 in Nyaruguru. In average, 1.36 structures were sprayed by one sachet of insecticide with 1.48 structures in districts supported by PMI and 1.33 structures in districts supported by GF/GoR and ranging from 1.48 in Nyagatare, Ngoma and Kirehe districts to 1.24 structures in Nyaruguru district (**Figure 2**).

Figure 2: Performance of IRS (Coverage, Structures per SOP per Day and per Sachet)





Regarding the sources of funds for IRS operational cost, in total, 3,757,721,206 RFW were disbursed from GF/GOR and transferred to the district hospitals, with 3,135,001,201 RFW (83.4%) from GF, 622,720,005 RFW (16.6%) from GoR.

The GoR also contributed 3,170,265,323Frw (15.90%) to procure insecticides, whereas the GF contributed 16,774,481,434Frw (84.10%)

Table 1: IRS Coverage per Partner and per District

District	IRS Start	IRS End	Structures Targeted	Structures Found	Structures Sprayed	Structure Coverage Rate (%)	Structure Sprayed/SOP/Day
Nyagatare	21.08.2024	15.09.2023	146 244	151 834	151 247	99.6	9.2
Kirehe	21.08.2024	15.09.2023	108 703	111 249	110 587	99.4	9.2
Ngoma	21.08.2024	15.09.2023	99 722	101 807	101 471	99.7	9.3
Total PMI			354 669	364 890	363 305	99.6	9.2
Nyanza	27.09.2023	19.10.2023	97 911	98 760	98 406	99.6	8.0
Kayonza	30.10.2023	21.11.2023	119 455	120 369	120 144	99.8	8.0
Gisagara	23.10.2023	14.11.2023	107 875	111 133	111 050	99.9	8.2
Bugesera	30.10.2023	21.11.2023	114 261	116 313	116 076	99.8	8.1
Kamonyi	20.11.2023	12.12.2023	118 913	119 983	119 901	99.9	8.1
Rwamagana	03.12.2023	28.12.2023	111 286	113 002	112 888	99.9	8.1
Ruhango	28.02.2024	21.03.2024	108 717	109 418	109 298	99.9	8.0
Rusizi	29.02.2024	22.03.2024	67 838	67 886	67 732	99.8	8.0
Gatsibo	03.06.2024	25.06.2024	151 839	154 100	153 927	99.9	8.1
Gicumbi	03.06.2024	25.06.2024	19 085	22 059	22 034	99.9	9.3
Gasabo	03.06.2024	25.06.2024	10 015	10 867	10 858	99.9	8.6
Huye	06.06.2024	26.06.2024	102 010	103 067	102 957	99.9	8.1
Nyamagabe	06.06.2024	26.06.2024	30 517	32 059	32 039	99.9	8.4
Nyaruguru	06.06.2024	26.06.2024	16 271	16 888	16 875	99.9	8.3
Total GF/GoR			1 175 993	1 195 904	1 194 185	99.9	8.1
Grand Total			1530662	1560794	1557490	99.8	8.4

Table 2: Population Protected, Room Coverage and Insecticide Used per IRS District

District	Pop. Targeted	Total Pop. Protected	Pregnant Women	Children < 5 Years Protected	Rooms Sprayed	Coverage Sprayed Rooms (%)	Total Insecticides Used	Insecticide Products Used	Structures Sprayed/ Sachets
Nyagatare	553 547	551 253	7 626	74 391	484 449	97.6	101 868	Fludora Fusion	1.48
Kirehe	450 573	448 114	5 883	59 645	403 952	98.0	74 944	Fludora Fusion	1.48
Ngoma	389 616	388 323	4 553	48 384	392 262	98.9	68 582	Fludora Fusion	1.48
Tot. PMI	1 393 736	1 387 690	18 062	182 420	1 280 663	98.1	245 394		1.48
Nyanza	350 903	349 547	3 992	40 373	319 674	98.4	74 693	Fludora Fusion	1.32
Kayonza	439 739	438 999	5 309	57 051	410 250	98.8	90 730	Fludora Fusion	1.32
Gisagara	412 169	411 869	5 641	55 154	419 200	99.5	83 876	Fludora Fusion	1.32
Bugesera	437 504	436 616	5 320	57 163	401 486	97.7	86 675	Fludora Fusion/Actellic	1.34
Kamonyi	406 283	405 974	4 300	45 814	403 435	99.0	90 142	Fludora Fusion	1.33
Rwamagana	393 483	393 045	4 231	46 605	394 384	98.0	85 854	Fludora Fusion	1.31
Ruhango	354 438	353 996	3 416	38 591	336 650	98.8	78 357	Fludora Fusion	1.39
Rusizi	300 991	300 292	4 777	37 950	264 930	97.5	50 065	Fludora Fusion	1.35
Gatsibo	541 765	541 144	6 117	64 812	530 271	99.1	116 559	Fludora Fusion/Actellic	1.32
Gicumbi	81 295	81 283	787	9 070	80 199	98.9	16 788	Fludora Fusion	1.31
Gasabo	40 181	40 141	209	4 376	38 424	99.2	8 513	Fludora Fusion	1.28
Huye	384 075	383 714	1 116	13 837	373 089	98.7	76 912	Fludora Fusion	1.34
Nyamagabe	129 072	129 009	1 116	13 837	114 485	98.6	24 728	Fludora Fusion	1.30
Nyaruguru	71 033	70 988	780	8 819	69 309	98.2	13 570	Fludora Fusion	1.24
Tot GF/GoR	4 342 931	4 336 617	47 111	493 452	4 155 786	98.6	897 462		1.33
G. Total	5 736 667	5 724 307	65 173	675 872	5 436 449	98.5	1 142 856		1.36

Key Achievements

During the fiscal year 2023/2024, the funding and execution of Indoor Residual Spraying (IRS) enabled the spraying of over 1,557,490 structures/houses (coverage rate of 99.8%) across 12 districts as a blanket coverage, along with targeted IRS in hotspot sectors of Rusizi, Nyamagabe, Nyaruguru, Gicumbi, and Gasabo. This effort provided protection to a total population of 5,724,307 in high malaria-endemic areas, including 675,872 children under the age of five and 65,173 pregnant women.

Key Challenges

Delays in the procurement processes at implementing hospitals, particularly in Gisagara and Rwamagana Districts, resulted in implementation occurring in November and December instead of the planned timeline of September and October. This hindered efforts to control the peak of malaria transmission during the critical period from November to December.

Delays in the transfer of funds for operational costs impacted the implementation of IRS at hospitals in some districts. Specifically, Kibilizi DH in Gisagara and Nyanza DH in Nyanza Districts faced delays from the Ordinary Budget (OB) source for IRS planned in September 2023. Additionally, Kiziguro DH in Gatsibo and six targeted hotspot sectors, as well as Kabutare DH in Huye and nine targeted hotspot sectors, experienced delays in receiving Global Funds (RBF Malaria) for IRS planned in February–March 2024. The latter delay had a particularly negative impact on hotspot sectors receiving IRS for the first time, with implementation being postponed to June 2024, coinciding with the peak of malaria transmission.

Recommendations

Improve the procurement and fund transfer processes for timely IRS implementation. There is a need to conduct a further investigation to understand the risk factors associated with malaria upsurge despite sustained blanket IRS and ITN distribution.

3. Insecticide Resistance Monitoring

3.1. Biological Resistance

From July 2023 to June 2024, the biological resistance tests were performed in 30 sentinel sites selected for insecticide resistance surveillance. The tests were conducted using WHO guidelines with cylindrical tubes method 2 for the seven insecticides belonging to the five classes: Carbamates (Bendiocarb 0.1%); Organophosphates (Fenitrothion 1%, and Pirimiphos methyl 0.25%); Organochlorines (DDT 4%); Pyrethroids (Deltamethrin 0.05%, Permethrin 0.75%, and Alphacypermethrin 0.05%); CDC bottles (CDC, 2018)³ for the two new classes of pyrrole (Chlorfenapyr 100µg) and Neonicotinoid (clothianidin 4µg).

Thus, larvae collections of *Anopheles* genus were performed using the dipping method as described by the WHO ⁴. Mosquito larvae were subsequently reared using field insectarium established at each sentinel site following the standard conditions of temperature (26-28°C) and relative humidity (70-80%). The susceptibility test was carried out on adult *Anopheles gambiae* s.l aged 3 to 5 days and fed on glucose. A minimum of 100 mosquitoes were used for testing in 4 replicates with 25 females per insecticide for WHO method and 5 replicates of 20 female mosquitoes with CDC bottles. Each test had two control replicates of 50 mosquitoes.

The mosquitoes were exposed to the standard dose of insecticide for one hour to measure the knock down test and then observed for 24 hours' post-exposure for assessment of direct mortality and up to 72 hours for delayed mortality, especially for the two new insecticides (Chlorfenapyr 100µg and clothianidin 4µg). The mortality was calculated as the proportion of dead mosquitoes over the total number exposed. A mortality rate between 98% and 100% indicates fully susceptibility; 90-97% mortality for the possible resistance that needs to be confirmed. The mortality under 90% indicates the confirmed resistance.

² WHO (2013). Test procedures for insecticide resistance monitoring in malaria vector mosquitoes

³ CDC (2018): Manual for Evaluating Insecticide Resistance Using the CDC Bottle Bioassay. 31 pp

⁴ WHO (2013) Malaria entomology and vector control – Learner's Guide

It was found that the resistance status to pyrethroid insecticide was more prevailing in malaria endemic districts of low land areas than in high land (Figure 3). The resistance was confirmed more to pyrethroid insecticide than other classes of insecticides with respectively Permethrin 0.75% for 100%, Alpha-cypermethrin 0.05% for 89%, and Deltamethrin 0.05% for 43% of the total sites surveyed (n=28).

The highest susceptibility was found respectively on Fenitrothion 1% (96%), Pirimiphos methyl 0.25% (96%) at 24 hours, and Bendiocarb (89%) (Figure 4).

Figure 3: Distribution of insecticide resistance to pyrethroid insecticides

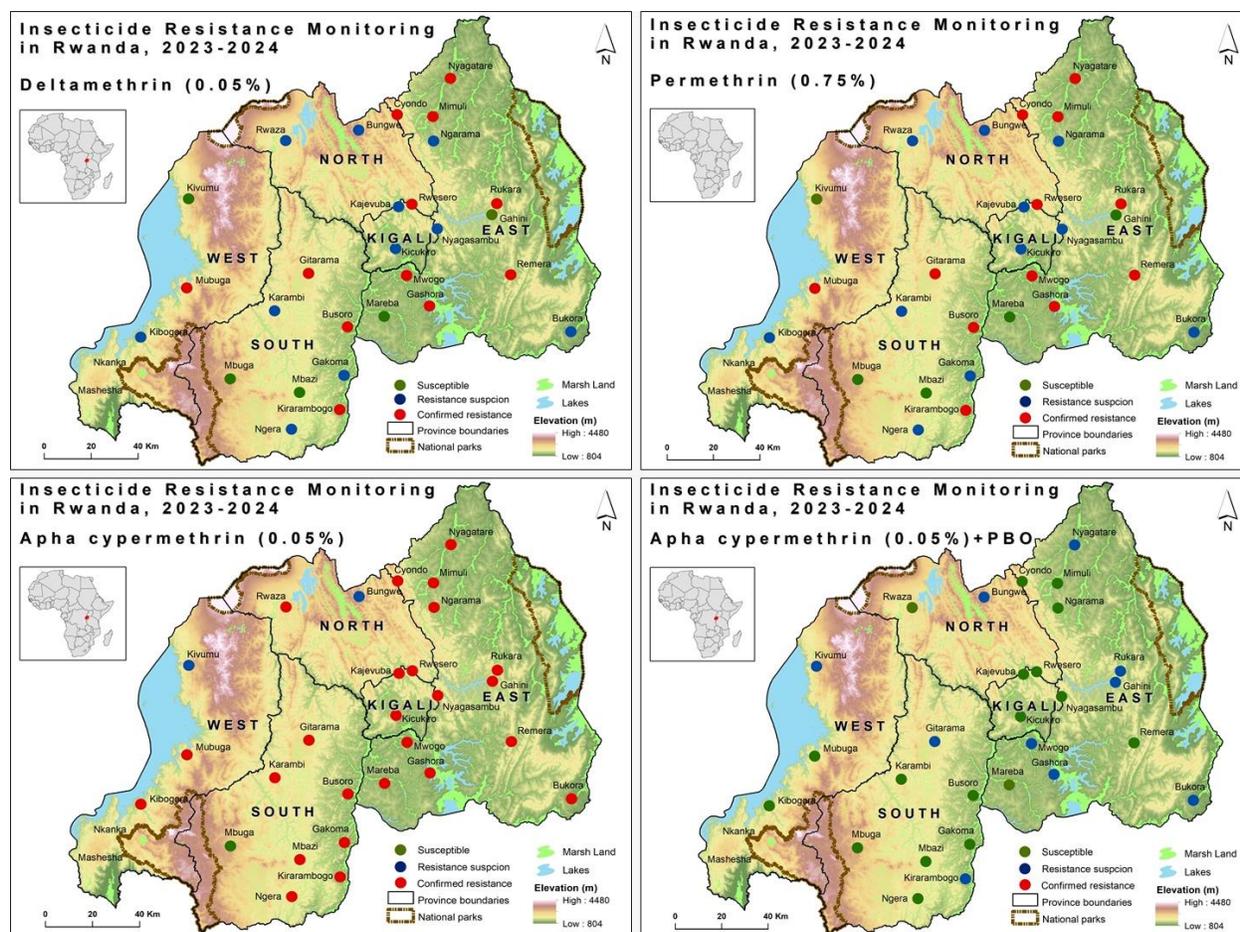
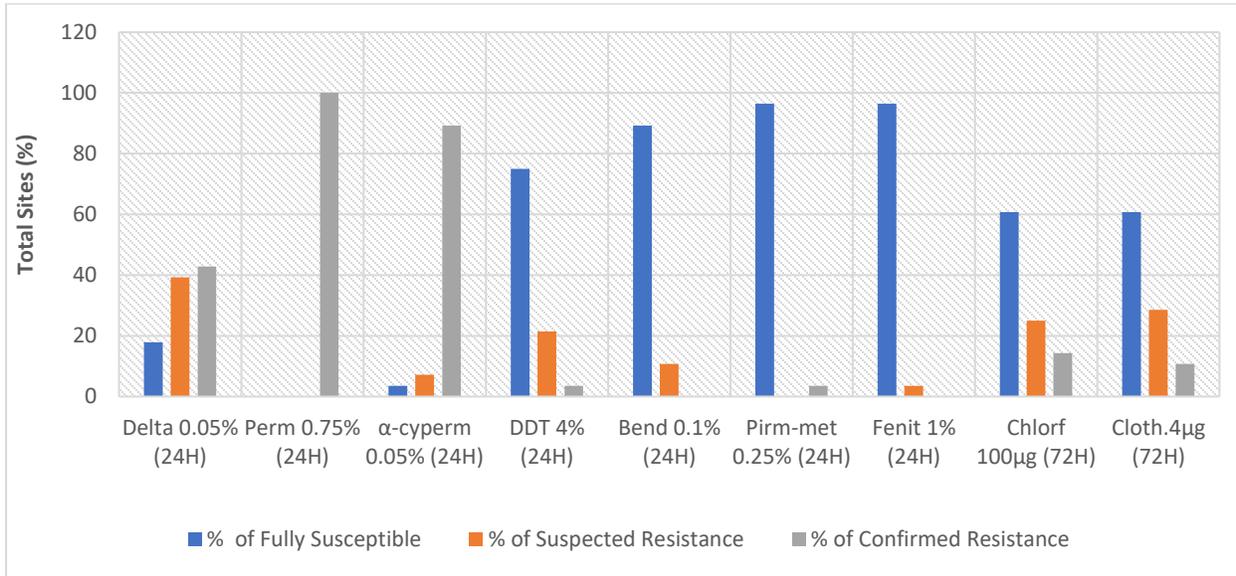


Figure 4: Levels of Insecticide Resistance per Insecticide Product



3.2 Resistance Mechanisms

In sites with confirmed resistance to pyrethroid insecticides, the addition of the synergist piperonyl butoxide (PBO) significantly restored susceptibility: 81.8% for Deltamethrin 0.05% and 68% for Alphacypermethrin 0.05%. This suggests that metabolic resistance mechanisms may play a key role in pyrethroid resistance among malaria vectors in the surveyed sites. However, susceptibility was not fully restored for Permethrin 0.75%, and only partial restoration was observed in ten sites for Alphacypermethrin (8 sites) and Deltamethrin (2 sites). These findings indicate the potential presence of other resistance mechanisms that warrant further investigation (Table 3).

Table 3: Results of Performed Resistance Tests for Insecticides (with PBO)

Susceptibility Status	Product Name					
	Delta 0.05% +PBO		Perm 0.75% +PBO		α-Cyperm 0.05% + PBO	
	Sites (n = 11)	%	Sites (n=28)	%	Sites (n=25)	%
Confirmed Resistance	0	0	26	144.4	0	0
Suspected Resistance	2	18.2	2	11.1	8	32
Susceptibility Restored	9	81.8	0	0.0	17	68

3.3. Resistance Intensity using WHO Susceptibility Test Kits

The analysis of insecticide efficacy reveals varied intensity levels across the surveyed sites where the resistance at diagnostic doses was confirmed to pyrethroid insecticides. Alphacypermethrin at 0.25% (5x) exhibited low intensity, with only 4% of sites showing $\geq 98\%$ mortality, while the 0.5% (10x) concentration showed moderate intensity with 96% of sites achieving $\geq 98\%$ mortality. Deltamethrin at 0.25% (5x) also showed low intensity, with just 9% of sites achieving $\geq 98\%$ mortality, while the 0.5% (10x) concentration indicated moderate intensity, with 55% of sites reaching this threshold. Permethrin at both 3.75% (5x) and 7.5% (10x) concentrations displayed high intensity, with none and only 7% of sites, respectively, achieving $\geq 98\%$ mortality.

Table 4: Insecticide Resistance Intensity in Areas with Confirmation of Resistance

Insecticides Tested and Concentration	Total Sites	Sites with Mortality <98%	Sites with Mortality ≥98%
Alphacypermethrin 0.25% (5x)	24	23 (96%)	1 (4%)
Alphacypermethrin 0.5% (10x)	23	9 (39%)	14 (61%)
Deltamethrin 0.25% (5x)	11	10 (91%)	1 (9%)
Deltamethrin 0.5% (10x)	11	5 (45%)	6 (55%)
Permethrin 3.75% (5x)	15	15 (100%)	0 (0%)
Permethrin 7.5% (10x)	28	26 (93%)	2 (7%)

Remark: (5x ≥ 98% mortality = low intensity, < 98% mortality = moderate intensity; 10x ≥ 98% mortality = moderate intensity, < 98% mortality = high intensity)⁵

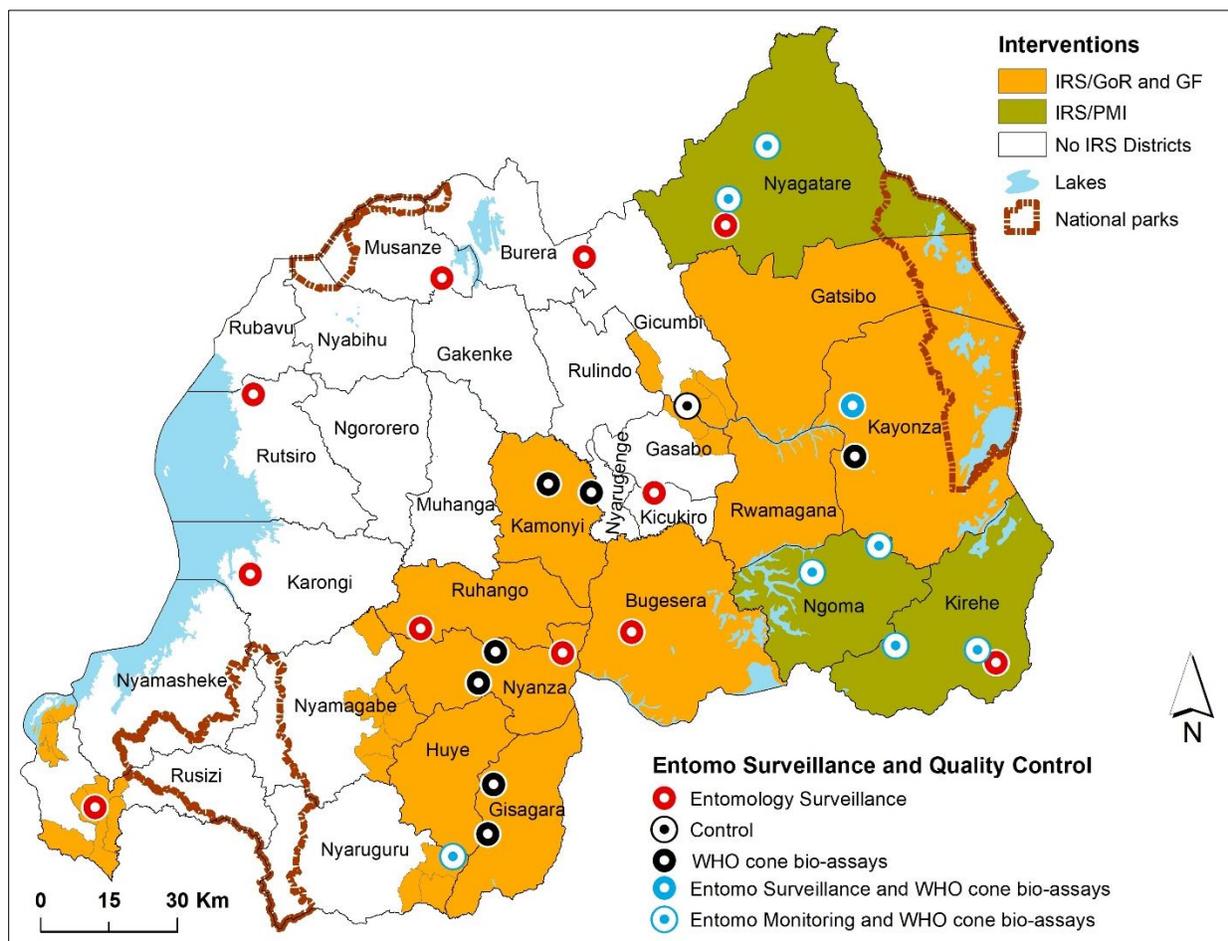
4. Quality Control of Interventions and Entomology Surveillance

4.1. Quality Control of IRS using Wall Bioassays

IRS quality control (wall bioassays) was performed one week post IRS as well as monthly to determine the residual efficacy of the insecticide on sprayed house walls. The IRS campaigns were performed in different periods as indicated earlier. The districts were sampled for IRS Quality Control as following: Gisagara, Kamonyi, Kayonza, Kirehe, Ngoma, Nyagatare and Nyanza.

⁵ WHO (2013). Test procedures for insecticide resistance monitoring in malaria vector mosquitoes

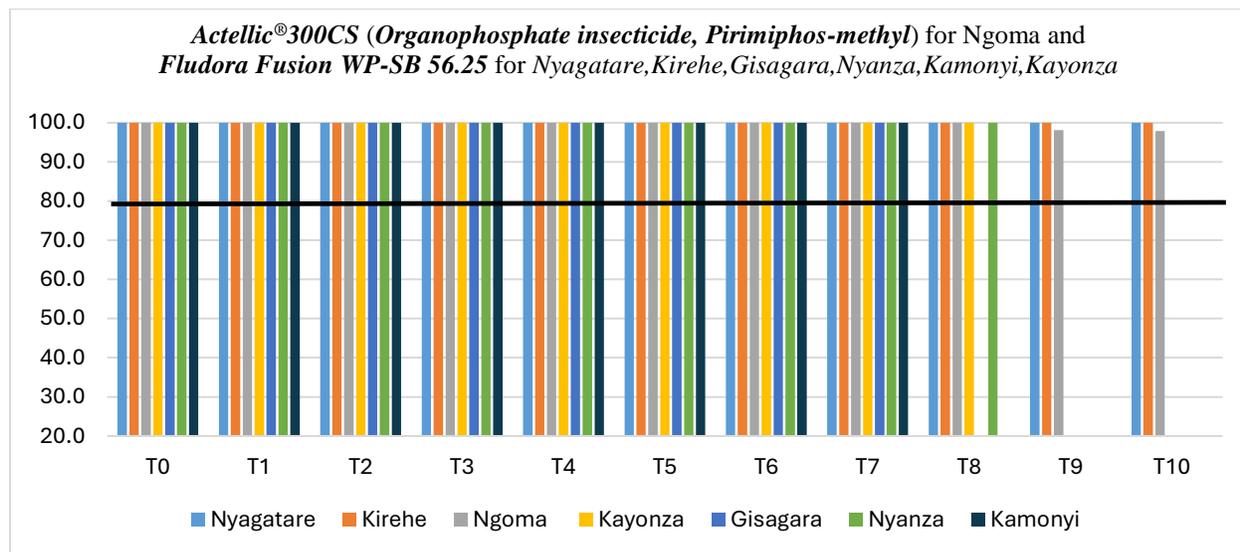
Figure 5: Quality Control of Interventions and Entomology Surveillance



The IRS quality control was performed in 2 sectors from each of the seven out of the 15 IRS districts. At each sector, 6 houses (2 plastered non-painted, 2 plastered painted, and 2 mud) were selected for bioassay tests. The susceptible Kisumu strains of *Anopheles gambiae* s.s. reared at the MOPDC/RBC insectary based at national entomology laboratory were used to run appropriate tests. Mosquitoes 2-5 days old were exposed in each wall house at the top, middle and bottom level of the walls. Two replicates for each type of house were applied. Mortality was read after 24 hours of exposure to the insecticide of **Actellic®300CS (Organophosphate insecticide, Pirimiphos-methyl)** sprayed in Ngoma District and mortality was read with interval of 24 hours up to 96 hours of exposure to the insecticide of **Fludora Fusion WP-SB 56.25** sprayed in

Nyagatare, Kirehe, Gisagara, Nyanza, Kamonyi, Kayonza Districts. The mortality was calculated for both exposed and control samples.

Figure 6: Post IRS Wall Bioassays Performed in FY 2023-2024



The results and sites of the post IRS wall bioassays are shown in figure 6. The results of the wall bioassay were available up to seven months in Kamonyi and Gisagara; eight months in Nyanza and Kayonza then in Nyagatare, Ngoma and Kirehe ten months post spraying. In all districts, the insecticide was still effective at the end of the year with mortality of exposed mosquitoes above the cut off mortality of 80% as recommended by WHO. Results confirm a residual efficacy of *Actellic®300CS (Organophosphate insecticide, Pirimiphos-methyl)* and *Fludora Fusion WP-SB 56.25* of more than ten months in the context of Rwanda as shown the above results from all Districts (Figure 6).

4.2. Quality Control of IRS using Entomology Monitoring

The entomological monitoring was carried out, from July 2023 to June 2024 in two sites located in each IRS district respectively Nyagatare (Nyagatare & Rukomo), Kirehe (Gatore & Nyamugali), Ngoma (Zaza & Remera). The control district was Gicumbi (Rwamiko). Between July 2023 and June 2024, mosquitoes were collected from indoor and outdoor monthly for assessment of the following parameters: vector_bionomics using human

landing catching method and indoor resting behavior of mosquitoes using Pyrethrum Spraying catching method. The findings are summarized as following:

1. As shown in the tables below, during the period of activities, 19 976 mosquitoes (*Culicidae*) were collected using human landing catching and PSC methods, and out of them, 94.7% (n = 18925) were *Culicinae* and 5.3% (n = 1051) were *Anopheles* mosquitoes. The *Anopheles gambiae* s.l. were the major malaria vectors, representing 67% (n = 704) of the total catches of *Anopheles* mosquitoes. Other *Anopheles* mosquitoes collected were, respectively, *An. ziemanni* (17.7%), *An. funestus* (3.6%), *An. pharoensis* (3.6%), *An. squamosis* (3.2%), and *An. maculipalpis* (1.9%). Of the *An. gambiae* s.l. collected, 73.2% (n = 451) were caught outside the houses, while 26.8% (n = 165) of other *Anophelines* mosquitoes were also collected outside the dwellings.
2. The biting rate by *Anopheles gambiae* s.l. varied from 0.3 to 1.5 bites per person per night within sites, the biting rate by *Anopheles* varied from 0.4 to 5.1 bites per person per night within sites, with an average of 1.5 bites per person per night. The average biting rate of mosquitoes in general (*Culicidae*) was 27.6 bites per person per night, ranging from 7.8 to 82.9 bites per person per night.
3. The total collected mosquitoes through PSC method were 1 106 mosquitoes including 88 *Anopheles gambiae* s.l., 31 total *Anophelines* and 987 *Culicinae* from seven sites. Among *Anophelines*, 73 (61.3%) were unfed and 46 (38.7%) were found fed. In total 13 were fresh fed, 16 half-gravid and 17 gravid. The proportion of gravid was 72% in all sites.
4. The determination of parity on a sample of 483 *Anopheles gambiae* s.l. dissected and collected from inside and outside in IRS sites and in none IRS site (control) showed, respectively, that the parous rates were 31.4% (n = 444) in IRS sites and 59% (n = 39) in none IRS sites. The dissected from inside was 20.4% (n = 107) and outside was 79.6% (n = 337) in IRS sites and in none of the IRS sites (control) showed, respectively, that the parous rates indoors were 73.9% (n = 20) and outdoors were 26.1% (n = 19). The results showed that the IRS intervention induced a reduction in the longevity of malaria vectors.
5. The entomological inoculation rate (EIR), which is the number of infectious bites per person per unit time, was measured and expressed per year.

The EIR was zero infected bites per person and per year for 1036 anopheline tested, with a sporozoite infection rate of 0% from the seven sites.

6. Out of 34 anopheles' mosquito tested for blood meal, 6 (17.5%) were fed on human, 13 (38%) were fed on bovine, 6 (17.5%) were fed on human, 6 (17.5%) were fed on unspecified hosts and other, 2 (6.2%) were fed on goat and bovine and HBI was 35%.
7. The speciation of *Anopheles gambiae* s.l. was performed in the entomology lab to identify the siblings of *Anopheles gambiae* complex. Out of 648 samples analyzed using PCR-identification, 4.9% samples were found to be *Anopheles gambiae* s.s. and 95.1% were *Anopheles arabiensis*. The dominant malaria vector recently became *Anopheles arabiensis* in the most entomological monitoring sites within IRS districts. Out of 42 samples analyzed using PCR-identification in none IRS District 71.4% samples were found to be *Anopheles gambiae* s.s.

Table 5: Distribution of Malaria Vectors Collected Using HLC & PSC Methods

No	Site Name	Anopheles gambiae s.l./HLC			Other Anopheles/HLC			Cn/HLC	PSC			Tot. An	Tot. Cn	Cd
		In	Out	Total	In	Out	Total		An.g	Ao	Cn			
1	Gatore	48	172	220	12	44	56	2456	28	7	113	311	2569	2880
2	Nyamugali	1	47	48	0	3	3	1077	0	0	72	51	1149	1200
3	Nyagatare	43	83	126	0	0	0	4731	18	1	80	145	4811	4956
4	Rukomo	4	73	77	0	1	1	1714	15	0	92	93	1806	1899
5	Remera	19	24	43	14	19	33	1347	6	0	144	82	1491	1573
6	Zaza	25	33	58	32	53	85	3811	19	4	144	166	3955	4121
7	Rwamiko	25	19	44	64	74	138	2802	2	19	342	203	3144	3347
Total		165	451	616	122	194	316	17938	88	31	987	1051	18925	19976

Table 6: Biting Behavior of Malaria Vectors Collected Using HLC

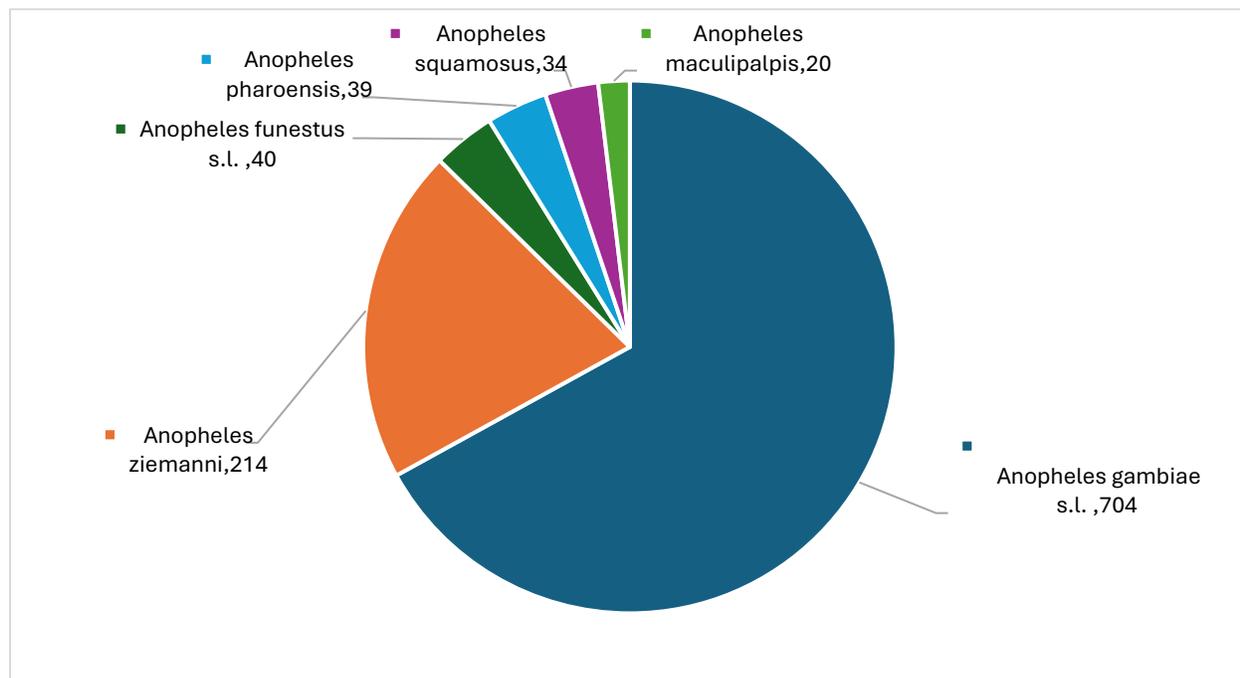
No	Site name	Biting behavior %				Biting Rate Person/Night				Infection rate (%) An	EIR An
		Ag. Endo	Ag. Exo	Ao. Endo	Ao. Exo	An.g	An	Cn	Culd		
1	Gatore	21.8	78.2	21.4	78.6	1.5	1.9	17.1	19.0	0.0	0.0
2	Nyamugali	2.1	97.9	0.0	100.0	0.3	0.4	7.5	7.8	0.0	0.0
3	Nyagatare	34.1	65.9	0.0	0.0	0.9	0.9	32.9	33.7	0.0	0.0
4	Rukomo	5.2	94.8	0.0	100.0	0.5	0.5	11.9	12.4	0.0	0.0
5	Remera	44.2	55.8	42.4	57.6	0.3	0.5	9.4	9.9	0.0	0.0
6	Zaza	43.1	56.9	37.6	62.4	0.4	1.0	26.5	27.5	0.0	0.0
7	Rwamiko	56.8	43.2	46.4	53.6	1.2	5.1	77.8	82.9	0.0	0.0
Total		26.8	73.2	38.6	61.4	0.7	1.5	26.1	27.6	0.0	0.0

Table 7: Results of Pyrethrum Spraying Catch Method

Period	Site	Houses	Number of Occupants	An. gambiae s.l.	Other Anopheles	Abdominal/Blood Digestion stages				Proportion of Gravid (%)	An. gambiae s.l. per House	Fed per House	Fed/Human Host	Culicinae
						UF [^]	F [^]	HG [^]	G [^]					
July 2023 - June 2024	Gatore	180	1285	28	7	15	1	4	15	95	0.2	0.1	0.0	113
	Nyamugali	180	1343	0	0	0	0	0	0	0	0.0	0.0	0.0	72
	Nyagatare	180	1711	18	1	12	4	3	0	43	0.1	0.0	0.0	80
	Rukomo	180	1386	15	0	9	5	1	0	17	0.1	0.0	0.0	92
	Remera	180	1086	6	0	2	0	4	0	100	0.0	0.0	0.0	144
	Zaza	180	1274	19	4	16	1	4	2	86	0.1	0.0	0.0	144
	Rwamiko	180	1242	2	19	19	2	0	0	0	0.1	0.0	0.0	342
Total		1260	9327	88	31	73	13	16	17	72	0.1	0.0	0.0	987

Abbreviations (Table 5, 6, 7): HLC: Human Landing Catching; PSC: Pyrethrum Spray Catch; In: Inside; Out: Outside; An: Anophelines; An.g: Anopheles gambiae s.l.; Cn: Culicinae; Cd: Culicidae; Inf: Infectivity; endo: Endophagic; exo: Exophagic. UF[^]: Unfed. FF[^]: Fresh fed. HG[^]: Half gravid. G[^]: Gravid. EIR: Entomological inoculation rate.

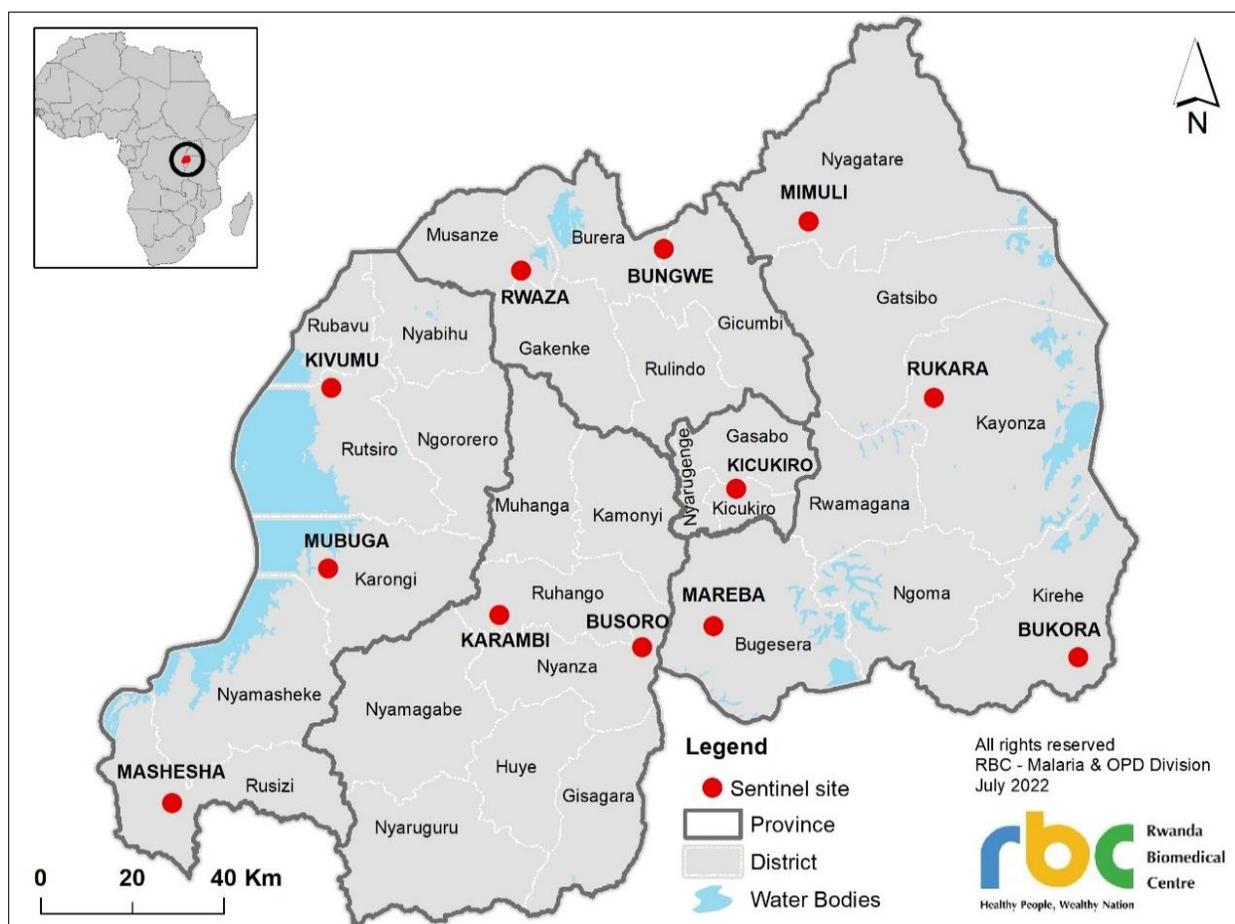
Figure 7: Species Composition from PSC and HLC in FY 2023-2024



5. Entomology Surveillance in 12 Sentinel Sites

Routine entomological surveillance was carried out over twelve sentinel sites located in different districts according to malaria eco-epidemiological strata (Bungwe and Rwaza in Northern Province. Rukara. Bukora. Mareba and Mimuli in Eastern Province; Busoro. Karambi in Southern Province; Mashasha. Kivumu. Mubuga in Western Province and Kicukiro in Kigali City (Figure 7). Between July 2023 and June 2024, mosquitoes were collected using human landing catching method from indoor and outdoor on a monthly basis for assessment of the different entomological parameters.

Figure 8: The Sentinel Sites for Entomology Surveillance



As shown in table 5. during the entomology activities for the FY. 115,103 mosquitoes (*Culicidae*) were collected out of them 10.4% were *An. gambiae* s.l. and 0.5% *An. Funestus* group. 12.4% total anopheles and 87.6% culicines. Out of 14,250 total anopheles' mosquitoes. 84.4% were *An. gambiae* s.l.. 3.8% *An. funestus* and 11.8% other anopheles species. The primary malaria vector for this FY 2023/2024 is *An. gambiae* s.l. (figure 8). Over that period, 61.4% *Anopheles gambiae* s.l. were collected outside and ranging from 33% in Mubuga to 98.3% in Bukora. The average of outdoor biting was 58.5% in non-IRS sites while it was 64.5% in IRS sites. Overall, 546 *Anopheles funestus* were caught in six sites of Kivumu (32.1%. n=206). Rwaza (26.7%. n=8). Bungwe (24.4%. n=29). Karambi (23.9%. n=153). Kicukiro (5.8%. n=137). and Mubuga (3.4%. n=13). The focal vector control intervention of IRS should be deployed and eliminate the above indoor malaria vector where it is appearing as the dominant species in malaria transmission.

Regarding the human biting rate by *Anopheles gambiae s.l.*, it varies from 0 (Bungwe) to 8.8 (Mashesha) bites per person per night (b/p/n), with an average of 2.3 b/p/n. The average human biting rate of *An. gambiae s.l.* was found respectively 1.9 and 2.9 b/p/n in IRS and non-IRS sites while it was 22.2 b/p/n in *Culicidae* and ranging from 4.7 (Rukara) to 56.2 (Kicukiro) bi/p/n with 15.3 and 31.9 b/p/n in IRS and non-IRS sites. There was a decrease of mosquito density of 4.2% in *An. gambiae s.l.* (from 2.4 to 2.3 b/p/n) and increase of 15% in total *Culicidae* (from 19.3 to 22.2 b/p/n) in comparison with mosquito catches of 2022/2023. Except for five sites of Karambi, Kivumu, Rwaza, Mareba and Bukora where the increase of *An. gambiae s.l.* was observed with 843.2%, 800%, 81.8%, 20.6%, and 3.4% respectively, other sites experienced a general decrease of the above species of primary malaria vector. The above increase in mosquito density should be linked to the abnormal rainfall followed by water flooding reported that occurred in the past FY. The general endophagic rate of *An. gambiae s.l.* was 38.6% and varying from 35.5% in IRS districts and 41.5% in non-IRS districts (Fig. 9).

The entomological inoculation rate (EIR) which is the number of infectious bites per person per unit of time was measured and expressed per year (ib/p/y). The average of EIR was 0.42 ib/p/y for *An. gambiae s.l.* and 0.08 ib/p/y for *An. funestus*. The *An. gambiae s.l.* carrying *Plasmodium sp* infections were found in Kicukiro site with 0.89 ibi/p/year. The infection in *An. funestus* was only reported in Mubuga sentinel site with 0.15 ibi/p/year (table 8). This information, particularly the prevailing of malaria infection at site level should be used to inform the focal control methods and to set the priorities in specific districts.

Figure 9: Comparison of *An. gambiae* s.l. and Total Anopheles Collected vs Total Anopheles spp and Culicidae

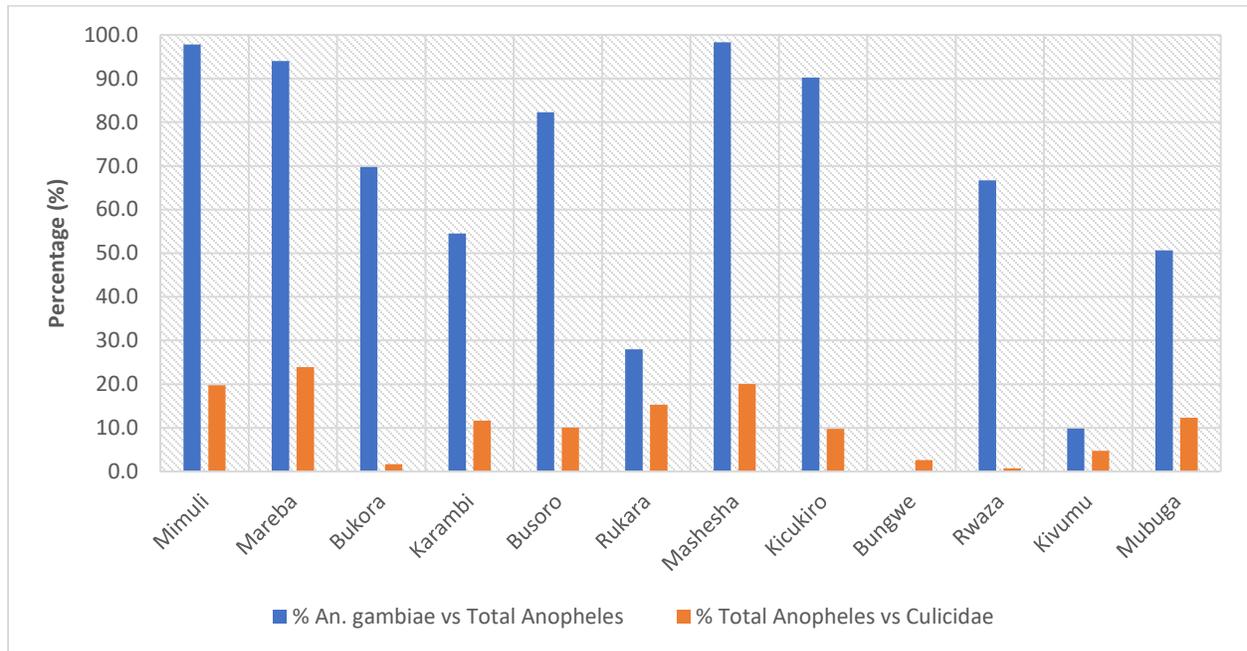


Figure 7: Trends of Endophagic Rate of *An. gambiae* s.l. per Site

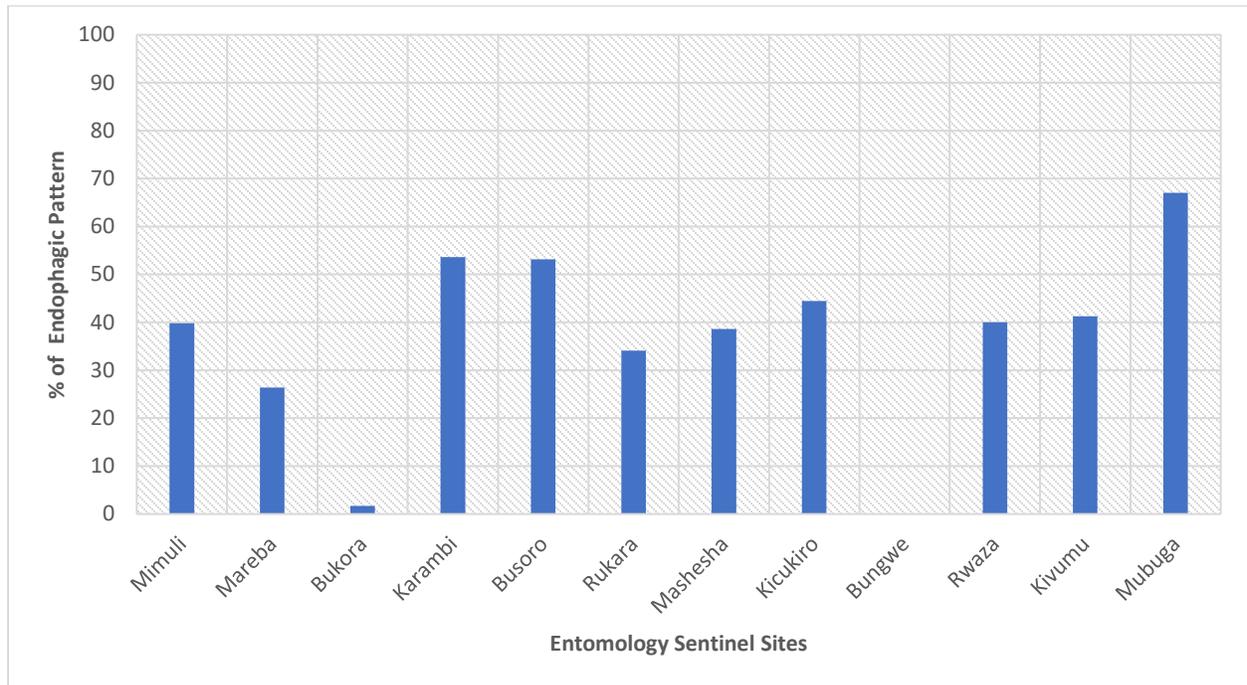


Table 8: Distribution of Malaria Vectors in 12 Sentinel Sites in Numbers

No	Site name	<i>Anopheles gambiae</i> <i>s.l.</i>			<i>Anopheles</i> <i>funestus</i>			Total An.	Total Culicinae	Total Culicidae	% An. gambiae vs Total An.	% An. fun vs Total An.	% Total An. vs Culicidae	% Culicines vs Culicidae
		In	Out	Total	In	Out	Total							
1	Mimuli	339	513	852	0	0	0	871	3 531	4 402	97.8	0.0	19.8	80.2
2	Mareba	856	2 391	3 247	0	0	0	3 454	10 976	14 430	94.0	0.0	23.9	76.1
3	Bukora	1	59	60	0	0	0	86	4943	5 029	69.8	0.0	1.7	98.3
4	Karambi	187	162	349	82	71	153	640	4846	5 486	54.5	23.9	11.7	88.3
5	Busoro	652	574	1 226	0	0	0	1 490	13 349	14 839	82.3	0.0	10.0	90.0
6	Rukara	30	58	88	0	0	0	314	1737	2 051	28.0	0.0	15.3	84.7
IRS Districts		2 065	3 757	5 822	82	71	153	6 855	39 382	46 237	84.9	2.2	14.8	85.2
7	Mashesha	1 459	2 322	3 781	0	0	0	3 847	15 320	19 167	98.3	0.0	20.1	79.9
8	Kicukiro	952	1190	2 142	48	89	137	2 375	21 901	24 276	90.2	5.8	9.8	90.2
9	Bungwe	0	0	0	5	24	29	119	4435	4 554	0.0	24.4	2.6	97.4
10	Rwaza	8	12	20	2	6	8	30	4201	4 231	66.7	26.7	0.7	99.3
11	Kivumu	26	37	63	109	97	206	641	12 883	13 524	9.8	32.1	4.7	95.3
12	Mubuga	130	64	194	9	4	13	383	2731	3 114	50.7	3.4	12.3	87.7
Non-IRS Districts		2 575	3 625	6 200	173	220	393	7 395	61 471	68 866	83.8	5.3	10.7	89.3
Total		4 640	7 382	12 022	255	291	546	14 250	100 853	115 103	84.4	3.8	12.4	87.6

Table 9: Distribution of Malaria Vectors in 12 Sentinel Sites

No	Site name	<i>Anopheles gambiae</i> s.l.			<i>Anopheles funestus</i>			Total An.	Total Culicinae	Total Culicidae	% An. gambiae vs Total An.	% An. fun vs Total An.	% Total An. vs Culicidae	% Culicines vs Culicidae
		In	Out	Total	In	Out	Total							
1	Mimuli	339	513	852	0	0	0	871	3 531	4 402	97.8	0.0	19.8	80.2
2	Mareba	856	2 391	3 247	0	0	0	3 454	10 976	14 430	94.0	0.0	23.9	76.1
3	Bukora	1	59	60	0	0	0	86	4943	5 029	69.8	0.0	1.7	98.3
4	Karambi	187	162	349	82	71	153	640	4846	5 486	54.5	23.9	11.7	88.3
5	Busoro	652	574	1 226	0	0	0	1 490	13 349	14 839	82.3	0.0	10.0	90.0
6	Rukara	30	58	88	0	0	0	314	1737	2 051	28.0	0.0	15.3	84.7
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10	Rwaza	8	12	20	2	6	8	30	4201	4 231	66.7	26.7	0.7	99.3
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Total		4 640	7 382	12 022	255	291	546	14 250	100 853	115 103	84.4	3.8	12.4	87.6

Abbreviations: In: Inside; Out: Outside; An.: *Anophelines*; An.g: *Anopheles gambiae* s.l.; An. fun: *Anopheles* group; EIR/Y: Entomological inoculation rate per year. ibp/y: infected bites per person and per years

Table 10: Species of Anopheles Mosquitoes Tested for Detection of Plasmodium Infection in IRS and non-IRS Districts

No	Anopheles Species	IRS Districts			Non IRS Districts			Total		
		Tot. Tested	Positives	SIR (%)	Tot. Tested	Positives	SIR (%)	Tot. Tested	Positives	SIR (%)
1	<i>An. gambiae s.l.</i>	4 420	0	-	1 936	3	0.16	6 356	3	0.05
2	<i>An. funestus</i>	102	0	-	298	1	0.34	400	1	0.25
3	<i>An. ziemanni</i>	313	0	-	119	0	0	432	0	0
4	<i>An. maculipalpis</i>	78	0	-	5	0	0	83	0	0
5	<i>An. pharoensis</i>	172	0	-	-	0	0	172	0	0
6	<i>An. coustani</i>	46	0	-	140	0	0	186	0	0
7	<i>An. christyi</i>	21	0	-	343	0	0	364	0	0
8	<i>An. squamosus</i>	53	0	-	3	0	0	56	0	0
9	<i>An. moucheti</i>	-	0	-	-	0	0	-	0	0
10	<i>An. rhodesiensis</i>	-	0	-	76	1	1.32	76	1	1.32
11	<i>An. demeilloni</i>	1	0	-	-	0	0	1	0	0
12	<i>An. rufipes</i>	13	0	-	-	0	0	13	0	0
13	Anopheles spp	22	0	-	-	0	0	22	0	0
Total		5 241	0	-	2 920	5	0.17	8 161	5	0.06

6. Climate Surveillance

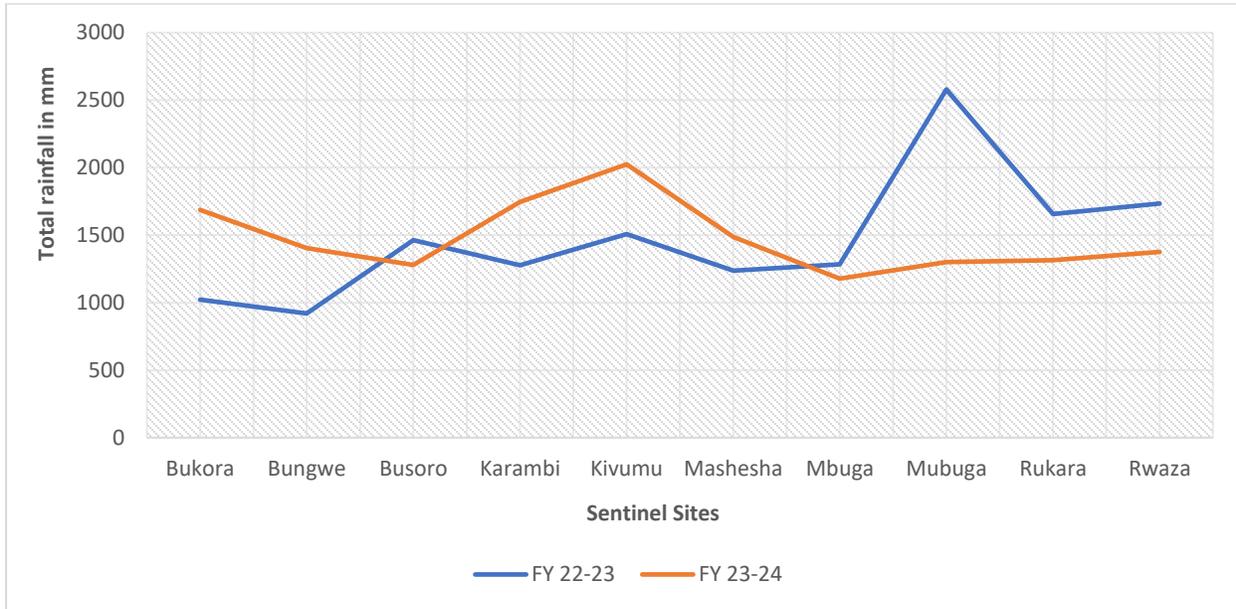
The spatial variation of the three climatic variables (temperature, rainfall and relative humidity) is mostly contributing to the distribution of malaria vectors. From July 2023 to June 2024. Mashsha (Rusizi District) was the most warmed station with 24.22°C and humid with 68.24%. Five stations out of ten registered abnormal rainfall varying between 1400-2025mm. These are Bungwe (Burera District. 1404mm). Mashsha (Rusizi District. 1553.3mm). Bukora (Kirehe District. 1688.3mm). Karambi (Ruhango District. 1746mm) and Kivumu (Rutsiro District) with the highest depth of 2025.3mm).

Table 11: Annual Rainfall, Temperature and Relative Humidity in Ten Entomology Sentinel Sites

District	Station	An. Max Temp	An. Min Temp	An. Mean Temp	An. Rainfall	Relative Humidity
Kirehe	Bukora	25.74	14.49	20.12	1688.3	65.5 %
Burera	Bungwe	26.46	15.11	20.74	1404	62.85 %
Nyanza	Busoro	26.18	14.77	20.74	1279	63.36 %
Ruhango	Karambi	25.47	14.43	19.95	1746	64.04 %
Rutsiro	Kivumu	25.58	14.26	19.92	2025.3	67 %
Rusizi	Mashsha	31.65	16.87	24.22	1553.2	68.24 %
Nyamagabe	Mbuga	22.78	13.01	17.89	1926.5	-
Karongi	Mubuga	26.41	14.52	20.47	1299.7	62.7 %
Kayonza	Rukara	25.58	14.54	20.06	1315.4	65.69 %
Musanze	Rwaza	26.32	14.94	20.63	1376.3	66.31 %

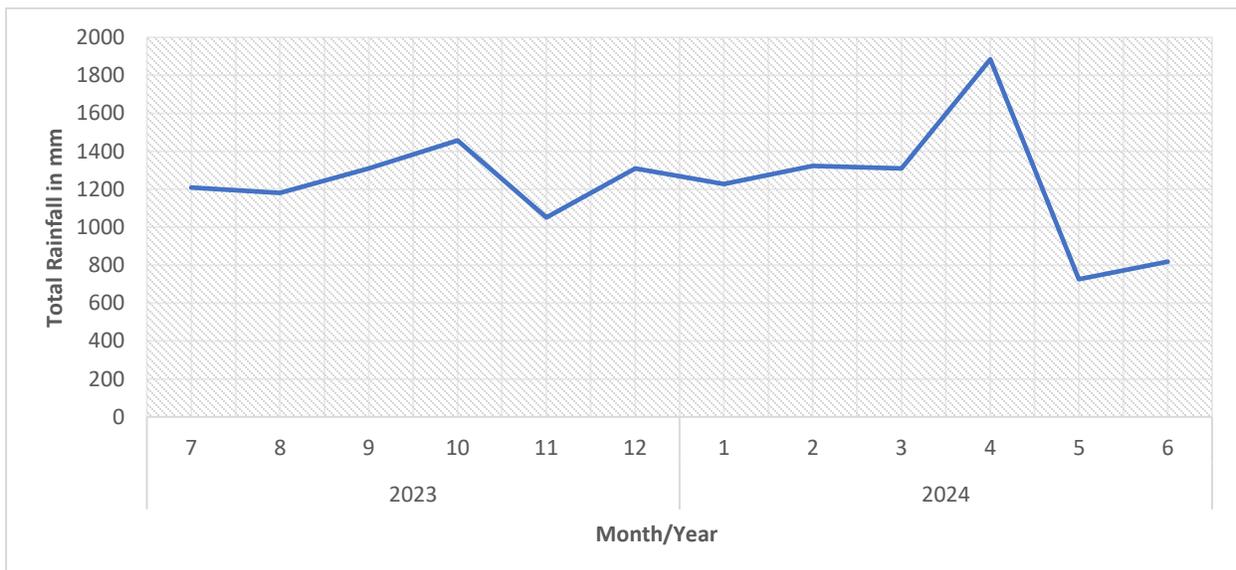
There is no significant increase of annual rainfall in 2023-2024 compared to the previous year. The annual average of recorded rainfall was 1480mm versus 1478.2mm in 2022-2023.

Figure 8: Comparison of Rainfall between 2022-2023 and 2023-2024



Contrary to the last FY (2022-23), where the peak of rainfall occurred in mid-August to mid-September 2022 and mid-January to end February 2023. In 2023-24, it occurs in October 2023 and April 2024. The lowest rainfall occurred in November 2023 and May 2024 (Figure 9).

Figure 9: Annual Rainfalls Patterns Reported from Ten Sites



The combination of three climate parameters (temperature, rainfall and relative humidity) make Mashsha likely to host more vectors in its catchment area compared to the other nine sites despite the IRS intervention. Consequently, 27% (n=14,250) of all *Anopheles* collected in 12 sites were reported from Mashsha sentinel site (Table 7).

However, the data indicate that climate parameters collected in 10 sentinel sites remain a risk factor of malaria transmission in all sites. It has been confirmed that malaria transmission is more likely to occur where temperature $\geq 18 \leq 35^{\circ}\text{C}$; rainfall > 80 mm and Relative humidity $> 60\%$ ⁶, if preventive interventions are not optimized.

7. Maintenance of Insectary and Laboratory Animals

The susceptible Kisumu strain of *Anopheles gambiae* s.s. was maintained at the Mal&OPDC/RBC insectary based at the National Entomology Laboratory of Kicukiro which complies with the WHO mosquito rearing standards. A total of 76,000 *Anopheles gambiae* s.s were supplied for the following activities. Around 54,000 female *Anopheles gambiae* s.s. 2-5 days old were supplies for IRS quality control in seven sprayed districts. 12000 females *Anopheles gambiae* s.s. 2-5 days old were supplies for new vector control tools evaluation (Vectron™ T500 and Sovranta® 15WP). The total of 3000 *Anopheles gambiae* s.s. larvae L3 were used to evaluate efficacy and residual effect of Spinosad granules in experimental breeding materials.

During the period of July 2023 to June 2024, a total of 104 Guinea pigs were kept at insectary for feeding mosquito colony. Out of them 82 were supplied in the community to improve food deficiency for the poor families around the entomology Laboratory. Current 22 are kept healthy and ready to supply blood for mosquitoes.

⁶ Ceccato P., Connor S. J., Jeanne I., Thomson M.C. **Application of Geographical Information Systems and Remote Sensing technologies for assessing and monitoring malaria risk.** *Parassitologia* .47.1 (2005), 81-96

8. Supplemental Interventions Capacity Building and Research

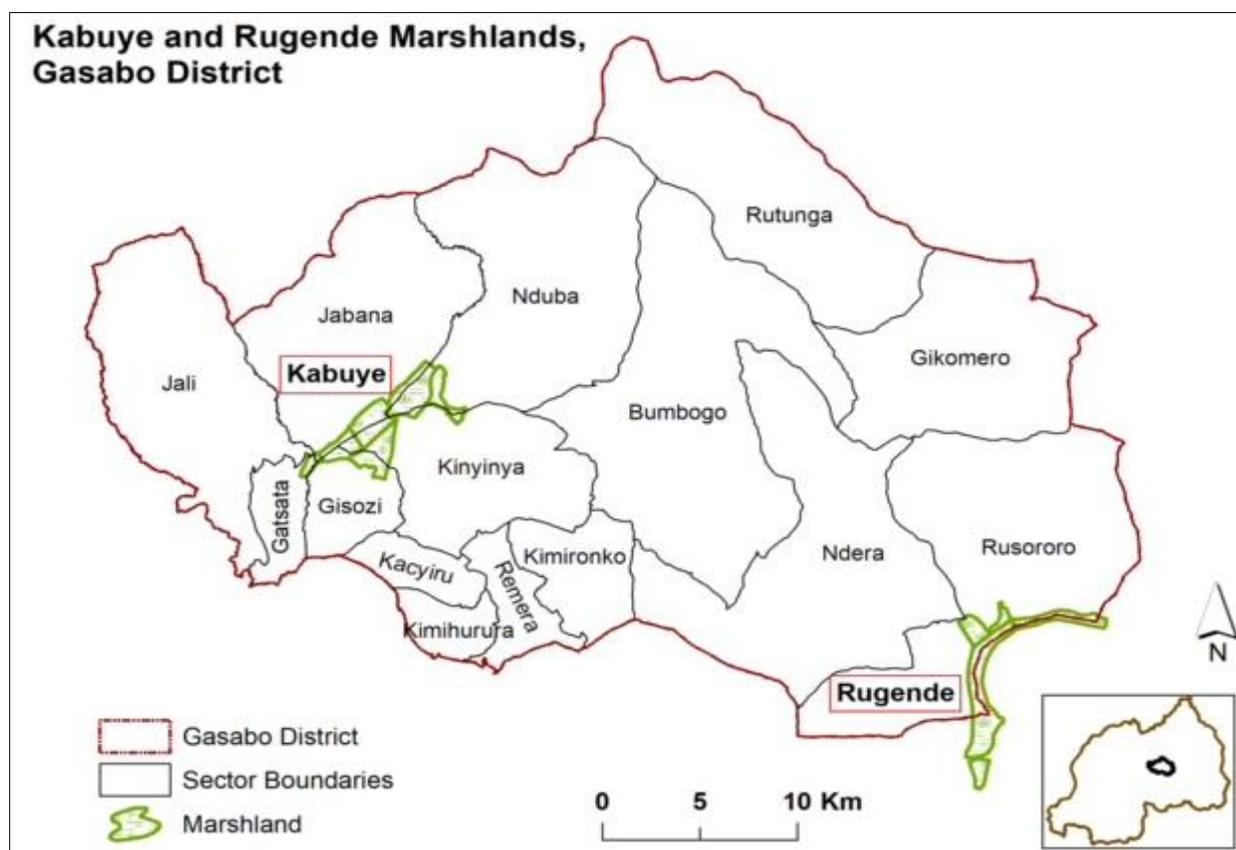
8.1. Supplemental Innovations

The MOPDC has a partnership with SFH through social marketing, 5197 off lotion mosquito repellents were distributed using private sector channels such as pharmacies supermarkets and trading shops.

Through collaboration with Charles UAS, RBC/MOPDD conducted the second pilot phase of larval source management using bio-larvicides (Bti). The larvicide product was sprayed using drones in flooded water bodies and irrigated rice fields and complemented with community-based hand applications in two marshlands. Rugende and Kabuye of Gasabo district. This extended pilot phase of larviciding was planned to cover a total surface of 964.9 ha of two marshlands with a combined land use of rice fields and wetland crops, located respectively in Kabuye with 396.2 ha and Rugende with 568.7 ha located in Gasabo District, Kigali City.

The spraying operations were guided by the monthly mapping of mosquito breeding sites to estimate the sprayable surfaces. A community mobilization using drones in intervention areas was also performed on a monthly basis in contingent villages in the intervention's areas in collaboration with Charis UAS and SFH. The spraying campaign and monitoring of the impacts started from February 2023 to June 2023 for FY 2022/23 and extended to FY 2023/24. From July 2023 to January 2024 with malaria saving funds and covered 12 months. Three partners were respectively involved (SFH, Charis UAS and Caritas Rwanda). SFH for procurement of the required larvicide product and recruitment of external experts. Charis UAS for spraying, mapping, and drone-based community mobilization. Caritas Rwanda through Kicukiro HC for entomology monitoring. The RBC ensured the overall coordination and evaluation of the impact.

Figure 10: Targeted Areas for Second Pilot Phase of Larval Source Management in Rugende and Kabuye Marshlands, Gasabo District in the City of Kigali



8.2. Integrated Vector Management

In the framework of Integrated Vector Management (IVM) approach, building capacity through strengthened inter-sectorial collaboration and community based environmental/larval source management the following activities were achieved:

- The RBC/MOPDD in collaboration with following Civil Society Organizations: RICH, ASOFERWA, Rwanda NGOs Forum, Profemme Twese Hamwe, RDO, SFH and CARITAS Rwanda conducted the IVM capacity building in 140 sectors (24 districts) out of 416 sectors (national level). The training targeted different stakeholders at sector level and covered 38.6% (n=139) out of 362 sectors of the targeted districts.

In total, 1023 participants have been trained as the IVM trainers to support in cascading awareness on IVM approach to the identified targeted groups at the communities level. The training used mixed training methods involving in class theories and field practices for mosquito larval collection and physical identification “learning by doing or seeing” in anophelines and culicines levels. The participants were identified in collaboration with respective districts, and the three CSO partners. The trainees were mainly composed by the in charge of agriculture and livestock (Agronome), president of rice famers cooperatives (where applicable), president of fish famers cooperatives (where applicable), president of mining cooperatives (where applicable), in charge of social affaires, in charge of schools, in charge of community health workers, head of health center, malaria focal person and CHW representative at sector level. The partners contributed to the training with 22.4% for ASOFERWA, 20 % for RICH, 16.3% for CARITAS, 15.1% for SFH, 9.3% for Profemme, 8.7% for RNF and 8.2% for RDO out of the 1023 total trainees.

8.3. Research and Monitoring

1. Efficacy and Residual Period Evaluation of VECTRON™ T500

An evaluation of efficacy and residual period of a new registered insecticide for indoor residual spraying. VECTRON™ T500 manufactured by Mitsui Chemicals Crop & Life Solutions. Inc. (MCAG). Japan. The experiment was performed in experimental houses located in Nyarubuye village. Kajevuba cell. Ntarabana sector. in Rulindo district of the Northern Province. This insecticide is made of new active ingredient “Broflanilide 500gr/kg” and formulated as Wettable Powder (WP). The experiment has two specific objectives: 1- To evaluate the efficacy and -2 to determine the period of insecticidal activity against susceptible *Anopheles gambiae* s.s. Kisumu strain on mud and cement plastered walls under experimental houses. The experiment started in December 2023 and covered 7 months in July 2024. Three arm treatments were applied for this evaluation as following: i) Vectron™ T500 as experiment; ii) Fludora Fusion as positive control and iii) Distilled water as Negative control. After seven months of evaluation, the preliminary findings are as follow:

The mosquito knocked down effects measured at each 10 minutes of intervals for 60 minutes showed 100% KDs for VectronT500 and Fludora fusion insecticides and both for mud and cement treated walls.

- The mortality of exposed mosquitoes was 100% in all sprayed houses. Cement as well for mud walls for Vectron™ T500 and Fludora® fusion. These findings were consistent from the one-week post spraying of houses for measuring the bio-efficacy and the seven months monitoring for evaluation of the residual period of the new insecticide. The trial will continue up to remaining 3 months until October 2024.

2. Efficacy and Residual Period Evaluation of Sovrenta 15WP

Another evaluation of bioefficacy and residual period was carried out on another new insecticide. Sovrenta 15WP is a new IRS insecticide under the code SYN547407 WP manufactured by Syngenta Crop Protection B.V. The experiment was performed in RBC experimental huts established in Ruhuha, Bugesera district of the Eastern Province.

The insecticide is made of new active ingredient “Isocycloseram” and is formulated as Wettable Powder (WP). The experiment has the following specific objectives:

- To assess the bio-efficacy and residual efficacy of SYN547407 WP against susceptible *Anopheles gambiae* s.s Kisumu strain on different types of insecticide treated walls.
- To determine the exophilic effects induced by the new insecticide on indoor wild anopheles’ mosquitoes under experimental huts.
- To evaluate mortality effects induced by the new insecticide on indoor wild anopheles’ mosquitoes at 24 hours for direct mortality and every additional 24 hours up to 168 hours for delayed mortality. The experiment started in March 2024 and covered 5 months at the end of FY 2023/24.

Three arm treatments were established for evaluation as following:

- 1- Sovrenta 15WP as experiment.
- 2- Fludora Fusion as positive control and
- 3- Distilled water as Negative control.

After four months of evaluation, the following are the highlighted preliminary findings:

- The mosquito mortality was 100% at 24 hours of observation period for Sovranta® 15WP as well as for Fludora® Fusion on cement and mud wall surfaces. Therefore, Sovranta® 15WP displayed less knock down effects with 34% on cement walls and 30% on mud walls after 60 minutes of KD measurement. However, Fludora fusion showed KDs effects of 100% both on mud and cement walls.
- The following monthly bioassays will be important to determine at which period the residual efficacy of Sovranta® will drop below 80% of mortality for four consecutive trials as the threshold of insecticide efficacy on treated substrate of walls.
- The observation for the delayed mortality will be extended up to 72 hours post exposure of mosquitoes on treated walls.

Strategy 2: Sustain Universal Access to Long Lasting Insecticide Treated Nets (LLINs)

1. Long Lasting Insecticide Treated Nets

According to the Extended National Malaria Strategic Plan 2020-2027 and WHO recommendations, the strategy aims for universal coverage of the at-risk population through the distribution of LLINs. These nets are distributed via mass campaigns in households with low to moderate malaria incidence, as well as through routine channels that focus on the most vulnerable groups, such as children under five and pregnant women, across the country.

1.1 LLINs Procurement

For the period 2023-2024, a total of 1,539,754 rectangular and conical LLINs were procured with Government of Rwanda and the support of the Global Fund through RMS Ltd and USAID/PMI through *GHSC-PSM*. Table 13 shows the types of nets and quantities procured:

Table 12: Number of LLINs Procured by Type and Source of Funds

Source of Fund	LLINs Type	Procured	Delivered	Accepted
GFATM	Standard	589,754	589,754	589,754
USAID/PMI	PBO	870,000	870,000	870,000
GoR	Conical	80,000	80,000	80,000
TOTAL				1,539,754

For 142,263 Standards LLINs the full process of the physical inspection was done by the technical team of RBC based on the ISO 2859-1 protocol and the Acceptance Quality Limit (AQL) of 2.5 for major defect and 4.0 for minor defects. All consignment has passed and recommended for the distribution. The received quantity was distributed to Nyamagabe district for the universal coverage of households (218,936 LLINs) with the coverage of 96% and the remaining quantity (923,327 LLINs) will be used for routine ANC and EPI distribution in 18 districts.

LLINs reception, quality control, and delivery to health centers are critical components of the malaria prevention strategy. In the fiscal year 2023-2024, the Rwanda Biomedical Center (RBC) and the Malaria & OPD division received a substantial shipment of Long-Lasting Insecticide Nets (LLINs). This included 80,000 standards conical LLINs, funded by the Government of Rwanda (GoR), and 870,000 rectangular PBO LLINs, financed by USAID/PMI.

Prior to acceptance, a thorough physical inspection was conducted by the technical teams from the Rwanda Medical Supply (RMS) and RBC. The inspection adhered to the ISO 2859-1 protocol, employing the Acceptance Quality Limit (AQL) criteria of 2.5 for major defects and 4.0 for minor defects. This meticulous quality control process ensured that all consignments met the required standards. After successfully passing the inspection, the LLINs were approved for distribution to health facilities.

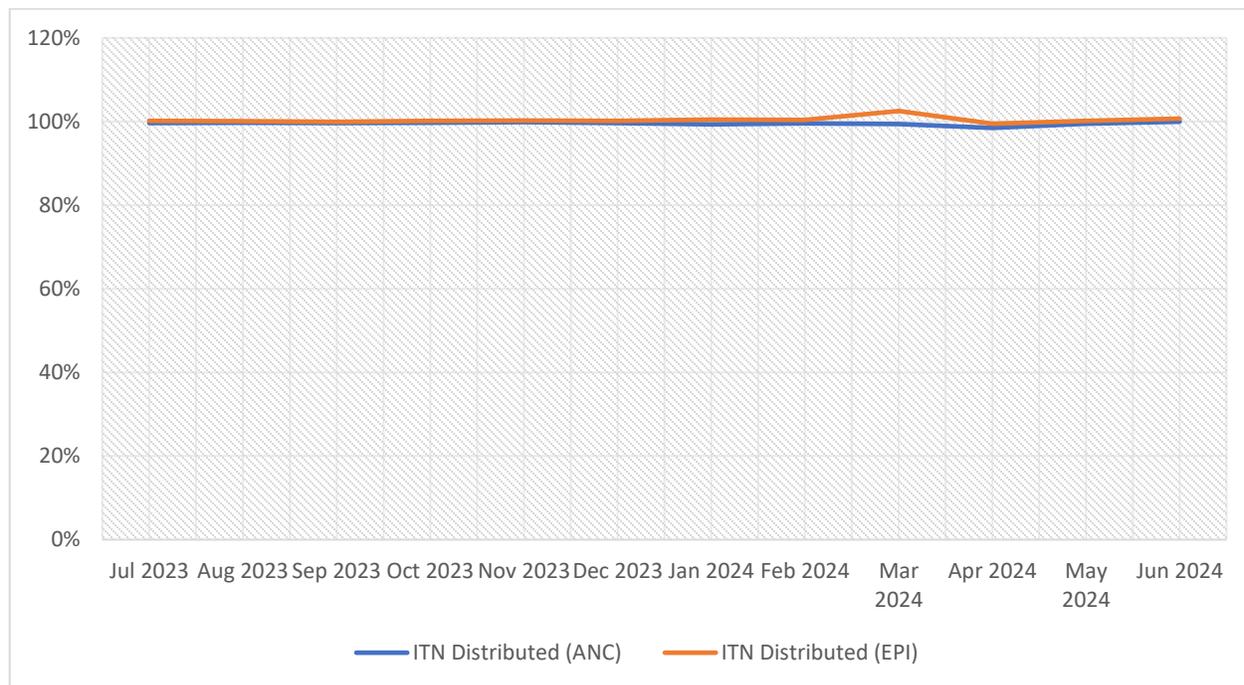
This rigorous process underscores the commitment to maintaining high-quality preventive measures in the fight against malaria, ensuring that all distributed nets are safe and effective for use in protecting communities.

1.2 LLINs Distribution to Pregnant Women and Children under 1 Year Old

The strategy of LLINs distribution to these vulnerable groups is integrated in Antenatal Care (ANC) package and Expanded Program in Immunization (EPI) services in all Health Centres. On a monthly basis, the distribution of LLINs was reported through the national Health Management Information System (HMIS).

During this fiscal year, 309,412 LLINs were distributed to pregnant women over 317,534 who attended the first visit of antenatal care representing 97% and 331,227 LLINs were distributed to children under one year over 340,172 who attended MR1 representing 97%.

Figure 11: National Coverage of LLINs through ANC and EPI



Using HMIS and Scorecard Data, and with support from Local NGOs, RBC/MOPD Division organized an active LLINs redistribution to address issues of LLINs stock status reported on monthly basis through HMIS by health centers.

In this year, a total of 90,250 LLINs were redistributed from 64 Health Centers to 178 Health Centers countrywide.

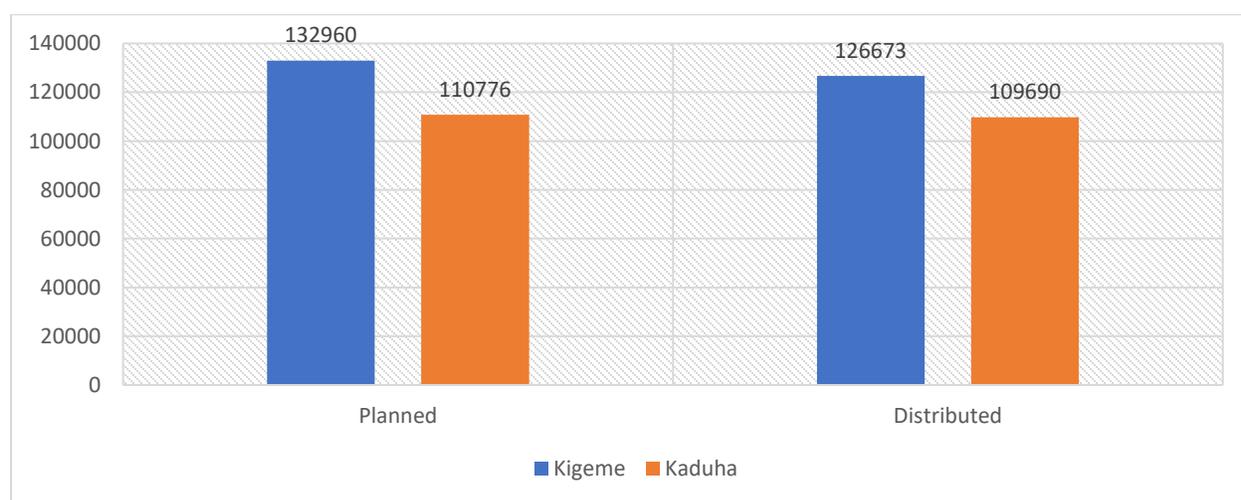
1.3 LLINs Distribution to Households through Mass Campaign

In addition to the routine LLINs distribution through ANC and EPI services, 237,000 have been distributed to households through mass distribution campaign in Nyamagabe district.

The preparation of LLINs distribution began with the identification of household needs, on the basis of which the quantification was elaborated in terms of 1 LLIN for 2 household members or the number of assessed sleeping spaces when it exceeded the number of household members divided by two.

The distribution of LLINs to households was done by health centers and community health workers in collaboration with local authorities using outreach site approach. Communities are called for gatherings in selected sites across districts area to receive LLINs and the communication was done through radio spots and radio talks on RBA as well as usual community communication channels (churches, community forums, etc.).

Figure 16: Mass Campaign of LLINs in Nyamagabe District



1.4 LLINs Distribution to Households in Hotspots Cells

In addition to the ongoing continuous and scheduled mass distribution efforts, data trends from the weekly Integrated Disease Surveillance and Response (IDSR) and the monthly Health Management Information System (HMIS) revealed a significant increase in malaria cases in several hotspots within the Gisagara, Bugesera, and Nyagatare districts. In response to this surge, the Malaria & OPD, in collaboration with local non-governmental organizations (NGOs), local government authorities, health facilities, and community health workers, undertook a targeted distribution of LLINs.

This concerted effort aimed to protect the affected populations and interrupt the transmission chain of malaria. Consequently, a total of 160,327 LLINs were distributed in Gisagara, 147,702 in Bugesera, and 74,943 in Nyagatare districts. These distributions were carefully coordinated to ensure that the nets reached the most vulnerable individuals, significantly bolstering the community's defense against malaria.

Figure 17: LLINs Distributed in Hotspots Sectors of Nyagatare District

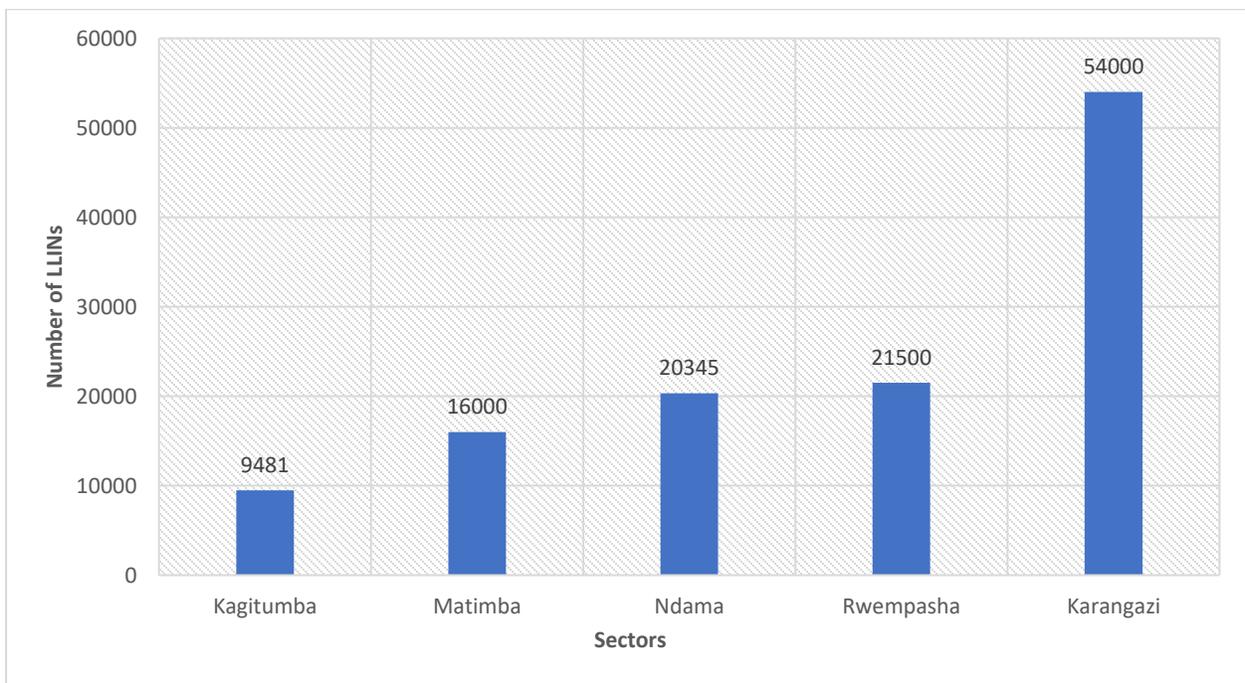
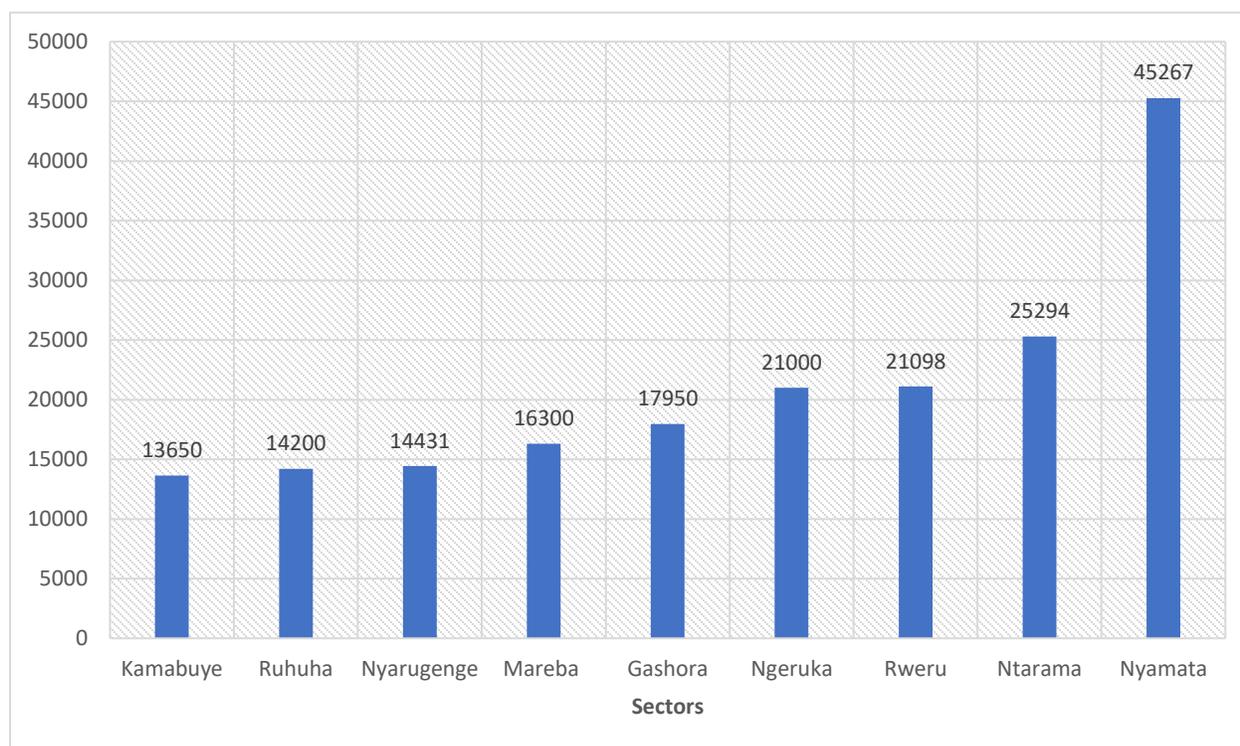


Figure 18: LLINs Distributed in Hotspots Sectors of Bugesera District



1.5 LLINs Distribution in Boarding School

In reference to the malaria Matchbox recommendations, in collaboration with partners, the Ministry of Health/RBC/MOPDD, using the Matchbox findings of March 2021, have conducted the need assessment, mapping of hotspots and situational analysis among high-risk groups to orient the specific interventions being implemented in the context of malaria. From the assessment, a total number of 766,647 persons among high-risk groups were identified. These vulnerable groups include Rice Farmers, Fishermen, Mining workers, truck drivers, Health Care Providers, Students at School, hotel staff and Clients, Female Sex Workers, Motorcyclists, Cross-border trades, Seasonal Workers, people with disabilities, and travelers, etc. With this background, RBC planned to distribute LLINs to all boarding schools sleeping space to ensure that students at school are protected by LLINs.

Reference was made to the LLINs stock status as of October 2023 countrywide in health facilities (ANC and EPI stock). The internal redistribution (from HCs to Boarding schools

in the district) helped to speed up the distribution and stock management at the health center level to avoid unnecessary overstock.

A total number of 236,522 LLINs were distributed in 480 schools countrywide as shown in the graph below.

Figure 19: Number of Schools Served by Districts

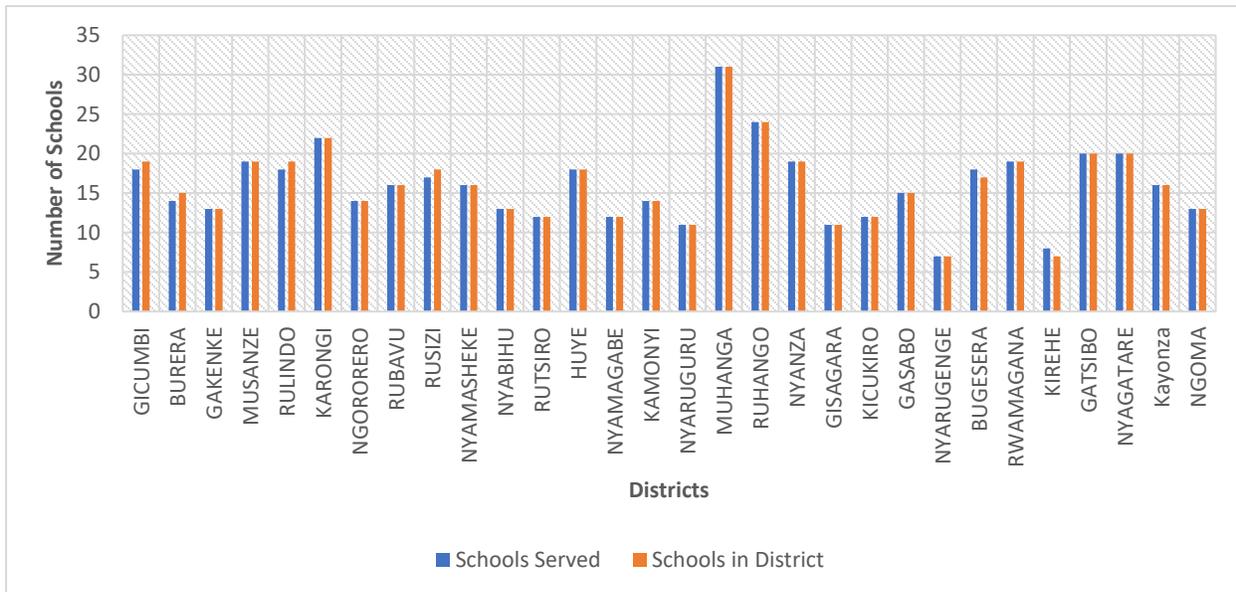
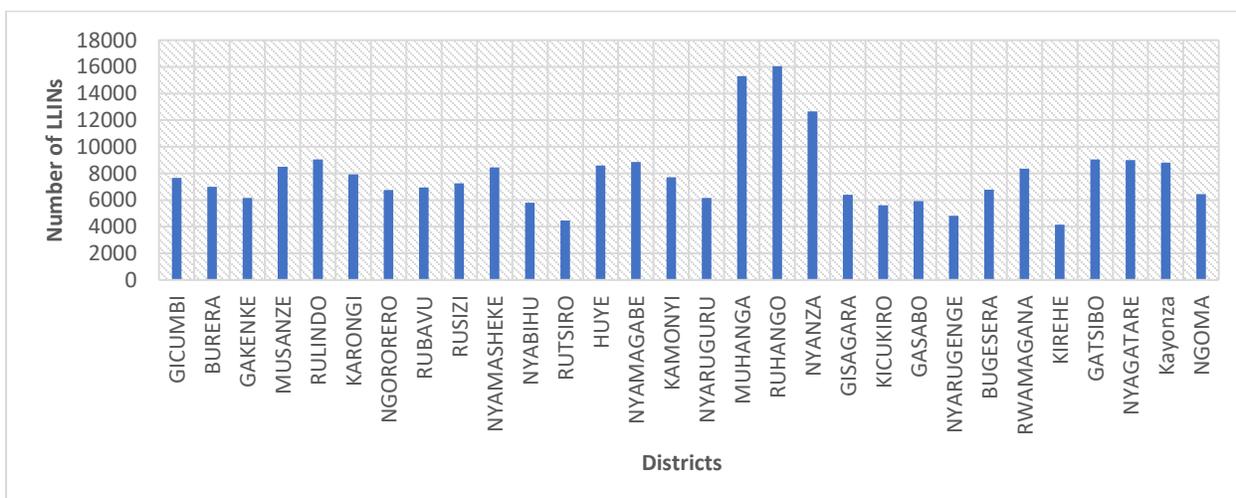


Figure 20: LLINs Distributed in Schools by Districts



Prior to the redistribution activity, 3 preparatory meetings were held on 26 October 2023, 6 December 2023, and 11 December 2023. These meetings took place at the RBC Headquarters and brought together all stakeholders involved, including the Society for Family Health (SFH) Rwanda, Rwanda Interfaith Council on Health (RICH), Profemmes Twese Hamwe (PFTH), Association de Solidarité des Femmes Rwandaises (ASOFERWA), Rwanda Development Organization (RDO) and CARITAS Rwanda.

The meetings aimed to discuss and plan the redistribution process, identify challenges and risks that could hinder it, and develop mitigation measures to address them. The preparatory meetings were crucial in ensuring the success of the LLINs redistribution process.

It was previously planned to distribute a total number of 237,850 LLINs to 482 schools countrywide but some schools had closed, and new ones had opened.

A list has been compiled to outline the locations and names of the schools found closed during the exercise. The following table also provides the number of LLINs that would have been provided to each of these schools.

Table 13: Number of Planned LLINs and not Distributed

Province	District	Name of School	LLINs
Northern	Gicumbi	GS Apapebu	150
	Burera	KABONA TSS	400
	Rulindo	ES Remera Mbogo	400
Western	Rusizi	St Peter	100
Total		4	1,050

New schools were identified during the LLINs distribution. Those schools were not planned but were provided with LLINs.

Table 14: Number of Non-Planned LLINs and Distributed in New Schools

Province	District	Name of School	LLINs
Eastern	Bugesera	Rwanda Children Christian School	180
	Kirehe	Musaza TSS	200
Total		2	380

1.6 LLINs Selling in the Private Sector

Following the Ministerial Instruction of February 26th, 2018, regulating the distribution of LLINs for free of charge to the population in Ubudehe 1,2, 3 and selling of LLINs to the population in Ubudehe 4 and some in Ubudehe 3, SFH Rwanda distributed 1,874 LLINs to those in need through Social Marketing in different areas of the country through selling points.

Successes or Best Practices in Malaria Case Management

The community case management of malaria maintained above 50%.
More than 90% of patients with fever tested and treated within 24 hours of the onset of symptoms.

Key Challenges or Gaps in Malaria Case Management

The emergence of partial resistance to Artemisinin.
Increased severe malaria cases and malaria related deaths.
Unexpected malaria commodities consumption (malaria upsurge in some districts) leading to stock out.

Proposed Way Forward

Implement the Multi-First Line Treatment (MFT) strategy to mitigate the spread of drug resistance.
Severe case and death investigation to understand risk factors.
Engage CSO and local leaders for targeted community awareness.

Objective 2: Maintain 100% Prompt Testing & Treatment of All Suspected Malaria Cases in Line with National Treatment Guidelines by 2024

Diagnosis and treatment are key components in malaria control. Various interventions have been implemented through program strategies to improve access to early diagnosis and appropriate case management, thereby reducing malaria morbidity and mortality.

In FY 2023-2024, the MOPDD, in collaboration with partners, has been strengthening the capacity healthcare providers in diagnostic testing to ensure all malaria patients are accurately diagnosed and receive timely and appropriate treatment. All suspected malaria cases were confirmed parasitological, either by Malaria Rapid Diagnostic Test or Blood Smear, and categorized as uncomplicated, simple malaria with minor digestive symptoms, or severe malaria before receiving the appropriate treatment.

Since October 2016, the rollout of Home-based Management of Malaria (HBMm) to all age groups has enabled Community Health Workers (CHWs) to provide timely treatment for all cases of uncomplicated malaria within the community, preventing severe malaria and limiting transmission. By ensuring early diagnosis and treatment at all levels of healthcare, all suspected malaria cases are tested and managed according to the National Malaria Treatment Guidelines.

Strategy 1: Provide Malaria Diagnosis to all Suspected Malaria Cases at all Levels

1. Review and Update the Integrated Malaria Control Guidelines

In this Fiscal Year, the MOPDD with partners have reviewed and updated the integrated Malaria control guideline, the main key changes included diversification of malaria drugs in response to the emergency of artemisinin partial resistance. This calls to add DHAP and artesunate pyronaridine for simple malaria cases and artemether injection for severe malaria. The multi-Firstline treatment (MFT) of simple malaria was adopted as new strategy to mitigate the malaria drug resistance. . The updated guideline has already been approved by the ministry of health and it is ready to be disseminated in FY2024-2025.

2. Assessment and Certification of Malaria Microscopists

WHO recommends that each country establishes a core group of skilled microscopists with up-to-date certifications to ensure their effectiveness in crucial activities. These activities encompass training laboratory personnel in malaria microscopy, conducting in-country competence assessments for microscopists, cross-checking malaria slide results, and providing onsite supervisory visits to malaria microscopy facilities. Therefore, the MOPDD in collaboration with NRL with support from US PMI conducted a five days assessment of 12 malaria microscopists including four from the NRL and eight from different hospitals in Rwanda. The outcome of this assessment was significant, with three microscopists certified as Level 1, seven as Level 2, and two achieving Level 4 certification according to WHO classification. This effort not only aligns with WHO guidelines but also ensures that the core group of microscopists remains competent and well-equipped to contribute to effective malaria diagnosis and management countrywide.

3. Quality Control/Quality Assurance of Blood Smears and Rapid Diagnostic Tests

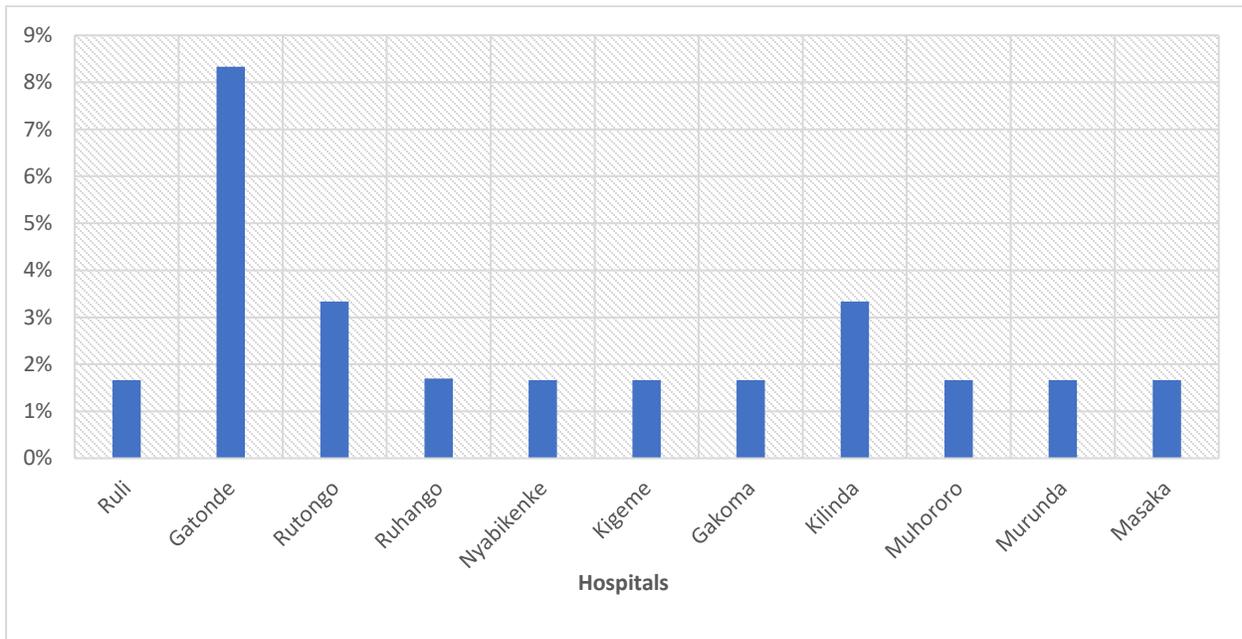
3.1 Quality Control of Blood Smears at Hospital Level

To ensure the quality of malaria diagnosis in the national laboratory network, malaria diagnosis External Quality Assurance (EQA) is conducted by RBC/MOPDD in collaboration with the National Reference Laboratory, Parasitology Section.

The EQA includes blinded slide rereading, proficiency testing, and on-site supervision of Hospital Laboratories.

Quarterly evaluation of the quality of thick and thin smear practices, Giemsa staining, and microscopy results are enforced in health facilities. Health center practices are supervised by the district hospital, and district hospitals are supervised by the NRL.

Figure 21: External Quality Control Results at Hospital Level



Results from hospitals with discrepancies (percentages represent the proportion of discordant results compared to the number of slides retested in the hospital during the fiscal year 2023-2024.

Among the 50 hospitals in which EQA/QC of blood smears was conducted during 2023-2024, discordant slides results from two observers were noticed in 11 Hospitals. Results from the 2023-2024 blood slides Quality Control demonstrate that discrepancy remained below the cut-off of 5% acceptable range (Figure 14) except for Gatonde Hospital (8 %) which exceeded the acceptable range with 8% of discordant results. The overall discrepancy was 1% during the reporting period.

In addition to the slide retesting, a general assessment of malaria microscopy laboratory setting was undertaken in 50 Hospital Laboratories by MOPDD in collaboration with NRL staff from January to March 2024. This included assessment of the Hospital laboratory settings, maintenance of laboratory equipment, the quality and validation of Giemsa Stain solution and the reporting of laboratory results. Findings showed that 87% of the laboratories assessed had enough working space with running water and electricity

(100%). They were equipped with, on average of 2 functioning microscopes per hospital lab, gloves (97%).

Giemsa used was kept out of light (97%), the staining SOPs were followed (%) and immersion oil was of good quality (91%). The report of Blood smear results recorded the parasite species (80%), development stage of the parasites (82%) and the quantification of parasites (71%). Corrective Measures were immediately provided to the mentored staff which included recording the opening date and performing validation of new Giemsa solution, performing the quality control of HCs blood films regularly and reporting parasites density for positive blood films.

The malaria program will continue to work closely with NRL to correct reported discrepancies in district hospitals through formative and refresher training during the FY 2024-2025.

3.2 Quality Assurance of mRDTs at Community Level

At the community level, quality assurance of malaria Rapid Diagnostic Tests (mRDTs) was conducted by direct observation of CHWs performing the test either on real patients or by simulation. In January 2024, a total of 509 CHWs from 30 districts and 69 Nurses from 69 Health Posts (HPs) were supervised. All steps of performing an RDT were assessed. Results show that 83% of CHWs were supervised on RDT testing during the previous quarter. RDT test kits were securely kept in cupboards (84%). The main steps of performing RDTs such as wearing gloves (97%), explaining the testing procedure to the patient (95%), cleaning the pricking site with alcohol swab (92%), taking the right amount of blood (96%), depositing the blood and buffer solution in the correct hole (98%) and interpreting results according to the guidelines (96%) were performed very well. Feedback including correct use of RDT Job Aid, verifying the expiration date of the test, observing 15 minutes waiting time to reading results and improving waste disposal was immediately provided to the supervised staff. Strategy 2: Strengthen Prompt Access to Diagnosis and Treatment of Malaria.

Strategy 2: Strengthen Prompt Access to Diagnosis and Treatment of Malaria

1. Ensure Malaria Drug Efficacy

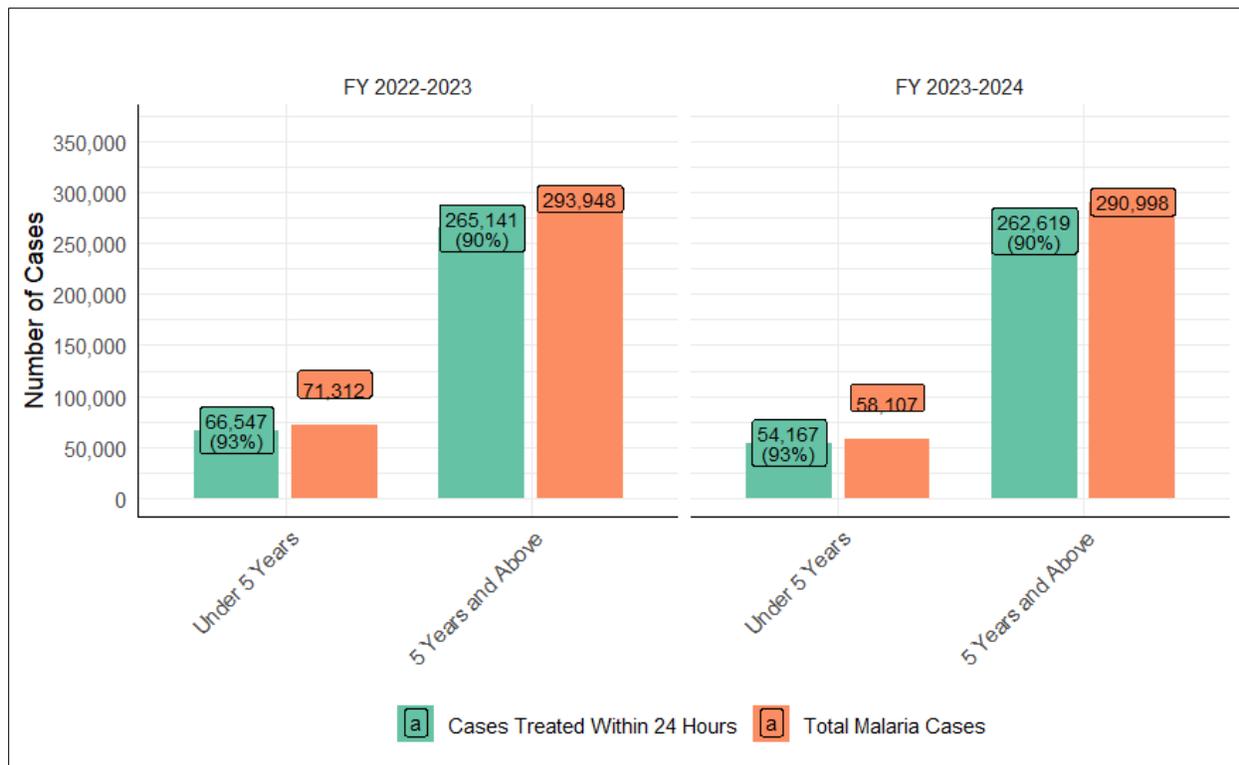
Based on the recommendations of the WHO Strategy to respond to antimalarial drug resistance in Africa, MOPPD in collaboration with WHO conducted an assessment of the country situation on status, epidemiology of Malaria drug resistance, drivers of artemisinin resistance, and overall health and regulatory system in order to Develop strategic interventions to respond to antimalarial drug resistance and mitigate the spread of partial artemisinin resistance. The main objective of this response strategy was to strengthen the surveillance of antimalarial drug efficacy and resistance, to provide expanded coverage of the data on antimalarial drug efficacy and resistance in the country, to limit drug pressure on parasites by optimizing and better regulating the use of diagnostics and treatments and limit the spread of antimalarial drug-resistant parasites through optimal malaria interventions including appropriate preventive measures in priority areas to restrict transmission from recrudescence cases.

2. Case Management at the Community Level

In 2016, the community case management of malaria was extended to children above five years of age and adults countrywide following the success of the iCCM program.

In FY 2023-2024, 93% of children under five and 90% of children above five and adults sought treatment within 24 hours of onset of symptoms at community level, Figure 15. Patients seeking care at the community were diagnosed with an RDT and treatment provided only when a positive RDT was observed.

Figure 22: Community Malaria Case Management in FY 2023-2024



Since the extension of HBM of malaria intervention to children above five years and adults, there was a steady increase of the proportion of malaria patients seeking care in the community from 13% to 57% in 2015-2016 and 2023-2024 respectively, Figure 17. During this scale up period, a decline in severe malaria cases and malaria deaths was observed until 2022-2023, The slight increase of severe malaria cases and death observed this FY may be due to decrease of immunity and emergence of artemisinin resistance which has been reported in our country (Figure 16).

Figure 23: Severe Malaria Cases and Malaria Mortality, 2014-June 2024

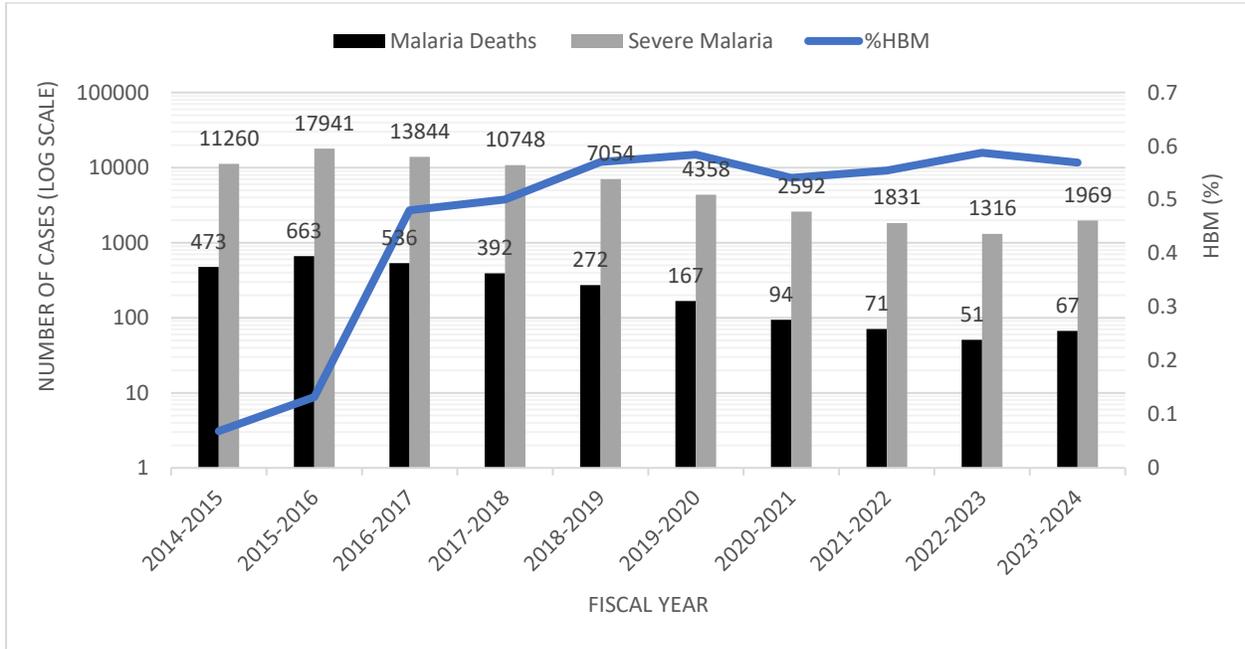
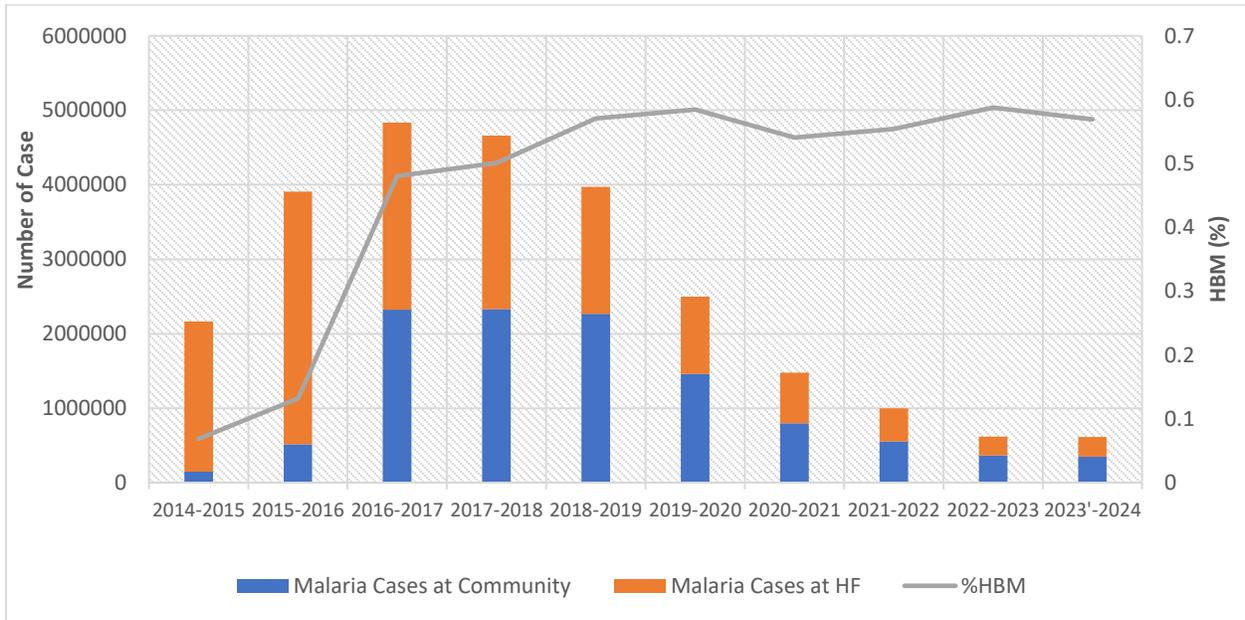


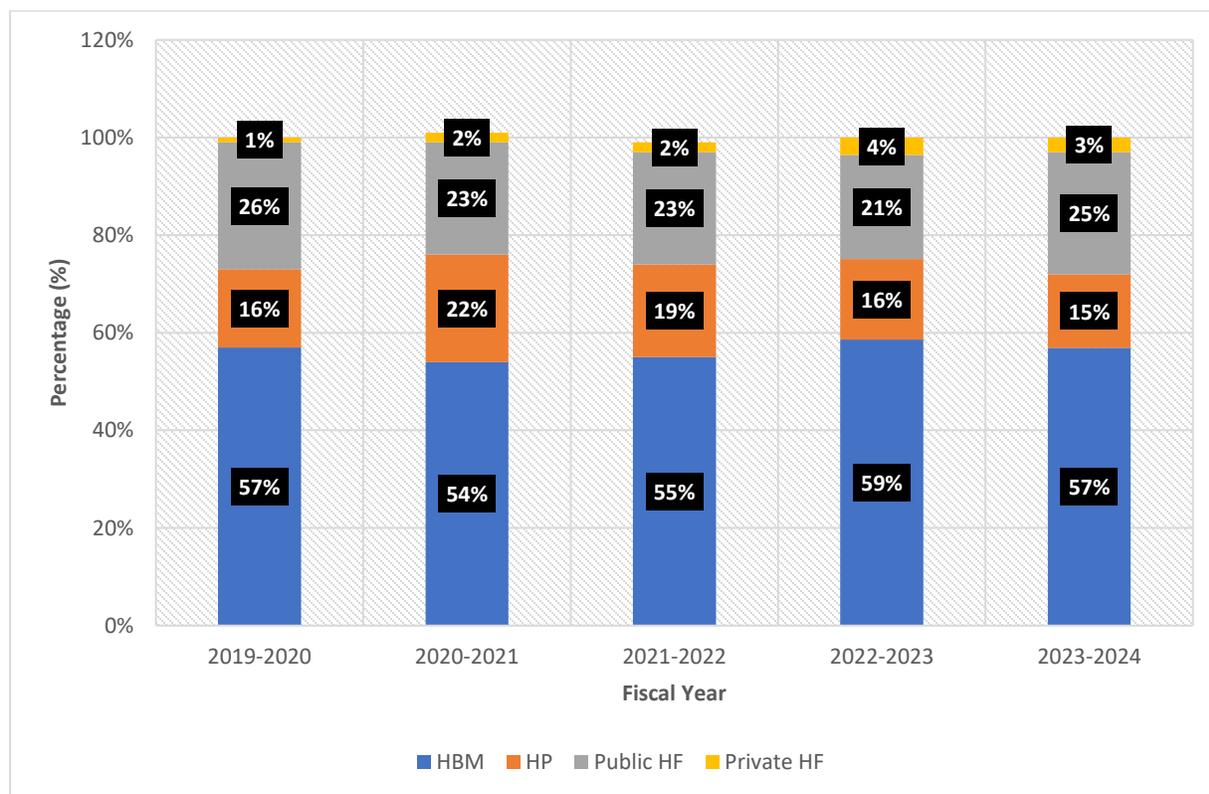
Figure 24: Proportion of Malaria Cases by Level of Service Delivery, 2014- June 2024



The proportion of malaria cases treated in the community remains above 50% since the scale-up of the home-based management of simple malaria to adults in 2017.

The introduction of HPs posts in the health system, a new strategy adopted by the GoR to scale up health services closer to the community and alleviate workload for the CHWs contributed to 15% of simple malaria cases. Figure 18.

Figure 25: Proportion of Malaria Cases by Level of Service Delivery, 2019-June 2024



Strategy 3: Strengthen Prompt and Correct Treatment of Simple Malaria at All Levels through Training and Supportive Supervision

3.1 Strengthening of Health Facility and Community Case Management through Supportive Supervision

During the fiscal year 2023-2024, the Malaria and other parasitic diseases division (MOPDD), in collaboration with its partners, significantly advanced the provision of high-quality malaria services through rigorous supportive supervision. This year, 52 hospitals, 515 health centers, and 63 health posts benefited from integrated supervisory efforts spearheaded by MOPDD and its partners. At the health center level, 1,734 staff members from health centers and health posts received direct support.

Additionally, 63 nurses across 63 health posts were mentored on critical aspects of malaria care, including diagnosis and treatment, supply chain management, and referral procedures, in alignment with established malaria treatment guidelines.

Community Health Workers (CHWs) were continuously trained to enhance their capability in delivering quality primary health care (PHC) to their communities.

During this reporting period, 6,066 CHWs (comprising 3,587 females and 2,479 males) from the districts of Rubavu, Nyagatare, and Ngoma were supported through supervisory sessions focusing on malaria drug supply management. This included the meticulous counting and analysis of both physical and reported stock levels for essential items such as Coartem and malaria Rapid Diagnostic Tests (RDTs).

3.2 Training of Community Health Workers

The introduction of a Polyvalent Community Health Model by Rwanda Ministry of Health in the FY 2021-2022 allowed community health activity transitioning from specialized CHWs to polyvalent and all CHWs can provide a comprehensive community health package to the served population. For the FY 2023-2024, in collaboration with MCCH CHOs, Nurses and data Managers were trained as trainers on CHWs polyvalent model who in turn conducted the training of CHWs covering ICCM and home-based management of malaria modules. Additionally, Rwanda MoH started the journey to digitalize Community health program. Therefore, it was conducted the training of CHWs trainers aimed of increasing the skills and knowledge to CHWs on the functionalities and use of the cEMR smartphone application for household registration and enrollment, assessment and treatment of malaria and other under-five illnesses, stock management, recording of numbers/instances during Indoor Residual Spraying (IRS) and long-lasting insecticide treated nets (LLINs) distribution campaigns.

Table 15: Capacity Building of Community Health Workers

SN	Training	Target Group	Achievement
1	Training of trainers on iCCM and HBM Component	CEHO of HCS Data managers of HCs OPD Nurses in Health Centers (one/HC)	In collaboration with MCCH, 167 participants including 16 CEHOs, 13 Data Managers and 138 nurses from Muhanga district were trained on Polyvalent Model including ICCM and Management of Malaria Cases in Adults (HBMa) component.
2	Training of ASM and Health Promotion CHWs on iCCM and HBMa	All ASM from Health Centers All Health Promotion CHWs from HCs	The training reached 600 CHWs including ASM and Health Promotion from HCs in Muhanga catchment area were trained.
1.	Training of trainers on cEMR	CEHOs, nurses in charge of pharmacy, laboratory technicians from HCS.	The training of trainers on cEMR benefited 100 participants included CEHOs, nurses in charge of pharmacy and laboratory technicians from HCS.
2.	Training of CHWs on cEMR	CHWs from 36 HCs where the cEMR is being piloted.	Capacity building of CHWs reached 600 CHWs of (Muhanga, Rwamagana, Gasabo, Nyarugenge, and Kicukiro districts) District

As of June, a total of 73,424 households were enrolled in the system by CHWs which process served as the foundation for CHWs to effectively provide essential services like assessments, treatment for simple malaria cases, and referrals for severe cases. CHWs were able to consult 369 children using cEMR and among them, 65 cases were assessed and managed malaria.

3.3 Implementation of the Therapeutic Efficacy Study (TES)

Monitoring the efficacy of antimalarial medicines is a key component of malaria control. As per the WHO recommendations, national malaria control programs should continue the use of current first-line antimalarial treatments if they have an Adequate Clinical and

Parasitological Response of 95% or greater and that treatment should be monitored at least every 24 months at established sentinel sites. Protecting ACT efficacy for the treatment for *P. falciparum* malaria is among the top national and global public health priorities.

During the previous year, MOPDD with the support of PMI-IM developed the TES protocol based on the standard WHO protocol. The study is evaluating the efficacy of AL and Dihydroartemisinin-Piperaquine (DHA-PPQ) for the treatment of uncomplicated malaria in three study sites across Rwanda. During the reporting period, the enrollment was completed and the advanced sample analysis like DNA amplification and microsatellites were done and writing TES is ongoing and the table below demonstrates the data collection completion.

Table 16: Study Sites, Enrolled Participants, and Treatment Failure by Site, Data Collected from June 2021 to December 2023 (Source: IM Rwanda TES Database)

Site Name	Enrolled	AL Arm	DP Arm	Treatment Failure		Comments
				Early treatment failure (ETF)	Late treatment failure (LTF)	
Ngoma	176	88	88	0	3	All treatment failures were AL-related and were all identified on Day 28 visit
Masaka	171	88	81	0	14	Treatment failures were AL-related. On Day 19, one case of treatment failure was identified; seven cases were identified on Day 21 while 6 cases were found on Day 28
Bugarama	176	88	88	0	6	Six cases of treatment failure were AL-related: one case on D2, one case on D14, two cases on D21 and three cases on D28.

AL= Artemether Lumefantrine; DP= Dihydro-artemisinin Piperaquine; ETF= Early Treatment Failure; LTF= Late Treatment Failure

Strategy 4: Ensure Accurate Quantification and Distribution of Quality Assured Malaria Commodities

4.1 Quantification and Procurement of Malaria Commodities

Accurate quantification and timely initiation of procurement is key to ensuring that malaria commodities are available at all levels of the supply chain and the stock level is always between the minimum and maximum levels. The malaria commodities procured in FY 2021-2022 are shown in Table 18.

During fiscal year 2023-2024, the MOPDD in collaboration with all CPDS partners kept the available malaria commodities stock at the desired stock level. This was achieved through regular supply plan reviews, use of appropriate quantification tools and willingness of partners to support the entire process. Several quantification reviews took place over the reporting period to adjust the real need of malaria commodities. Malaria commodities were routinely distributed to health facilities through RMS branches and finally from HC to the community and when and where appropriate, redistribution of commodities was undertaken.

Table 17: Malaria Commodities Procured in 2023-2024

Product	Quantity Procured	Source of Funds
Artemether-Lumefantrine 1x6, Blisters	8,790	GF
Artemether-Lumefantrine 2x6, Blisters	60,930	GF
Artemether-Lumefantrine 2x6, Blisters	164,940	PMI
Artemether-Lumefantrine 3x6, Blisters	80,790	GF
Artemether-Lumefantrine 3x6, Blisters	336,240	PMI
Artemether-Lumefantrine 4x6, Blisters	123,085	PMI
Artemether-Lumefantrine 4x6, Blisters	176,430	GF
Artesunate 60mg/ml Vials	21,861	PMI
Artesunate 60mg/ml Vials	28,500	GF
Malaria RDTs	2,250,000	GF

Note: Some ACTs on PMI were not procured in FY2023/24 and the budget allocated to this procurement will be used in the next FY.

4.2 Validation of RMS Branch Reports and Distribution of Malaria Commodities

The objective of the validation of malaria commodities is to:

- Ensure that the RMS Branches and lower service levels receive the right amount of malaria commodities at the right time.
- Ensure that RMS Branches are given the quantities they need to be stocked according to plan (stock to be between the minimum and the maximum levels) and that they receive feedback on the validation report.
- To ensure e-LMIS data accuracy as the validation exercise is currently based on the information found in e-LMIS.
- Rationalize the quantities available at the RMS store in case of understock. This was done through the redistribution of commodities within districts not only to prevent stock out at RMS but also to avoid expiration of malaria commodities.

During the FY 2023-2024, the validation exercise allowed to align the distribution of malaria commodities with trend of Malaria cases in different districts.

4.3 Stock Status of Malaria Commodities, End June 2022

By the end of the FY 2023-2024, the stock status of malaria commodities was kept in acceptable levels. Table 19. However, there was a slight understock for ACTs and Artesunate due to the overall increase in malaria cases observed in the country.

Table 18: Stock Status of Malaria Commodities

Product	RMS HQ	RMS Branche	Qty (HFs)	Stock all Levels	AMC all Levels	MoS all Levels	Quantity in Pipeline
A/L 1 x 6	2 406	10 858	21 626	34 890	5 659	6,2	37 950
A/L 2 x 6	60	27 199	21 990	49 249	8 631	5,7	42 960
A/L 3 x 6	30 975	76 907	27 086	134 968	7 626	17,7	0
A/L 4 x 6	128 165	27 255	39 414	194 834	21 616	9	126 210
Artesunate Inj.	6 076	4 617	4 193	14 886	4 124	3,6	31 021
mRDTs	295 800	129 280	83 129	508 209	153 120	3,3	809 0

4.4 Monitoring of Stock Status

The monitoring of malaria commodities done on a quarterly and monthly basis helped to understand the status of each commodity and calculate the month of stock that allows the program to know if products are between maximum and minimum required levels (9 months minimum and 12 months' maximum at national level).

In FY 2023-2024, the monitoring allowed the program to plan for redistribution of Artesunate from districts with over stock (Gicumbi RMS, RMS Huye, RMS Nyamagabe, Rwamagana RMS, RMS Musanze, RMS Rutsiro, RMS Nyabihu, Byumba District Hospital, Shyira DH, Rwinkwavu DH, Gisenyi DH) to the Health Facilities in need of stock to minimize the risk of expiration and prevent stock out.

4.5 Challenges

The procurement of Artemeter injection, Dihydro-Artemisinin Piperaquine and Artesunate-Pyronaridine failed due to lack of a WHO Prequalified bidder. The tender process will resume in FY 2024-2025.

Successes of Best Practices in Surveillance

The national malaria incidence in Rwanda reduced from 47 cases per 1,000 persons per year in FY 2022- 2023 to 45 cases per 1,000 persons per year in FY 2023-2024 (4% reduction).

Out of 30 districts, 27 districts have incidence below 100 per 1,000 and 363 out of 416 sectors (87%) with API below 100 per 1,000.

Key Challenges or Gaps in Malaria Surveillance

Lack of more granular data (cell, village, and individual level) to inform targeted interventions. The inadequate use of data at the decentralized level for the timely response.

Proposed Way Forward

Introduce Community Electronic Medical Record (C-EMR) to improve data use and targeted response.
Capacity building of district teams in data use for decision-making.

Objective 3: BY 2024, Strengthen Surveillance and Reporting for Complete and Timely Accurate Information for Appropriate Decision Making at All Levels

Strategy 1. Strengthen Malaria Routine Surveillance and Epidemic Preparedness and Response (EPR) at All Levels

1. Introduction

Globally, there were an estimated 247 million malaria cases in 2021 with an estimated 234 million cases in African region accounting for about 95% of global cases (WHO, Report 2022).

Rwanda made a remarkable progress towards malaria control in Rwanda during the last five years. However, malaria remains also a major public health challenge, with the entire population at risk.

In Rwanda, malaria surveillance system is integrated into the Health Management Information Systems (HMIS) where the program collects data on malaria epidemiology to provide information for planning, implementing, and monitoring and evaluating malaria control interventions.

The establishment of a robust malaria surveillance and reporting system through strengthening routine IDSR, HMIS and SISCOM reporting systems, improving monitoring and evaluation of the program implementation and promoting the generation and use of evidence to inform malaria programming is essential for the success of this strategic plan.

In addition, population-based surveys and operational research such as surveillance of antimalarial drug efficacy and drug resistance, entomological surveillance and vector control monitoring, Malaria Indicator Surveys (MIS), Demographic Health Survey (DHS) and other studies are conducted on regular basis to support evidence decision making to fight against malaria. During the reporting period the Malaria program in collaboration with NISR and ICF International conducted MIS in 2023 with USAID funding.

2. Key Malaria Program Indicators

Health facilities report malaria data on a weekly and monthly basis through IDSR and HMIS while community data are reported monthly through SISCOM system. Key malaria data includes malaria cases, malaria related deaths, malaria inpatients cases (severe malaria), number of testing and treatment.

The program produces trends on key malaria indicators on a monthly basis both at national and district level in order to detect any changes and respond to outbreaks in a timely manner.

Table 20, summarizes the key malaria indicators for FY 2022-2023 compared to previous reporting period:

Table 18: Key Malaria Program Indicators

Indicators	2021/2022	2022/2023	2023/2024
Malaria Incidence per 1,000 Persons per Year	76	47	45
Slide Positivity Rate (%)	18	14	14
Uncomplicated Malaria Cases	998,811	621,465	613,415
Inpatient Malaria cases	3,843	3,307	4,055
Severe Malaria Cases	1,831	1,316	1,969
Malaria Deaths	71	41	67
Case Fatality Rate (per 100,000 Malaria cases) *	7.0	6.4	10.9
Proportion of Malaria Cases Treated at Community	55%	59%	57%

Key Malaria Program Indicators

- ✓ 4% Reduction of in Malaria Incidence from 2022/2023 to 2023/2024
- ✓ 1% Reduction in Uncomplicated Malaria Cases from 2022/2023 to 2023/2024
- ✓ 50% Increase in Severe Malaria Cases from 2022/2023 to 2023/2024
- ✓ 23% Increase in Malaria Deaths from 2022/2023 to 2023/2024
- ✓ 23% Increase in inpatient malaria cases from 2022-2023 to 2023-20
- ✓ Today, 57% of all malaria cases are being treated at Community Level by CHWs compared to 59% during the FY 2022-2023

2.1 Malaria Incidence

Malaria incidence has been calculated using the average medium projected population of 2023 and 2024. Data shows that the national malaria incidence in Rwanda reduced from 47 cases per 1,000 person per year in FY 2022- 2023 to 45 cases per 1,000-person per year in FY 2023-2024 (4% reduction).

Figure 26: Trends in Malaria Incidence per 100 Persons Year, 2008-2024

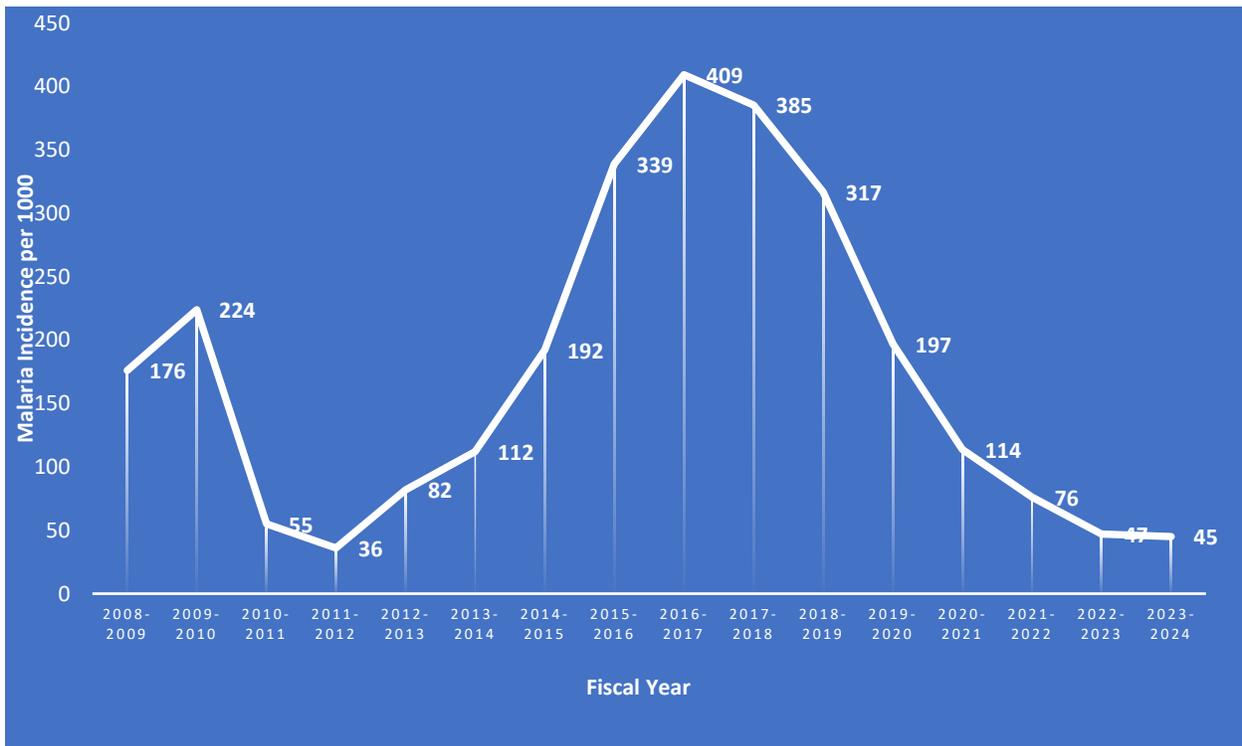


Figure 27: Malaria Incidence (per 1000) by District, FY2023-24

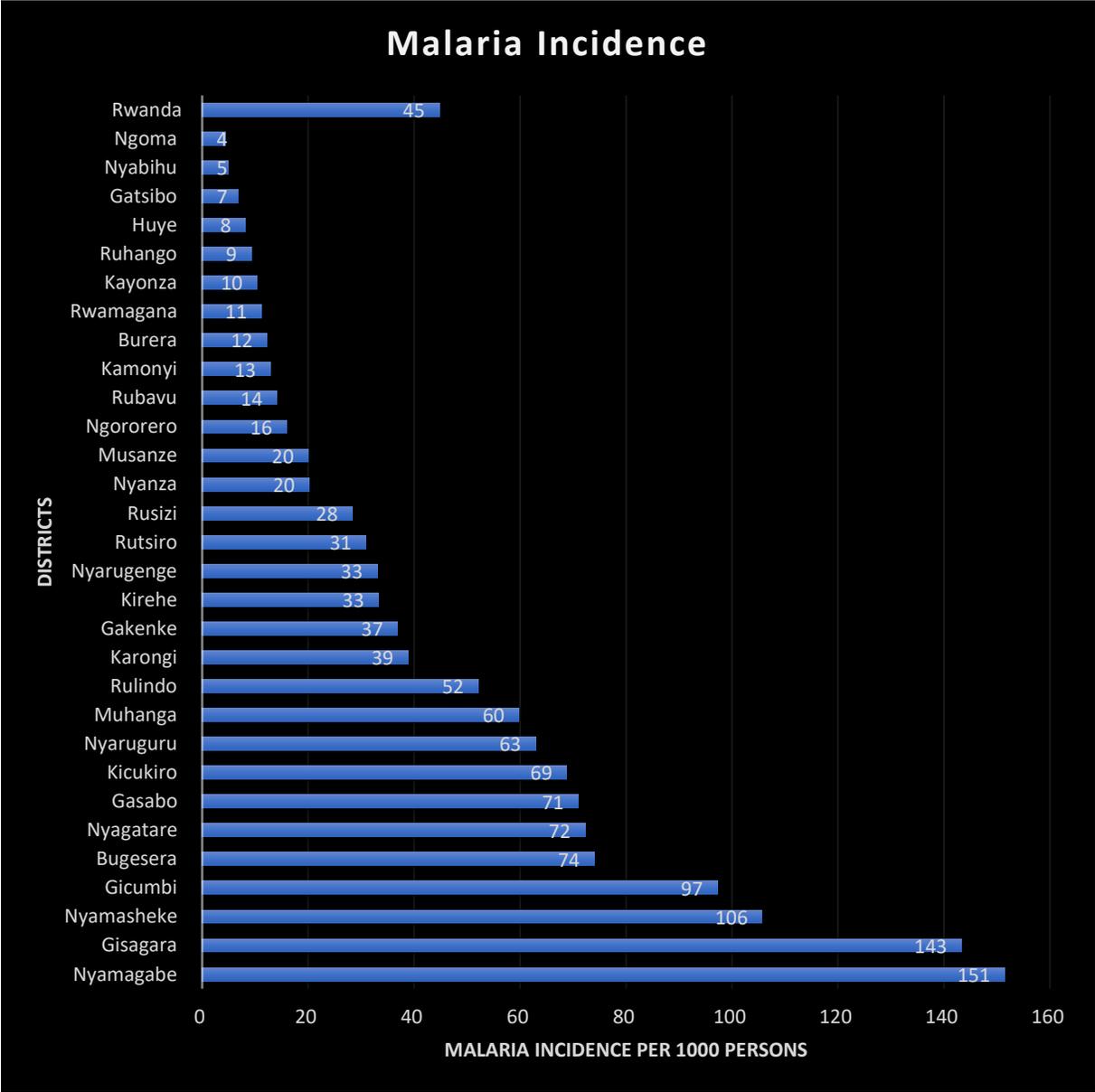
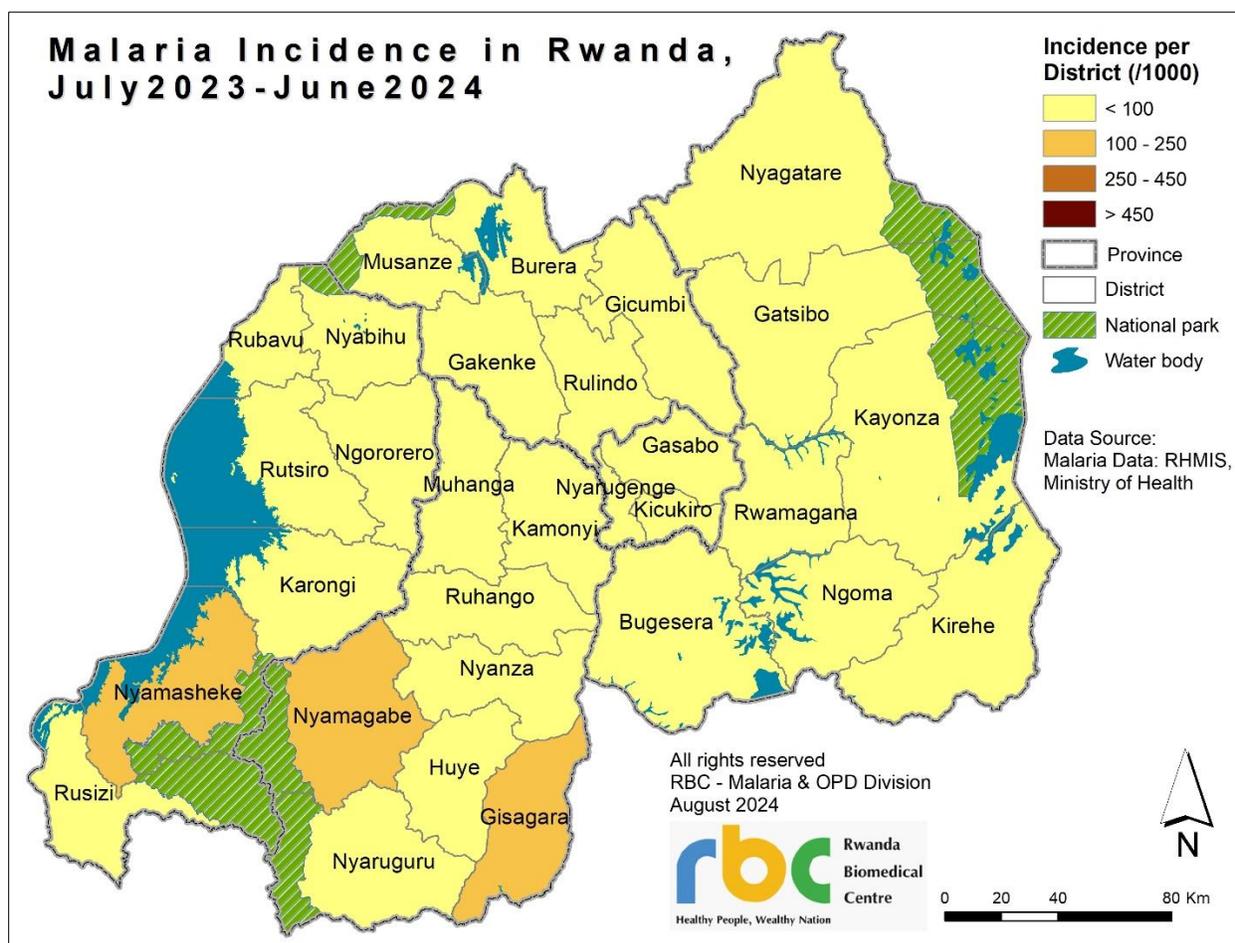


Figure 28: Malaria Incidence (per 1000) by District



Eleven districts have incidence above national average of 45 per 1000 persons. Out of 30 districts, 3 registered API above 100 per 1,000: Nyamagabe (151‰), Gisagara (143‰) and Nyamasheke (106‰), compared to two districts in FY 2022-2023: Gisagara and Nyamagabe (**Figure 22**).

During this reporting period, malaria incidence reduced by more than 20% in 13 districts: Ngororero (66%), Huye (63%), Ruhango (56%), Rutsiro (55%), Kamonyi (54%), Rwamagana (50%), Nyarugenge (44%), Nyaruguru (31%), Gakenke (30%), Rusizi (29%), Nyanza (28%), , Gatsibo (25%), Gasabo (22%), Rulindo (20%). However, 8 districts including four with IRS registered an incidence increase of more than 20%: Nyagatare (88%), Kirehe (50%), Gisagara (44%), Musanze (43%), Nyamagabe (37%), Nyamasheke (34%),Burera (26%), Bugesera (21%).

There is a need to conduct a further investigation to understand the risk factors associated with malaria upsurge despite sustained blanket IRS and ITN distribution.

2.2 Malaria Incidence per Sectors

During the FY 2023-2024, 3 sectors registered an incidence of more than 450 per 1,000: Giti from Gicumbi (API=854), Cyanika from Nyamagabe (API=722), Mukindo from Gisagara (API=477) **Table 21.**

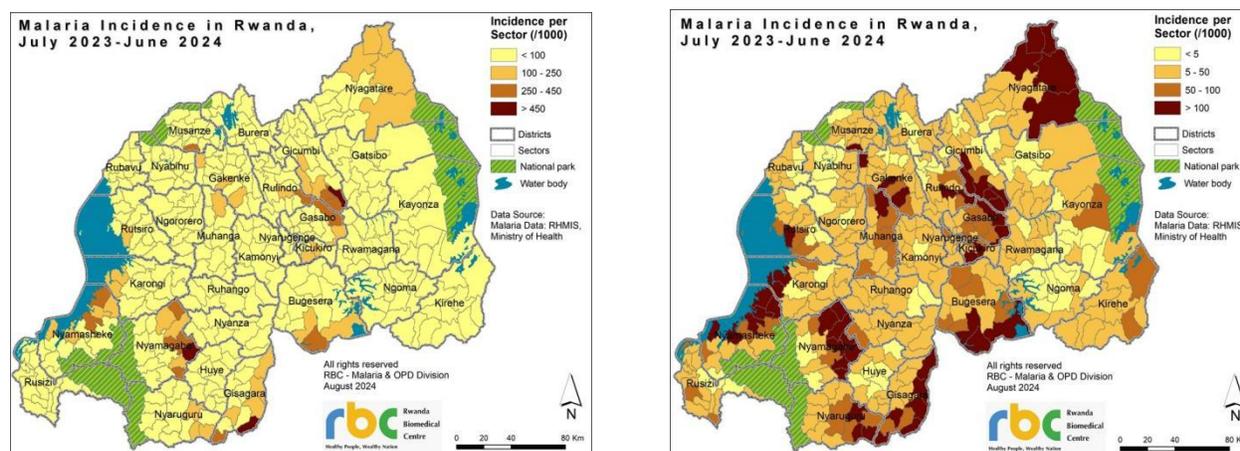
Table 19: Change in Malaria Incidence in High to Moderate Incidence Sectors

District	Sector	Mal Incidence per 1000 FY 2022_2023	Mal Incidence per 1000 FY 2023_2024	Increase/Decrease
Gicumbi	Giti	1006	854	-15%
Nyamagabe	Cyanika	360	722	101%
Gisagara	Mukindo	284	477	68%
Gasabo	Gikomero	456	448	-2%
Gicumbi	Rwamiko	373	389	4%
Gicumbi	Bukure	340	357	5%
Rulindo	Ntarabana	501	353	-29%
Gasabo	Rutungu	314	351	12%
Bugesera	Kamabuye	187	333	78%
Nyamagabe	Musange	283	312	10%
Nyamasheke	Macuba	136	286	111%
Nyamagabe	Kibumbwe	144	284	98%
Nyamagabe	Kamegeri	224	276	23%
Musanze	Nkotsi	197	270	37%
Gisagara	Nyanza	237	260	10%
Nyamagabe	Mbazi	274	260	-5%
Nyamasheke	Gihombo	201	253	26%

Table 20: Distribution of Sectors per API Category per Type of Intervention

Mal incidence category (per 1000)/Year	FY2022-2023		FY2023-2024	
	IRS	No IRS	IRS	No IRS
>450	0	3	1	2
250-450	1	9	2	12
100-250	6	35	11	25
<100	132	230	125	238

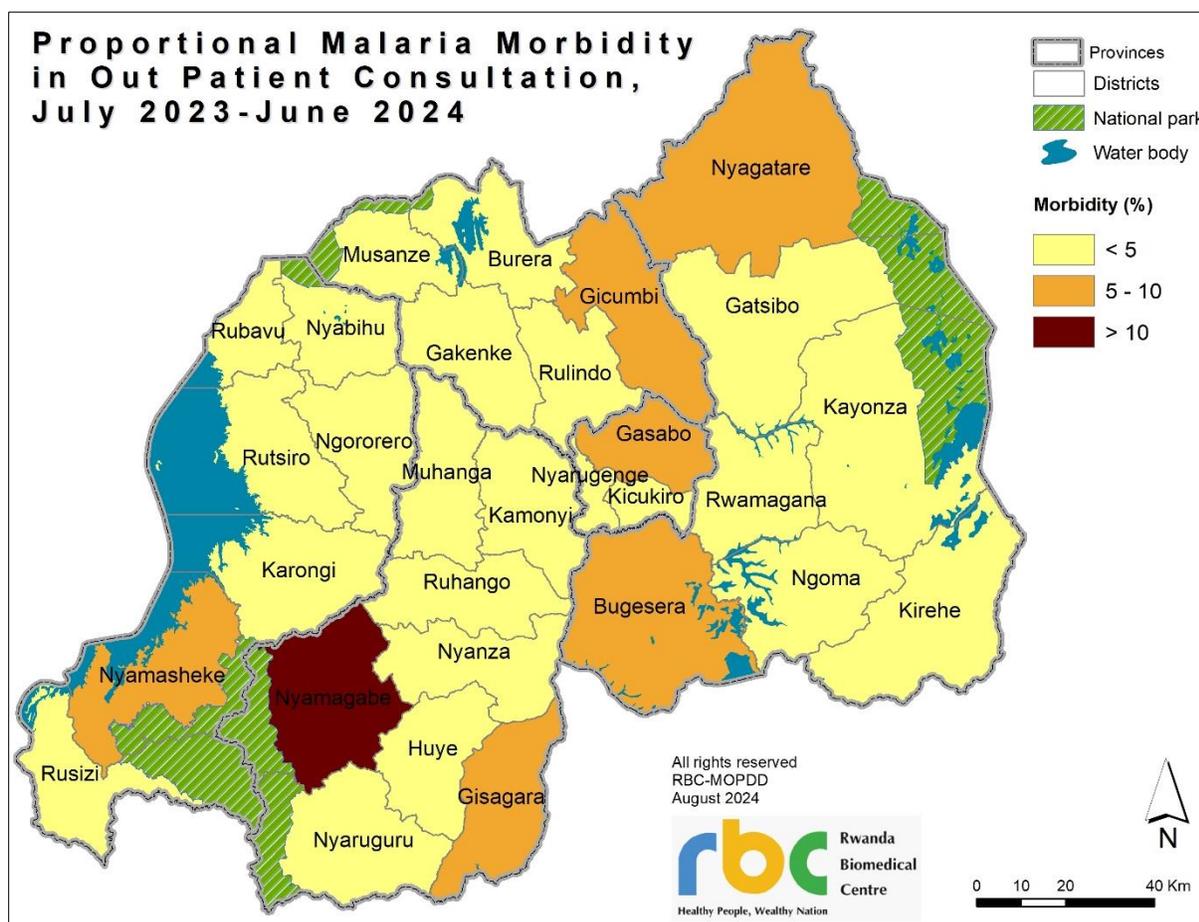
Figure 29: Malaria Incidence (per 1000) by Sector



3. Malaria Morbidity

In FY 2023-2024, a total of 613,415 malaria cases were reported at both health facilities and community levels compared to 621,465 cases in FY 2022-2023(1%). Malaria outpatient department (OPD) cases constituted 3% of all new OPD consultations. Of the reported malaria cases, 57% were treated at the community level, 15% at health posts, and 3% at private health facilities. The proportion of malaria morbidity differs among districts, ranging from less than 1% in Ngoma, Nyabihu, and Gatsibo districts to 8% in Gisagara and 11% in Nyamagabe districts. Figure 24 These patterns highlight the necessity of enhancing availability of diagnosis and treatment health commodities at the community level, health posts, and within both private and public health facilities.

Figure 30: Malaria Proportional Morbidity by District



4. Malaria Test Positivity Rate

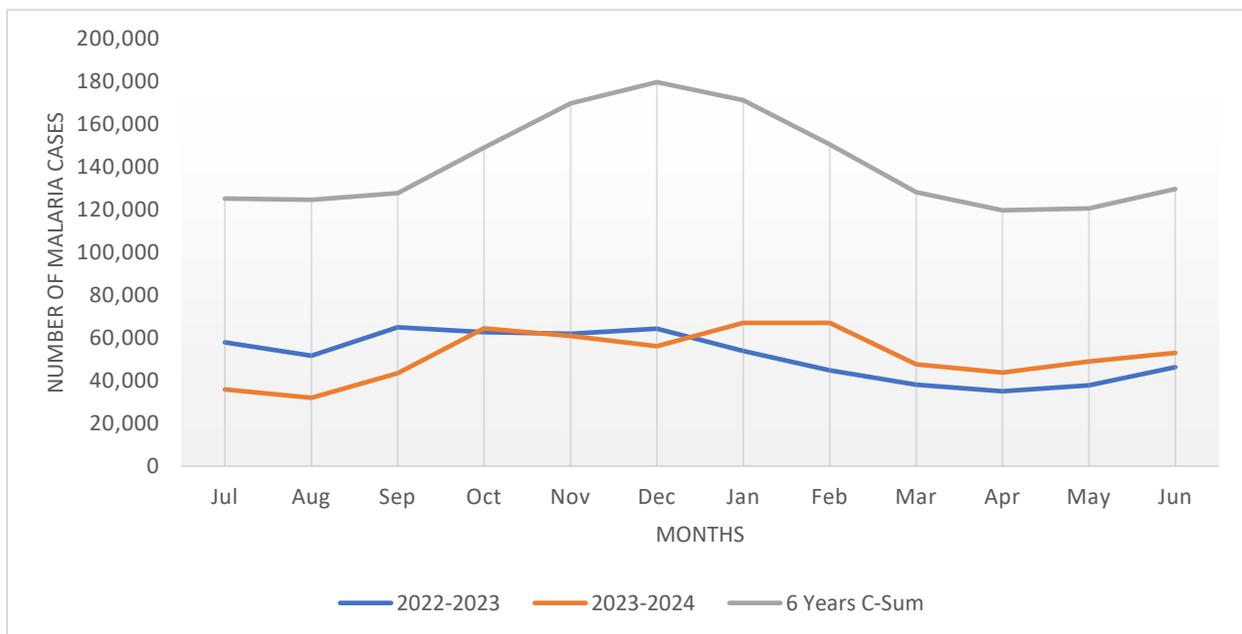
During the reporting period FY 2023-2024 a total of 4,453,208 lab tests were performed. This includes 2,744,478 blood smears and 1,708,730 RDTs. The number of RDTs done by community health workers was 917,977 representing 54% of all malaria RDT tests performed. The overall slide positivity rate was 14%, the same as for last fiscal year. The positivity rate was 6% for Blood Smears and 27% for RDT. At community level, the test positivity rate was 38%. The Annual blood examination rates (ABERs) was 32% compared to 35% during the last FY 2023-2024

5. Trends in Uncomplicated Malaria Cases

From July 2023 to June 2024 a total of 613,415 outpatients were reported compared to 621,465 during the FY 2022-2023, representing a decrease of 1%. Malaria cases treated at the community level represent 57% of all cases. The private health facilities account for 18,434 (3%) and health posts accounted for 92,265 (15%). Children under five years accounted for 88,896 malaria cases (14%) and pregnant women 2,895 (0.47%). The estimated malaria incidence among pregnant women attending antenatal care is 0.8%.

Figure 23 shows the monthly trends of malaria cases of FY 2023-2024 compared to FY 2022-2023 and the monthly average cases for the last 6 years using the C-sum method. The trends for the FY 2023-2024 are similar to FY 2022-2023.

Figure 31: Trends in Malaria Cases, FY 2022-2023, 2023-2024 and Previous 6 Years Cumulative Monthly Average



Note: The 6 years average was calculated using the C-Sum method.

Strategy 4. Strengthen Severe Malaria Notification and Malaria Death Audits

1. Severe Malaria Cases

Over the reporting period, 1,969 cases of severe malaria were reported by hospitals level compared to 1,316 reported in the FY 2022-2023, representing a 50% increase of severe malaria cases. The number of inpatients malaria cases also increased from 3307 cases in FY 2022-2023 to 4055 cases during the FY 2023-2024. The drug resistance, decrease in HBM and other factors may contribute to the increase of severe malaria cases. The cases of severe malaria referred to the Hospital by the health centers were 1119 in 2022-2023 while in 2023-2-24; the cases of severe malaria are 1,113 and are in the table below:

There is a variation of severe malaria cases by sectors within a district as per the map.

Table 21: Number of Severe Malaria Cases Referred to Hospitals per District

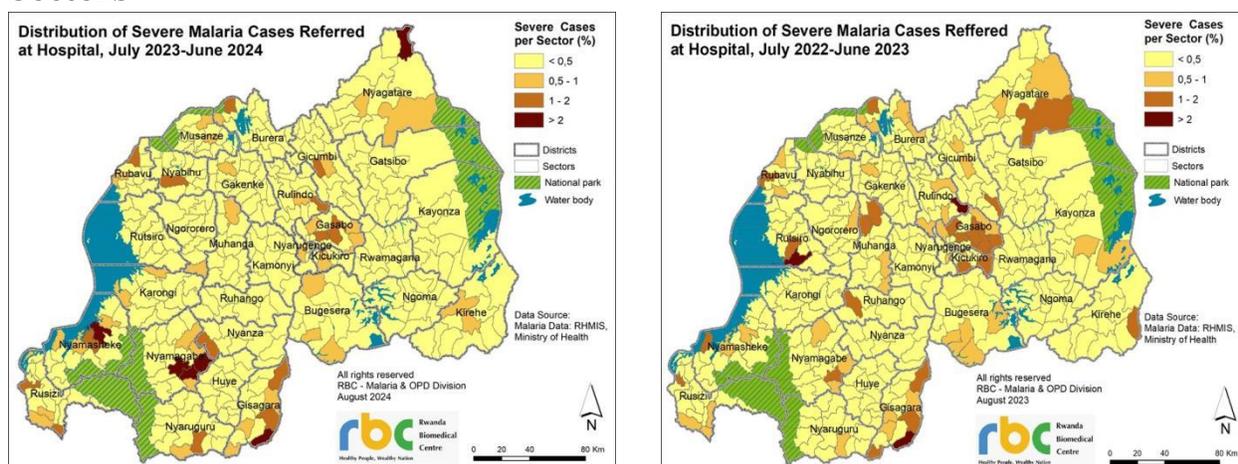
Districts	# Severe Cases	%	Districts	# Severe Cases	%
Bugesera	99	5%	Ngororero	64	3%
Burera	35	2%	Nyabihu	24	1%
Gakenke	35	2%	Nyagatare	99	5%
Gasabo	82	4%	Nyamagabe	146	7%
Gatsibo	28	1%	Nyamasheke	103	5%
Gicumbi	145	7%	Nyanza	39	2%
Gisagara	198	10%	Nyarugenge	45	2%
Huye	21	1%	Nyaruguru	41	2%
Kamonyi	8	0%	Rubavu	119	6%
Karongi	92	5%	Ruhango	15	1%
Kayonza	43	2%	Rulindo	62	3%
Kicukiro	105	5%	Rusizi	93	5%
Kirehe	81	4%	Rutsiro	16	1%
Muhanga	27	1%	Rwamagana	2	0%
Musanze	87	4%	Total Severe Cases	1,969	100%
Ngoma	15	1%			

The majority of severe cases are from Nyamagabe, Gisagara, Nyamasheke, Rusizi and Gicumbi Districts, Burera and Rutsiro districts.

Table 22: Sectors with 10 or More Severe Malaria Cases Referred to Hospitals

Districts	Sectors	Severe Cases	%	Districts	Sectors	Severe Cases	%
Nyamagabe	Kibirizi	59	5%	Rusizi	Mururu	14	1%
Nyagatare	Matimba	38	3%	Nyanza	Nyagisozi	13	1%
Nyamasheke	Macuba	32	3%	Nyaruguru	Cyahinda	13	1%
Gisagara	Mukindo	31	3%	Rulindo	Ntarabana	13	1%
Nyamagabe	Gasaka	27	2%	Burera	Cyanika	12	1%
Nyamagabe	Cyanika	26	2%	Rusizi	Bugarama	12	1%
Gasabo	Bumbogo	21	2%	Burera	Gahunga	11	1%
Gasabo	Kinyinya	20	2%	Gasabo	Rusororo	11	1%
Gisagara	Muganza	20	2%	Gisagara	Gishubi	11	1%
Gicumbi	Kageyo	17	2%	Kicukiro	Kanombe	11	1%
Gisagara	Mamba	15	1%	Musanze	Muhoza	11	1%
Kicukiro	Masaka	15	1%	Nyagatare	Karangazi	11	1%
Nyabihu	Rambura	15	1%	Bugesera	Kamabuye	10	1%
Nyamasheke	Kanjongo	14	1%	Nyamasheke	Kirimbi	10	1%
Rubavu	Busasamana	14	1%	Rusizi	Nkombo	10	1%
Sub Total		537					
% to Total Cases		47%					
Total Severe Referred to Hospital		1133					

Figure 32: Distribution of Severe Malaria Cases Referred to Hospitals per Sectors



2. Malaria Mortality and Deaths Audit

During the FY 2023-2024, 67 deaths due to malaria were recorded compared to 51 deaths in the FY 2022-2023 (23% increase).

Figure 33: Malaria Related Deaths per Aged Group from 2019-2024

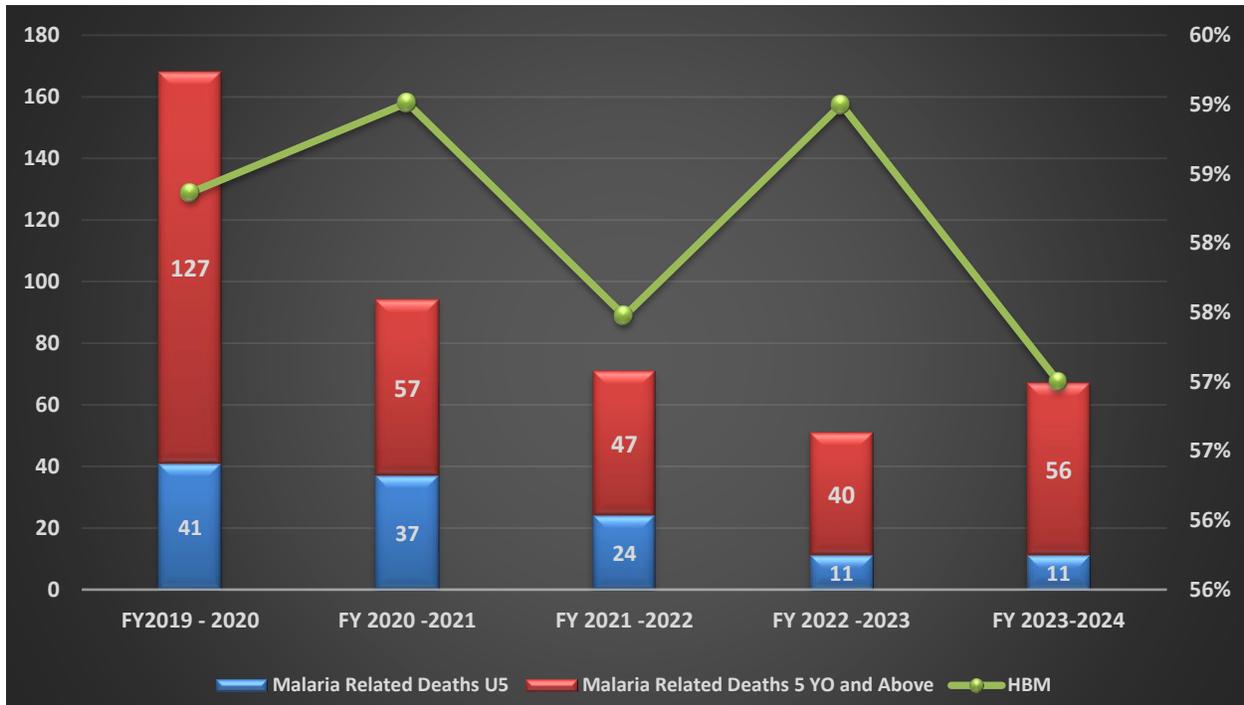
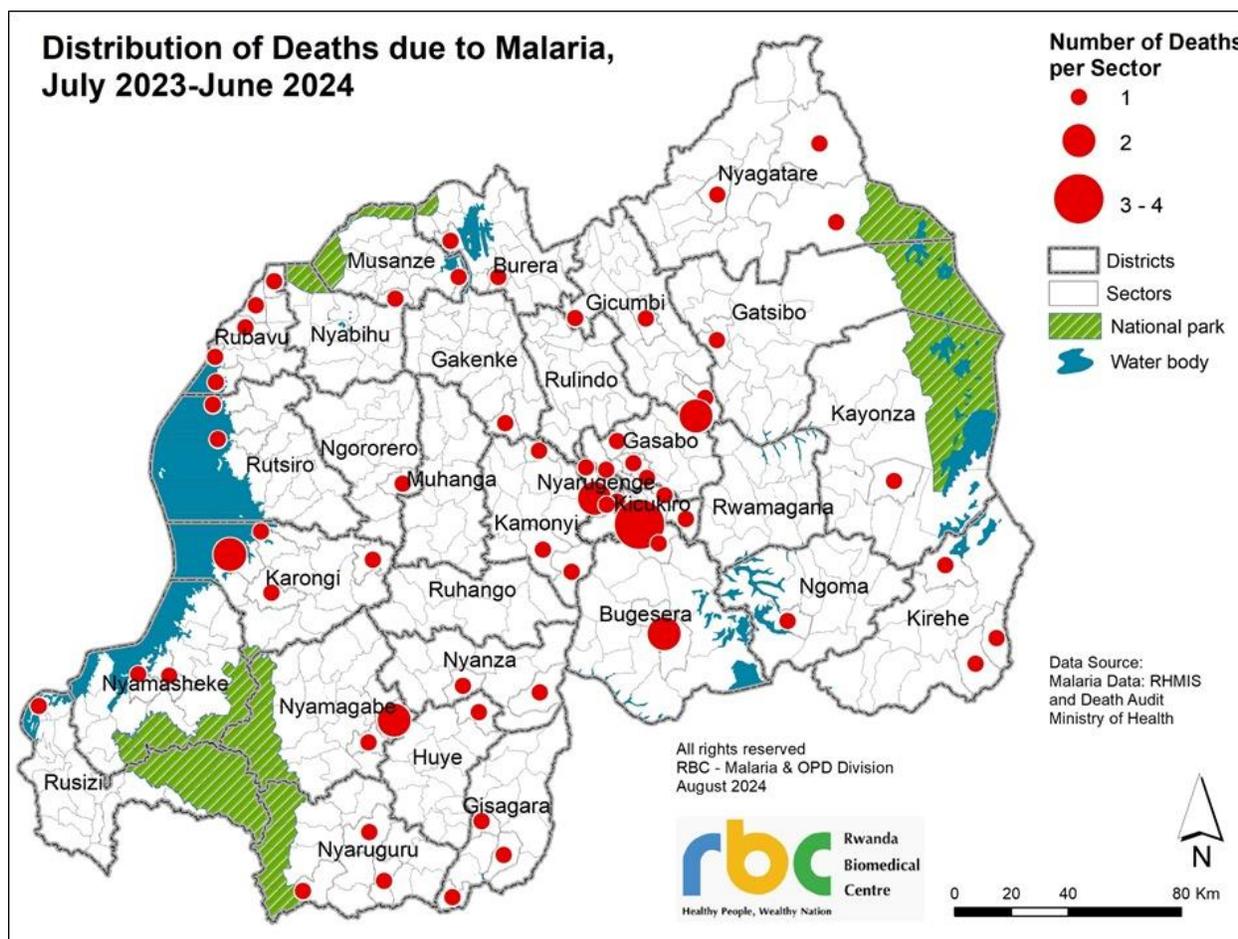


Figure 34: Distribution of Deaths Due to Malaria per Sector



a. Malaria Death Audit

During the FY 2023-2024, 55 malaria deaths were reported into HMIS and 66 malaria deaths reported into CRVS. The program conducted malaria deaths audits and 67 were confirmed as deaths due to malaria. Report from malaria deaths audit shows that 81% had severe malaria cerebral form and 9% severe malaria anemic form. The increase in malaria deaths may be linked to the increase in severe malaria and inpatients deaths. Other factors must be explored to deeper understanding the increase in severe malaria and malaria deaths.

Table 23: Malaria Deaths in Hospitals

Hospital Name	Malaria Deaths	Hospital Name	Malaria Deaths
CHUK	10	Rwinkwavu DH	2
Gisenyi DH	6	Kibogora DH	2
Nyamata DH	5	Mugonero DH	2
Kibuye DH	5	Butaro DH	1
Byumba DH	4	Kibagabaga DH	1
CHU Btare	4	Nyarugenge DH	1
Masaka DH	4	Ruli DH	1
Munini DH	3	Murunda DH	1
Ruhengeri DH	3	Nyanza DH	1
Kigeme DH	3	Kibilizi DH	1
Kirehe DH	3	Gihundwe DH	1
Nyagatare DH	2	Kibungo RH	1
Total	67		

Strategy 5. Improve Reporting from the Private Sector and Sustain Public Sector Reporting

1. Capacity Building

a. Integrated Supportive Supervision and Mentorship

Supportive supervision and mentorship of health providers at the facility level is a continuous activity aiming to strengthen the delivery of quality malaria services. The supportive supervision is led by hospital-based malaria supervisors in collaboration with RBC/MODD Supervisors and implementing partners guided by the national integrated supportive supervision tools. Malaria Program carried out the malaria integrated supportive supervisions (ISS), in collaboration with USAID/Tubeho Project in targeted health facilities.

This ISS serves to strengthen the capability of health care providers and ensures consistent monitoring of progress at district and health facility levels in various activities of prevention, case management and surveillance of Malaria/NTDs.

Its objective is to enhance the quality of services at operational levels and evaluate the degree of control and integration of intervention by healthcare providers as well as the reinforcement of dialogue between central and peripheral levels. During the ISS, it was the time to assess the availability of tools, policy and guidelines, malaria drugs and commodities, LLINS and SBC tools for both Malaria and NTDs.

District hospitals in collaboration with malaria implementing partners conducted quarterly supportive supervision at all health centers and communities at least once a year per facility. During this Fiscal year 2023-2024, the integrated supportive supervision was performed in 18 hospitals, 58 health centers and in 18 RMS branches.

b. Data Quality Assurance

To ensure the quality of Malaria indicators reported in HMIS by health facility and community, every sixth day of the month, MOPPD generate and analyze the data for the data quality verification. The analysis report is shared with to all concerned health facilities to correct the data before closing HMIS and SISCom systems. The second extraction and analysis of this data is carried out and shared with HFs between the 11th and 14th day of the same month to check if the corrections were made.

In addition, Malaria Program in collaboration with the Hospitals organized data quality review meetings to improve data quality and the malaria data use to improve service delivery and malaria surveillance. Participants of those meetings are mainly Director General of the Hospital or his/her delegate, M&E team at the Hospital, Head of health centers, the data managers, C-EHOs and nurse in charge of OPD services at health center level and triangulation of malaria indicators analysis were the focus of the meeting.

During this year, the reporting rate was 90% at hospitals, 99.5% at health centers, 57% at health posts and 42% at private health facilities.

The on-time reporting was 80 % at health centers, 72 % at hospitals.

The root causes of discrepancies were related to the counting errors, incompleteness of data source documents, misunderstanding of some malaria indicators, and irregularity in conducting data validation meetings.

c. Data Quality Assessment/Audit at Community Level

Data quality assessment is carried out with the objective of improving the quality of reported data used for decision-making. The program identifies data quality issues at the health facility and community level and proposes solutions together with the health facility. During this fiscal year 2023-2024, this activity was performed in one session in collaboration with the team of Global Fund Auditors. Thirteen Health Facilities including eight Health Centers, and five Hospitals have been selected and visited.

In each selected Health Center, the DQA has been conducted in all villages composing one Cell selected and all Community Health Workers have been audited comparing the data in their registers and the village reports then comparing all village reports and the cell reports in selected period.

The data quality assessment considered to verify whether the data reported in the SIS Com system on malaria cases treated, positive tests and distributed ACTs are those found in the source data documents (registers of community health workers).

Generally, there was no significant discrepancy between those assessed malaria indicators.

d. Orientation Meeting on Integrated Supportive Supervision

In line with a continued goal of eliminating malaria nationwide, MOPDD and its partners have developed and extended the National Strategic Plan spanning from 2020 to 2027. This plan underscores the importance of supportive supervision across all facets of malaria control, Assessment and targeting factors contributing to malaria hotspots and high- risk groups and ensure mitigation of malaria drugs resistance.

Integrated Supportive Supervision aims to guide, support and assist the program to ensure malaria guidelines for care and treatment, prevention and vector control and surveillance and M&E are implemented properly. It also helps to identify gaps and propose solutions. To ensure productive Supportive supervision, the MOPDD and its partners have set up integrated supportive supervision tools to be used. However, the staff involved in this activity are multidisciplinary with different backgrounds, therefore, the workshop aims to conduct an orientation on tools to be used, create a teamwork spirit,

clarify methodology, problems identification and root causes assessment, possible solutions and reporting to ensure the same understanding of the activities and expectations. Clarification on the supervision of neglected tropical diseases have been given also to supervisors for integration.

While a total of 29 out of 30 districts have reached the incidence ≤ 100 per 1000 in FY2022-23 including those initially in high burden zones (IRS Districts), a special attention is required to investigate what is leading to persistent malaria transmission in some hotspots in both IRS and non-IRS districts to accelerate malaria reduction/elimination in Rwanda.

Additionally, while artemether-lumefantrine remains efficacious in Rwanda, evidence of emerging artemisinin partial resistance was confirmed and vigilance for decreasing efficacy and additional antimalarials in Rwanda were considered in the updated National Malaria treatment guidelines 2024.

It is in this regard that RBC / MOPDD in collaboration with all Malaria implementing partner organized an orientation workshop with the main objectives of discussing strategies to improve integrated supportive supervision, factors related to malaria hotspot and implementation of multiple first line malaria treatment.

The workshop held was attended by 43 participants from RBC/MPDD and its malaria Partners including USAID Tubeho project, PFTH, RICH, Caritas Rwanda and SFH Rwanda. The workshop was opened by Malaria and Other Parasitic Diseases (MPDD) Division Manager. With guidance on key Malaria program focus on Malaria incidence, High Risks Groups, Severe Malaria and Malaria Death, He emphasized on the clear implementation of Integrated Supportive Supervision (ISS) with different partners and RBC. The Integrated Supportive Supervision Tool to be used at all levels (From Central level to community) have been developed.

e. Malaria Case Investigation in Hotspot Sectors

In May 2024, a significant increase in malaria cases was observed a significant increase of Malaria cases in Rusizi, Nyamasheke, Nyagatare, Kayonza and Kirehe Districts.

This increase has been observed when analyzing IDSR malaria data reported on weekly basis at sector level during the Week 20 starting 13 May and Week 26 ending 30th June 2024 as summarized in the following table.

Table 24: Malaria Cases Increase as per IDSR Data

District	Sector	2022	2023	2024
Rusizi	Nkombo	29	11	232
Nyamasheke	Kagano	147	90	855
	Mahembe	150	247	1038
	Macuba	66	58	814
Nyagatare	Karangazi	315	261	744
	Kagitumba	155	78	838
Kayonza	Mwiri	31	65	674
	Murundi	31	42	109
Kirehe	Nyamugari	138	248	500
	Mpanga	39	173	393
	Gahara	59	38	77

The Malaria program organized a field visit in these targeted districts with objectives of recounting those malaria cases into lab registers; identifying sectors, cells, and villages where with a big number of malaria cases; checking the availability of malaria drugs and commodities at RMS branches, health facilities and at community levels as well as identifying risk factors (environment, use of ITNs....).

Generally, those malaria cases have been confirmed in the majority of visited Health Facilities except in Nkombo HC (43%) and Kibingo (30%) HC located in Rusizi and Nyamasheke Districts respectively.

Identified factors were related to geographic location where the visited HCs in Rusizi and Nyamasheke are HC bordering the Lake Kivu.

In these areas, the majority of men are Fishermen and conduct their night activities in the lake without means of Malaria prevention. In Districts of Eastern Province, the more affected villages are those with a numerous number of dams and other are those neighboring Tanzania.

Other factors There was a problem of Stock out of Malaria drugs and commodities at community level and the allocated quantity at Health Center is very insufficient and this impacted on HMB which is very low in the visited sites. Insufficient mosquito control measures, such as mosquito repellent, use of ITNs... has also observed in the visited selected Districts.

Related recommendations such us correction of the non-existing HP in the HMIS, improving the supply chain to avoid stock out of malaria drugs and commodities as well as increase sensitization for Social Behavior Change.

Strategy 6. Develop and Implement an Operational Research Agenda for Malaria

In line with improving the quality of malaria-related services, the malaria program regularly conducts research. In this reporting period, the following research projects have been conducted:

1. Malaria Indicator Survey 2023

Rwanda Malaria Indicator Survey (RMIS) is conducted every two to three years after the Demographic Health Surveys (DHS) by Rwanda Biomedical Center (RBC)/Malaria and Other Parasitic Diseases Division (MOPDD) through funding from the U.S President's Malaria Initiative (PMI) with support from ICF and NISR conducted the 3rd MIS during malaria peak seasons (October-December2023) after the recent one that occurred in 2017.

A total of approximately 170 clusters with probability proportional to size has be selected from the sampling frame. Thirty households (30) will be selected from each EA, for a total sample size of approximately 5,100 households. All women aged 15-49 who are either permanent residents of the selected households or visitors who stayed in the household the night before the survey will be eligible for interview. All household members age 6 months and older will be tested for malaria parasite.

- Possession of at least one ITN: 80%

- Households with 1+ ITN for every two persons who stayed in the household last night:55%
- Percentage of the household population with access to an insecticide-treated net (ITN): 71%
- Percentage of the household population with access to an insecticide-treated net (ITN) and percentage that slept under an ITN the night before the survey: (79%)
- Percentage under5 children slept under an ITN (70%)
- Percentage pregnant women slept under an ITN (70%)
- Malaria prevalence (microscopic) among children (5-59 months): 0.6%
- Malaria prevalence (microscopic) among children 5-14 years :0.7%
- Malaria prevalence (microscopic) among pregnant women:0.7%

2. Abstracts Presented or Submitted for Dissemination

In FY 2023/24, MOPDD participated in four important international conferences with 10 abstracts (Table 11) presented or submitted. The conferences are as follows, with the number of abstracts in brackets:

- PAMCA 2023. September 17th-21st. 2023. Addis Ababa. Ethiopia (2 abstracts)
- American Society for Tropical Medicine and Hygiene (ASTMH) annual conference. 18-22 October 2023. Chicago-USA (4 abstracts)
- Multilateral Initiative on Malaria (MIM) Society 21-27 April 2024. Kigali-Rwanda (16 abstracts).
- American Society for Tropical Medicine and Hygiene (ASTMH) 13-17 November 2024. New Orleans. USA (5 abstracts)

Table 25: List of Abstracts for Dissemination of Vector Control Activities in Rwanda

#	Title of abstracts
A. PAMCA 2023. September 17th-21st. 2023. Addis Ababa. Ethiopia	
1	Using Larval Source Management to complement Core Vector Control Interventions in Malaria Control. Experience of Rwanda
2	Using Larval Source Management to complement Core Vector Control Interventions in Malaria Control. Experience of Rwanda.
B. ASTMH annual conference. 18-22 October 2023. Chicago-USA	

#	Title of abstracts
1	Entomological Impact of PBO and Interceptor G2 nets compared to Indoor Residual Spraying using Actellic 300CS insecticide on <i>Anopheles gambiae</i> s.l in Rwanda
2	Impact of new generation insecticide treated nets and indoor residual spraying on entomological indicators of malaria transmission in Rwanda
3	Insecticide chemical content and bioefficacy of insecticide-treated nets containing Chlorfenapyr or piperonyl butoxide over 24 Months of field use in Burkina Faso. Rwanda. Sierra Leone. and Burundi
4	Malaria cases in four least low endemic districts in Rwanda
C. MIM Conference 21-27 April 2024. Kigali-Rwanda	
1	Local community empowerment towards IVM implementation in Rwanda: learning by doing approach for mosquito larval source management. MIM Conference 21-27 April 2024. Kigali-Rwanda.
2	Durability of four brands of Insecticidal Treated Nets after 2020 Mass Distribution campaign in Rwanda: 36 months findings on attrition and survivorship of Nets.
3	Drone-assisted larval source management for malaria control in Rwanda.
4	Entomological and epidemiological impact of new generation insecticides (Actellic® 300CS and Fludora® Fusion WP-SB 56.25) used for Indoor Residual Spraying in Rwanda. 2018-2020.
5	Adaptation and application of MosquitoDB to support malaria vector entomological surveillance in Rwanda.
6	Climatological factors associated with malaria incidence in lowland zone of Rwanda: a time-series study. 2012- 2019.
7	Enhancing malaria vector abatement: the advantages of drone-based larviciding with <i>Bacillus thuringiensis israelensis</i> (Bti) spraying.
8	<i>Bacillus thuringiensis</i> subsp. <i>israelensis</i> (Bti): a promising solution for malaria control in peri-urban anopheles breeding sites: a case study of Rugende and Kabuye rice marshlands in Gasabo District. Kigali. Rwanda.
9	Spatial distribution of pyrethroid insecticide resistance in <i>Anopheles gambiae</i> s.l population. Rwanda.
10	The role of malaria vectors in 2022 Rift Valley Fever (RVF) outbreak in Rwanda: evidence for the need of multi-sectoral management approach for both diseases.
11	Role of CSOs in enhancing SBC implementation and fostering the uptake of malaria interventions in Rwanda.
12	Mapping malaria hotspots among high-risk groups in Rwanda: An opportunity for targeted interventions.
13	Evaluating the Malaria Scorecard in Enhancing Community-Driven Home-Based Malaria Management in Rwanda.

#	Title of abstracts
14	Mapping analysis of cross borders malaria high risk groups: A case study of Truck drivers and cross-borders population in Rwanda.
15	Rwanda profile on Malaria Control: trend analysis of surveillance data, success and challenges.
16	Why investing in Indoor Residual Spraying (IRS) for malaria control would provide high economic returns in Rwanda, case of Kayonza District.
D. American Society for Tropical Medicine and Hygiene (ASTMH) 13-17 November 2024. New Orleans. USA	
1	Residual efficacy of wall contact bioassays and fumigants effects induced by Actellic® 300CS and Fludora® Fusion WP-SB 56.25 insecticides used for Indoor Residual Spraying against susceptible <i>Anopheles gambiae</i> s.s.. Rwanda.
2	Impacts of focal malaria control using targeted indoor residual spraying (irs). 4 years results from Rusizi district. Western Province of Rwanda
3	Dynamics of resistance intensity and mechanisms of <i>Anopheles gambiae</i> (s.l.) to pyrethroid insecticides between 2021 to 2023 in Rwanda
4	Interceptor G2 nets and standard nets combined with IRS each provides superior protection against malaria compared to standard ITNs treated with only pyrethroid insecticide in Rwanda: Results from new nets project pilot study. 2020-2022
5	The economic benefits of Indoor Residual Spraying in Rwamagana District, Eastern Province, Rwanda.

PART IV: PROGRAM COORDINATION AND MANAGEMENT

Objective 4: By 2024, Strengthen Coordination, Collaboration, PSM and Effective Program Management

To sustain gains made by the Malaria Control Program and its Partners, there is a need for strong coordination and collaboration between different Stakeholders. Advocacy and resources mobilization efforts are very key to cover all program needs and priorities. From July 2023 to June 2024, the following activities under specific strategies have been implemented in line with strengthening coordination, collaboration, procurement, and supply management, as well as effective program management.

Strategy 1: Mobilization of Adequate Financial Resources

- Development of Malaria Operational Plan 2025 (MOP 2025) funded by PMI

In collaboration with the Presidential Malaria Initiative (PMI) and CDC, the Rwanda Malaria Control Program developed and submitted the Malaria Operational Plan 2025 (MOP 2025) amounting to **\$19 million** to cover key malaria control interventions as per the Extended National Strategic Plan 2020-2027.

- Participation in National Planning for Action Plan for FY 2024-2025

In FY 2023-2024, a malaria control program participated in the Action Plan (AP) development process coordinated by the Ministry of Finance (MINECOFIN) and the Ministry of Health (MOH). During the planning sessions for AP FY 2024-2025 a total of **4,187,949,814** RWF as direct support to malaria and NTDs programs to cover direct program needs including IRS, integrated vector control, malaria and NTDs case management and surveillance, etc.

- Resource Mobilization from the Global Fund for the Grant Cycle 7

During this reporting period, the Rwanda Malaria Control Programme in collaboration with its partners joined the Ministry of Health to write the Global Fund Concept note to be submitted to the Global Fund. For this coming Global Fund Grant Cycle 7 (GC7), a total of **\$50,034,762** was mobilized to cover the program needs such as IRS, LLINs, Malaria Case Management, Social Behavior Change Strategies, malaria surveillance, program management, etc. From July 2024 to June 2027.

Additional resources mobilized during FY2022/23 include \$286,000 direct support from the END Fund to RBC, \$98,641.16 from the END Fund to Heart and Sole Africa (HASA), \$260,185.56 from the END Fund to RNGOF on HIV/AIDS and Health Promotion. The END Fund also provided a total of in-kind drug donations (Approximately 8 million Praziquantel tablets donated by Merck KGaA) equivalent to \$520,000.

The World Food Programme (WFP) made direct funding of \$22,396 to RBC for the payment of salaries of the WASH-NTD Coordination Officer and supervision activities to schools under WFP's Home-Grown School Feeding (HGSF) program in Rwanda.

The in-kind donation (29,566,000 Albendazole tablets) is equivalent to US \$591,320 by GSK GLAXOSMITHKLINE (GSK) a pharmaceutical company through the World Health Organization (WHO). In addition, the WHO funded the supervision activities in surveillance sites for rhodesiense Human African Trypanosomiasis (r-HAT) around the Akagera National Park.

- Development of the Extended National Malaria Strategic Plan 2020-2027

Following the Malaria Program Review conducted in 2023, the National Malaria Control Program with support from all partners in malaria response, Rwanda revised the National Malaria Strategic Plan 2020-2024 to set new national goals and targets. With the end of FY2023-2024, the Extended National Malaria Strategic Plan 2020-2027 was developed and endorsed to guide all national efforts in malaria control from July 2024.

- Development of the Integrated National Guidelines

Following the recent WHO guidelines updates and considering the emerging artemisinin partial resistance documented in Rwanda, the National Malaria Control Program through its Technical Working Group revised the National Malaria Guidelines. With the end of FY2023-2024, the Integrated Malaria Guidelines, version 2024 was developed and validated. Key changes include the new treatment options to address or mitigate the anti-malaria drug resistance in Rwanda (Multiple First Line Therapies-MFT), the introduction of the Dual Active Ingredients ITNs, etc. Its actual implementation is expected in FY2024-2025.

- Organize the MIM24 African Conference

The Multilateral Initiative on Malaria (MIM) Society, in collaboration with the Ministry of Health (MoH), the Rwanda Biomedical Center (RBC) and different stakeholders hosted the MIM Society 8th Pan-African Malaria Conference (PAMC) from April 21-27, 2024, at Kigali Convention Center.

The conference brought together around 2,500 leading researchers, policymakers, and innovators to deliberate on the status of malaria in Africa, share research findings, and discuss the challenges and efforts of controlling malaria in the continent. The conference provided a platform to share perspectives that strengthen efforts towards locally driven research and development (R&D) and grassroots mobilization to end malaria through innovations, collaborations, and synergy among stakeholders. The team from RBC and partners presented different abstracts as posters, symposiums, and oral presentations.

Strategy 2: Strengthen the Intra- and Inter- sector Collaboration and Coordination for Malaria Control at All Levels

From July 2023 to June 2024, four (4) Malaria Technical Working Group Meetings were organized to discuss key malaria control program issues including the Review of the National Malaria Guidelines, the Multiple First-line Therapies (MFT) Strategy, the Integrated Malaria Surveillance and Response, etc.

Strategy 3: Synchronization and Alignment of Malaria Commodities Procurement and Supply Management

The program procurement plan FY2023/24 was developed to guide all program commodities procurement. Anti-malaria drugs, diagnostic tests, LLINs, Insecticides for IRS, IRS materials, etc. were procured based on the program needs.

The process was guided by comprehensive malaria commodities need assessments and timely implementation procurement plans to avoid stock outs, expiries, or delays in implementation of key malaria interventions such as IRS or LLINs mass distributions. Regular data and supply chain review meetings were organized to inform adjustments in quantities to be procured.

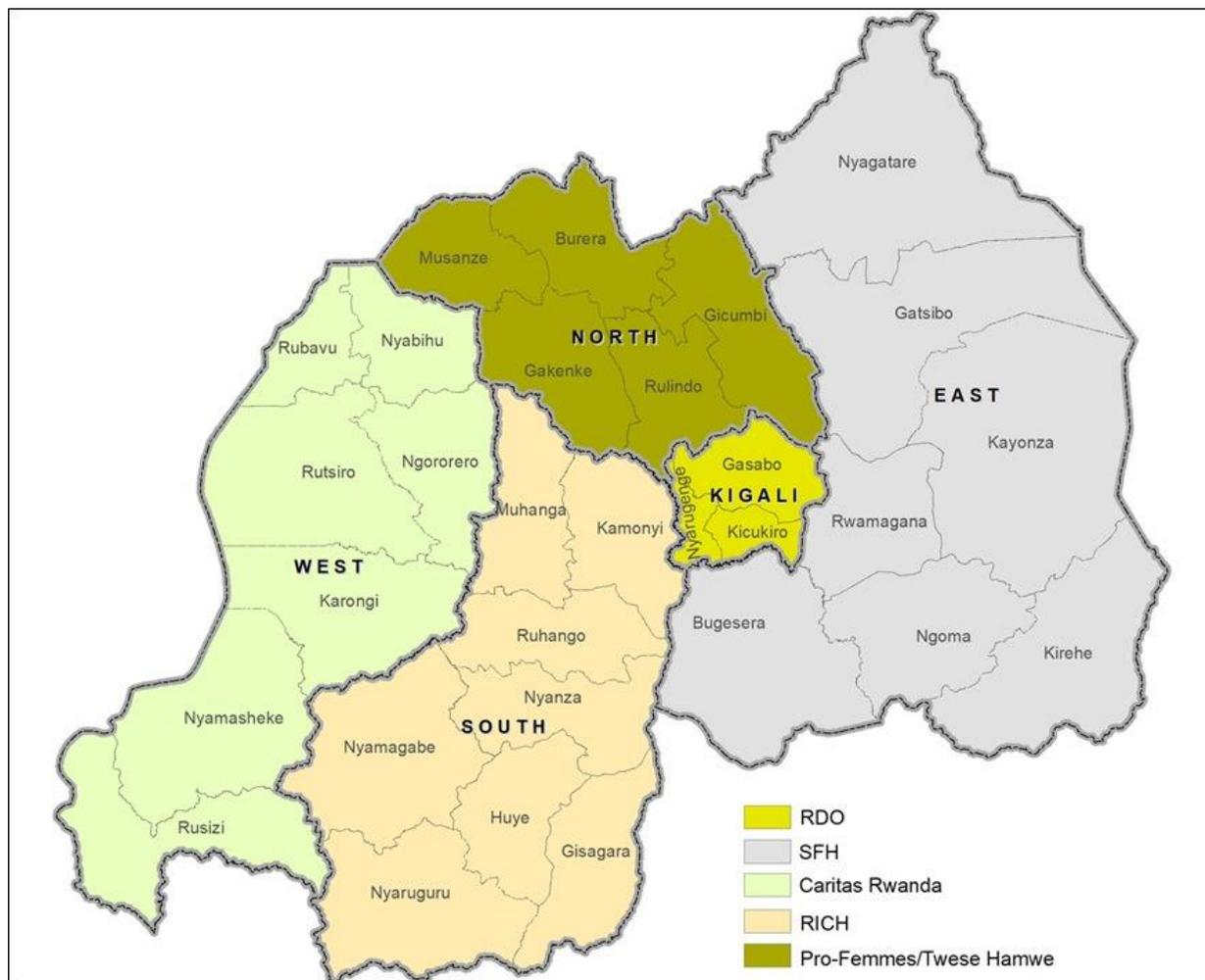
PART V: SOCIAL BEHAVIOR CHANGE COMMUNICATION

Objective 5: By 2024 85% of the Population Will Have Correct and Consistent Practices and Behaviors towards Malaria Control Interventions

1. Introduction

The Government of Rwanda continues to make progress in Malaria control through multifaceted evidence-based approaches as clearly defined in the Rwanda National Extended Strategic Plan (MSP) 2020 -2027. Social and Behavior Change (SBC) activities were implemented referring to the National SBC Strategy for Malaria Prevention and Control 2022-2024. SBC Strategy aims at identifying and addressing gaps in terms of strategies, interventions and messages, channels and community engagement interventions and aligning them with the findings from the Matchbox Toolkit assessment of the gaps in the human rights and gender of Malaria vulnerability in Rwanda for the national response. Furthermore, in this reporting period, the Social and Behavior Change (SBC) activities on malaria prevention and control were guided by the Health Promotion Policy, mainly building on the principles of community mobilization and participation, health education, access to health services, advocacy, and partnerships, to ensure acceptability, usage and thus sustainability of key interventions including LLINs, IRS and early case management and integrated malaria vector control at all levels. The implementation has been done through different partners and Seven Civil Society Organizations (CSOs) deployed countrywide: five CSOs implementing malaria SBC activities per province targeting the general population and two CSOs (RNGOF and ASSOFERWA) implementing SBC activities targeting all Malaria identified at high risk groups countrywide:

Figure 35: Deployment of Five CSOs Implementing Malaria SBC Activities per Province in the General Population



2. Strengthen the Malaria SBC Framework (Improved)

During the year 2023-2024, MOPDD in collaboration with malaria implementing partners and stakeholders conducted malaria district specific coordination meetings. aimed at increasing advocacy to high level support to sustain malaria prevention and control interventions adopted by the Government of Rwanda with a total of 3944 participants reached, to call for support and appropriation and ultimately engage community members to address the gaps identified.

3. Increase Awareness on the Communities' Role in Malaria Prevention and Control

During the fiscal year 2023-2024, strategic interventions for changing social behaviors related to malaria were implemented from the provincial level down to the community level to encourage communities to take ownership of malaria prevention and control efforts and maintained the “*Zero Malaria Starts With Me/Kurandura Malariya Bihera Kuri Njye*” Slogan. Different SBC activities were boosted especially during post world malaria day celebrations. In the same context, different interpersonal communication (IPC) through existing community platforms (Umuganda, Inteko z'Abaturage, Umugoroba w'Umuryango, ...) were conducted where gaps, challenges were discussed by all concerned parties, plotting channels and solutions for both the short and long term. Using the scorecard as a comprehensive tool to measure Malaria, key performance indicators: the coverage of LLINS in ANC and EPI programs as well as malaria incidence, severe malaria cases, HBM and the proportion of suspected Malaria cases that receive parasitological test at community level, the Community mobilization such as outreach campaigns and supervisions were conducted and reached the 145094 people. At health facility level, the SBC targeted supervisions were helpful to address the problems identified by scorecards.

To increase community awareness and ownership of malaria prevention and control interventions, the following SBC activities were implemented: Radio and TV talk shows 54, educative audio and video spots 27, radio sketches 7. There was also production and dissemination of IEC materials including Banners with messages 91, Tear drops: 121, T-shirts 10,750, stickers with message: 8,000, Flyers: 14,000.

4. Increase Advocacy for High Level Support to Sustain Malaria Prevention and Control Interventions

This year has been remarkable in advocating for malaria prevention and control. Stakeholders at all levels are committed to achieve the government's goal as far as malaria prevention and control is concerned, by including malaria prevention and control measures in their routine agenda.

The RBC-MOPDD, in partnership with Civil Society Organizations (CSOs) successfully hosted and organized the MIM Society 8th Pan-African Malaria Conference (PAMC) that took place in Rwanda from April 21-27, 2024, and coincided with World Malaria Day. This unique coincidence provided an opportunity for stakeholders across the globe to come together to discuss the global status of malaria and strategize better ways to combat its prevalence in the continent. The conference theme was Grassroots Mobilization to end Malaria: Invest, Innovate & Integrate, highlighting the significance of grassroots efforts, innovation, and research in developing new tools and technologies for malaria control. This conference provided a platform for researchers, policymakers, and stakeholders to share experiences and insights on addressing Malaria as a critical public health concern. The conference plays a significant role in promoting scientific advances to reduce the global burden of malaria, emphasizing the importance of continued investment in malaria prevention and control, while also paying tribute to the efforts of researchers and healthcare professionals in the fight against malaria.



Photo: Celebration of the MIM-WMD 2024, Kigali Convention Center

5. Promote Community Engagement in Malaria Prevention and Control Interventions (Improved)

Throughout this fiscal year, in collaboration with RBC/MOPDD, partners and CSOs implemented several SBC community engagement activities, making a significant contribution to malaria prevention and control, paving a way to positive health outcomes including earlier diagnosis and treatment at the community level, reaching the general population and high-risk groups (easy to reach and hard to reach groups). During this reporting period, different malaria schools-based awareness activities were implemented to increase knowledge of malaria prevention. This included the widely dissemination of key message about Malaria on its prevention and control measures via diverse communication channels including analogue and digital platforms. Messages disseminated hinged on creating awareness on the role of community in malaria prevention and control, including sleeping under Long Lasting Insecticides Nets (LLINs), use of mosquito repellents, households' environmental hygiene to eliminate peri-domestic mosquito breeding sites and seeking early treatment.

Furthermore, through the coordination and collaboration of RBC/MOPDD and CSOs, implementing partners successfully implemented different community based integrated vector management in the general population and malaria high-risk/vulnerable, implemented community awareness activities regarding Larval source management, using drones and environmental management targeting peri-domestic breeding sites through monthly community works "Umuganda". Conducted training workshops on Integrated Vector Management (IVM) for key stakeholders at sector level and peer educators among high-risk groups. The training workshops reached a total number of 1354 participants. Having this said, we faced several challenges such as supply shortage of adapted outside malaria preventive tools particularly mosquito repellent and LLINs.

Table 26: Key SBCC Malaria Activities Implemented in 2023-2024

No	Activities	Target	Reached	%
1	Conduct annual review meetings at district and provincial level	3644	3944	108%
2	Conduct Training on IVM in General population and high-risk groups	1519	1534	101%
3	Conduct community mobilization on Malaria prevention and control in hot spots using mobile sound system	145	145	100%
4	Organize Radio and TV talk shows	52	54	104%
5	Production and Airing radio spots on (LLIN utilization, Malaria Early treatment, environmental management and HBM)	19	19	100%
6	Production of IEC materials: # of Banners	90	91	101%
7	Production of IEC materials# of tear drops	91	121	133%
8	Production of IEC materials# of T-shirts	10750	10750	100%
9	Production of IEC materials# of stickers	8000	8000	100%
10	Production of IEC materials# of booklets	5000	5000	100%
11	Production of IEC materials# of flyers	14000	14000	100%
12	Carry out quarterly Supportive supervision in collaboration with PSF to Hotels/Lodges on Malaria prevention and control.	100	114	114%
13	Organize and conduct Outreach Awareness raising campaigns in malaria high burden sectors on LLINs Hanging and use, on early care seeking	132511	145094	109%
14	Edutainment activities, competitions (poems, debates, sports competitions) to involve youths on Malaria prevention and control	49200	49360	100%
15	Conduct Supportive supervision at Health centers/posts level targeting malaria high incidence	280	269	96%
16	Conduct need assessment, mapping of hotspot and situation analysis among high-risk groups	2	2	100%
17	Production of educative videos on Malaria prevention and control	22	27	123%
18	Produce and disseminate educative radio sketch on Malaria prevention and control	7	7	100%
19	Organize annual SBC advocacy meeting	257	257	100%

No	Activities	Target	Reached	%
20	Produce and airing educative Malaria TV Series with key message for Malaria prevention and control among hard to reach groups	10	10	100%
21	Organize and conduct special Umuganda led and in collaboration with hard to reach groups and local leaders	2600	2600	100%
22	Facilitate the initiation of repellents selling points and provide repellents package to 30 focal persons selected from hard to reach groups	30	30	100%
23	Distribution of repellents to 30 selected focal persons among hard to reach group members	3000	3300	110%
24	Organize follow up meeting and mentorship of peer educators already trained per district representing hard to reach groups under Malaria Prevention and control interventions	440	440	100%
25	Conduct Malaria targeted IPC sessions and supervisions in identified hotspots through existing community platforms	38580	38889	101%
26	Conduct decision making meeting at Community	780	772	99%
27	Distribution of bottle of mosquito repellents	6000	5197	87%
28	Disseminating Malaria Prevention and Control messages through Bulk SMS	40000	40000	100%

PART VI: NEGLECTED TROPICAL DISEASES & OTHER PARASITIC DISEASES

1. Introduction

In Rwanda, Neglected Tropical Diseases (“NTDs”), include intestinal worms–Ascariasis, Trichuriasis and Hookworm, Schistosomiasis (SCH), Scabies and other ectoparasites (Tungiasis or Jigger disease), Podoconiosis, Leprosy, Rabies, Snakebite envenoming (SBE), Trachoma, Taeniasis/Cysticercosis, Mycetoma, Lymphatic filariasis, Onchocerciasis and Human African Trypanosomiasis (HAT). Other parasitic diseases (OPDs) include amebiasis and giardiasis.

According to 2020, remapping of Soil Transmitted Helminthiasis (STH) commonly known as intestinal worms and schistosomiasis, STH is the most common NTDs with the overall national prevalence of 41%. The same remapping shows that adults (16 years and above) are the most affected age group with 48%, followed by School Aged Children -SAC (5-15years old) with 41% and Pre-SAC with 31%.

Persisting high prevalence was observed in 10 out of 23 districts that had high prevalence (>50%) in 2008 initial nationwide mapping. The persistence of high prevalent infections is observed in districts with high infections with *Trichuris trichiura*, a species that poorly responds to a single dose of benzimidazoles using in mass deworming.

For Schistosomiasis, 1013 out of 2148 cells (47%) were found eligible for mass deworming. With the draft elimination plan under finalization, specific cells will be assigned to the strategy of deworming twice a year, once a year or every 2 years.

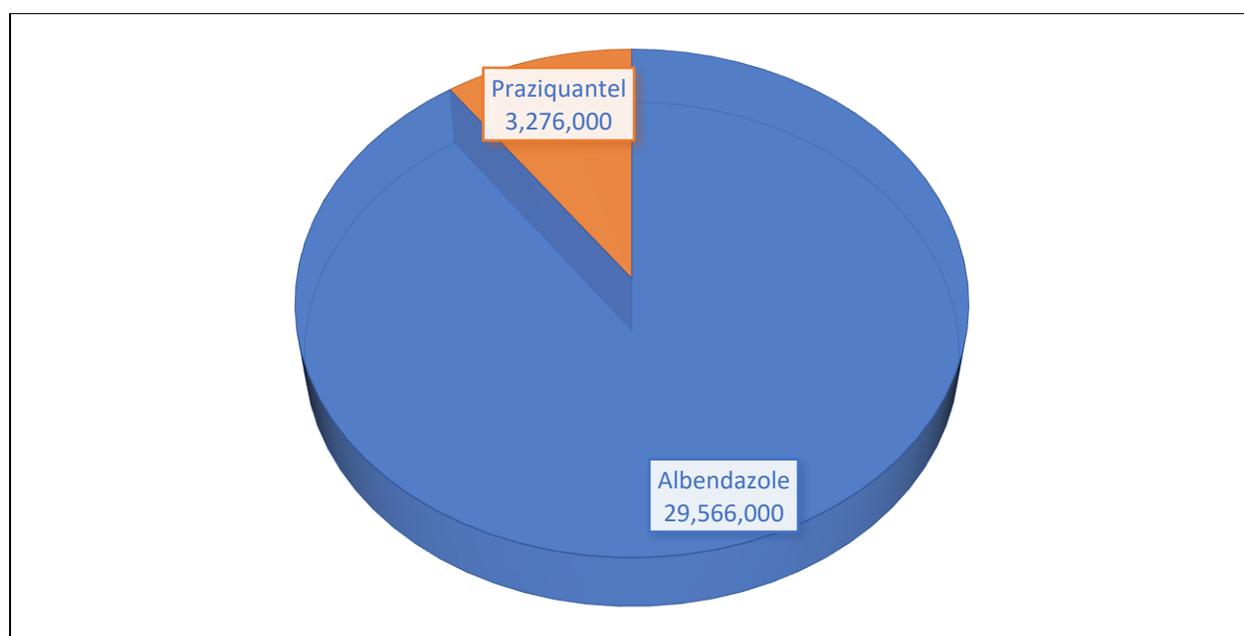
The activities implemented during the FY 2023-2024 are grouped in thematic areas, including NTDs prevention, case management, surveillance and research, WASH and NTDs coordination and awareness. The thematic areas align with the objectives and strategies illustrated in the National NTDs Strategic Plan 2019-2024.

2. Prevention of NTDs and Other Parasitic Diseases

2.1 Mass drug administration

a. Supply Chain of Drugs for Mass Drug Administration

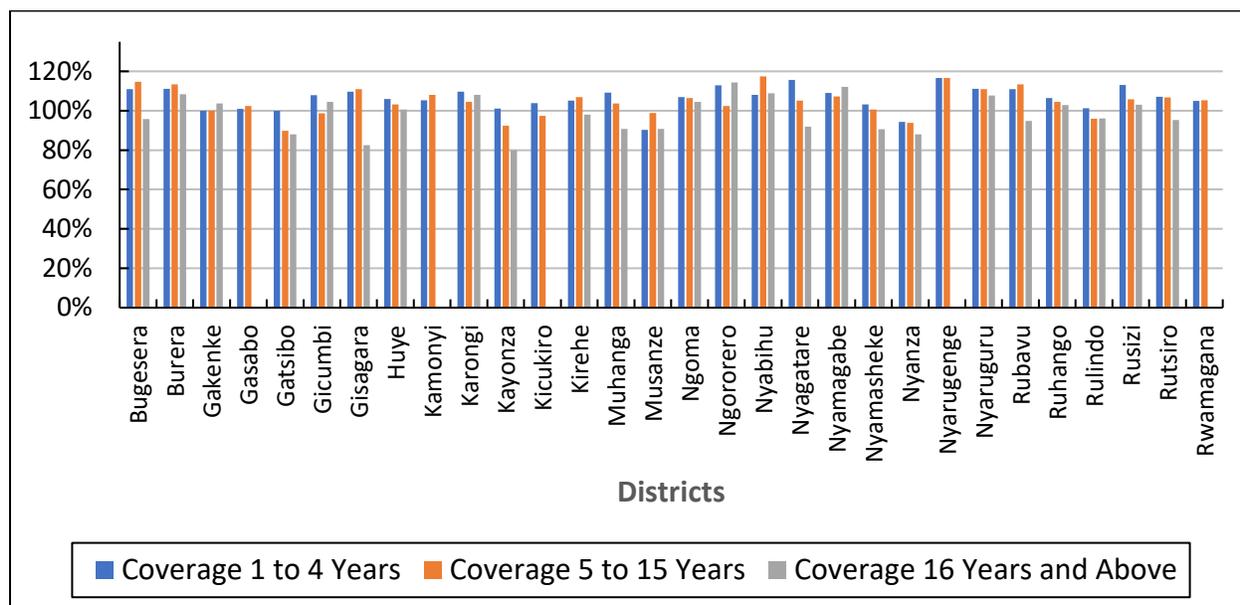
Rwanda Ministry of Health has partnered with pharmaceutical companies for drug donations to treat all at-risk populations including adults aged from 16 years and above in line with the NTDs elimination target set out in the country and WHO plans. Therefore, the increase of drug donation was remarkable including drugs for adults' target population.



During FY 2023-2024, a total of 29,566,000 Albendazole, and 3,276,000 Praziquantel tablets were procured for distribution in MDA. The pharmaceutical companies through WHO donated 11,820,000 tablets, Vitamin Angel through Home for Hope Foundation donated 851,000 tablets, while 12,801,700 purchased with support of the END Fund and 4,093,300 supported by the Government of Rwanda.

In addition, 3,276,000 praziquantel tablets were donated through WHO. During this year we experienced the delay in the shipment of donated Praziquantel tablets for the year 2024 which had an impact on the MDA coverage for Schistosomiasis.

Figure 36: MDA Coverage for STHs Using Albendazole/Mebendazole July 2023 to June 2024



During FY 2023-2024, two rounds of MDA for STHs using ALB/MBZ were conducted, the first was conducted from 27th November to 1st December 2023, and the second from the 3rd to 7th June 2024 during the Maternal and Child Health (MCH) week. The coverage was above 95% in most of the districts. A total of 23,117,340 treatments were delivered, 2,928,106 children aged from 12 to 59 months, 7,511,452 aged from 5 to 15 years, and 12,667,782 adults.

Regarding MDA for Schistosomiasis using Praziquantel tablets 2,502,502 people were treated against 4,878,294 targeted due to the delay in the shipment of the tablets.

2.2. Increasing awareness on NTDs and other Parasitic Diseases

The community mobilization was conducted using different platforms to ensure that messages reach the community for behavior change to prevent NTDs and OPDs. These included radio spots, radio talks, TV shows. In this report, Bilharzia story telling lab, celebration of the world NTD day and media engagement to streamline the uptake of preventive measures are highlighted.

a. Bilharzia Story Telling Lab

The project was supported by Merck KGaA in collaboration with the END Fund with 10,000USD aiming at assessing possible behavior change interventions to improve knowledge, attitude and perception of School Aged Children (aged between 5 and 15 years) about schistosomiasis. It was conducted at selected schools in Rweru sector, Bugesera District. The demonstrated innovation in teaching children for behavior change for Schistosomiasis prevention. The activities included health education to children through distribution of notebooks with pictural preventive message “Ikayi y’umukoro”, capacity building of teachers and local leaders, and educational sessions with parents. The results showed a tremendous change in the knowledge on schistosomiasis and a positive change in preventive practices and attitudes.



A total of 2500 notebooks were distributed to children. The results of the project were promising to accelerate the elimination of schistosomiasis. However, due to a limited budget, it covered a small area and needs more funds to scale up the project in other



Youth who piloted BSL in Rweru sector, Bugesera District

b. Celebration of World NTD Day (WNTDD 2024)

To raise awareness of NTDs and increase multi-sector collaboration, World NTD Day was celebrated on January 30th, 2024, in Kicukiro district/Masaka Sector. The purpose of this event was to raise the profile of NTDs, the suffering they cause and to garner support towards their control, elimination and eradication, in line with the programmatic targets set out in the NTD roadmap 2021–2030 and the commitments of the 2022 Kigali declaration on NTDs. Different partners (local authorities, Government Institutions, NGOs....) attended this celebration event. The worldwide theme of WNTDD2024 was the following: Unite (to improve the health and wellbeing of 1.62 billion people worldwide), Act (Raise voice and action to change lives) and Eliminate (NTDs are preventable and treatable).

This theme was contextualized as Unite in WASH Implementation to Eliminate diseases related to poor sanitation and hygiene translated as **“Tujyanemo mu Isuku n’Isukura, Duhashye Indwara Ziterwa n’Umwanda”**.

The NTD Day celebration was honored by the presence of the Deputy Director General of RBC.



Leaders on the celebration of World NTD Day on 30 January 2024

Before the due day, a week-long campaign steered in diverse districts of Rwanda including Gisagara, Rubavu, Burera, Kirehe, Kayonza, and Rwamagana was conducted. Journalists from different media (Radio, TV, Newspapers, etc.) and social media influencers participated in the campaign. The campaign consisted of NTD Media Tour and aimed at raising awareness on NTDs control and elimination strategies, their burden and multi-sectoral actions to speed up achievement of WHO NTD roadmap 2030 and country commitment targets. The campaign had tremendous success: 4 aired segments by TVs related to the NTD day tour, 13 aired segments by the radio stations that provided coverage, a remarkable total of 63 articles were published in Kinyarwanda, English and French, showcasing the tour's diverse aspects in addition to messages published via twitter, Facebook etc.

The number of articles, radio and TV segments that appeared during the week of January 22nd to February 2nd, 2024

The following table summarizes the number of articles produced per NTD.

Table 27: Number of Articles Produced by NTD

Diseases/Topics	Articles produced
Snake bites envenomation	16
Prohibition of the use of human feces as fertilizer	14
Stakeholders' engagement in WASH	8
School WASH promotion/health club	8
Schistosomiasis	3
Teniasis (cystercercosis)	2
Soil Transmitted Helminth	2
Jiggers	2
Hygiene and sanitation	2
Promoting access to clean water	2
Advocacy to raise funds on WASH-NTD	2
Prevention on NTDs in general	1
Total	63

Other articles were produced on NTDs prevention, control and elimination strategies, multi sector collaboration, etc.

In conclusion, the NTD media tour has proven to be a resounding success, capturing the attention of both traditional and social media. The combined impact of radio, television, online articles, and extensive social media engagement showcases the tour's effectiveness in reaching diverse audiences and promoting the significance of World NTD Day.

c. WASH-NTD Media Journalism Award

Media engagement was also conducted through WASH-NTD Media Journalism Award 2024 in partnership with Rwanda NGO Forum and End Funds. The objective of this activity was to recognize and celebrate the outstanding work of journalists who have made significant contributions to raising awareness about NTDs, especially Schistosomiasis

and soil-transmitted helminths and water, sanitation, and hygiene (WASH) issues in Rwanda. The award also aimed to inspire and motivate other journalists to continue their efforts in promoting informed and responsible journalism in health promotion. Awards were primarily targeting media in the following categories: Radio, TV/Online, Online newspapers, social media and other digital communication platforms X (formerly Twitter), LinkedIn, Facebook...) and Print. Twenty-four (24) journalists and one social media personality submitted their entries (2 maximum entries were allowed per journalist/person) with 43 entries and three best performers were awarded.

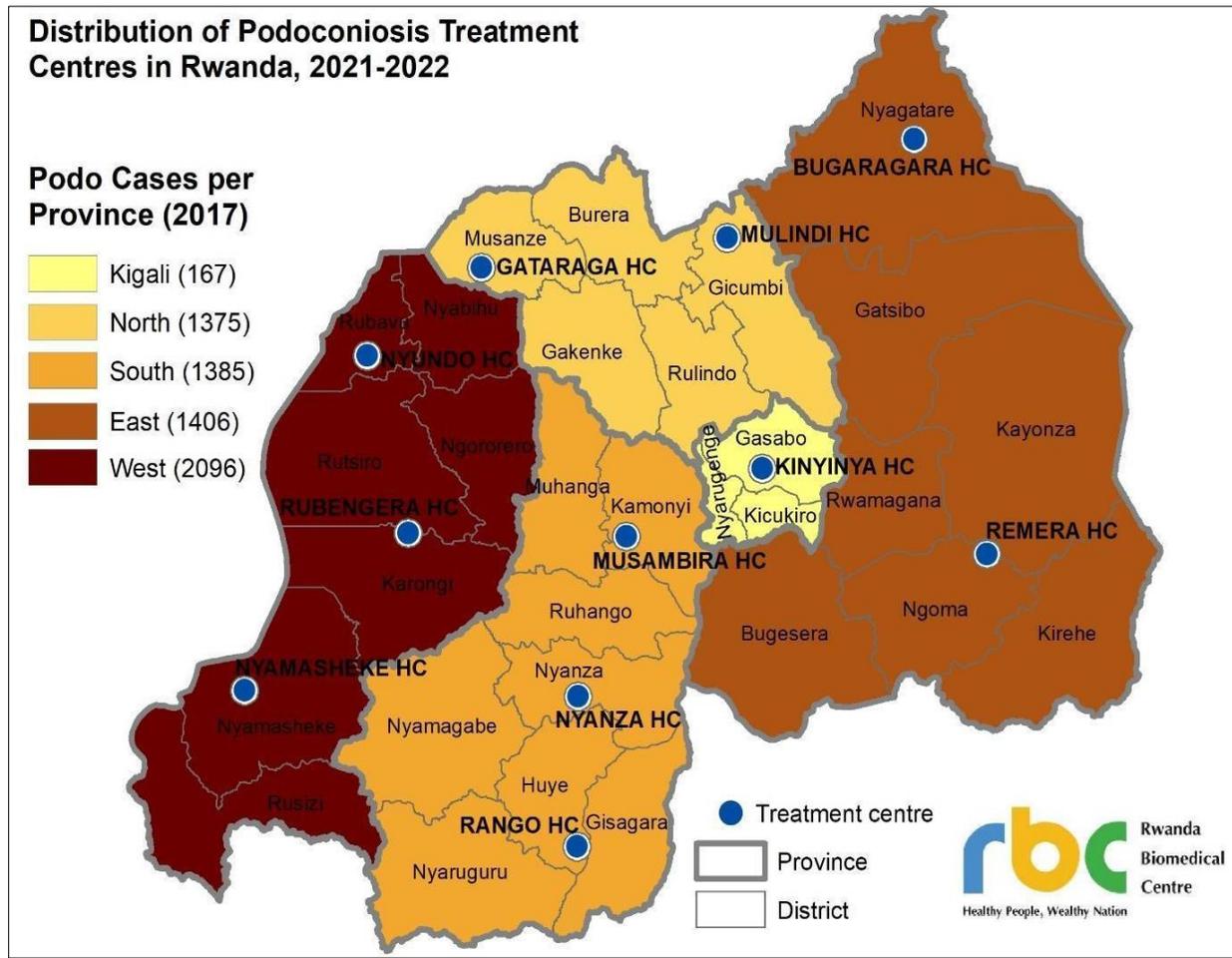
Articles published had emphasized NTDs prevention, control, and elimination and the role of WASH in NTD prevention, control, and elimination agenda.

3. NTDs and Other Parasitic Diseases Case Management

3.1. Scaling up NTD Case Management Interventions for Chronic NTDs

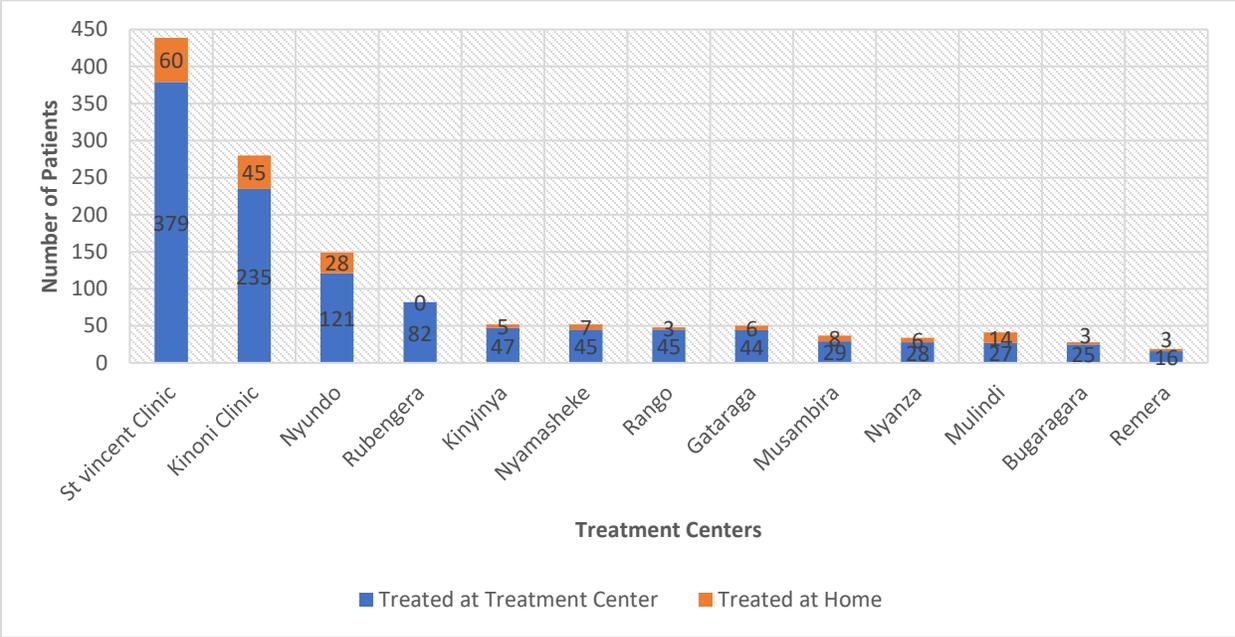
The patients with podoconiosis get services from 13 treatment centers supported in collaboration with Heart and Sole Africa. The services are delivered by trained nurses in the health centers and physiotherapists from corresponding district hospitals. A total of 1311 patients (figure 29) were enrolled and provided services during FY 23/24.

Figure 37: Distribution of Podoconiosis Treatment Centers in Rwanda, 2023-2024



In addition to the treatment centers illustrated in the figure 29 above, other patients are managed in three treatment centers under Health and Sole Africa/Action namely Musanze clinic, Kinoni clinic, Kinigi site.

Figure 38: Podoconiosis Treatment Services, July 2023 to June 2024 in 13 Treatment Centers

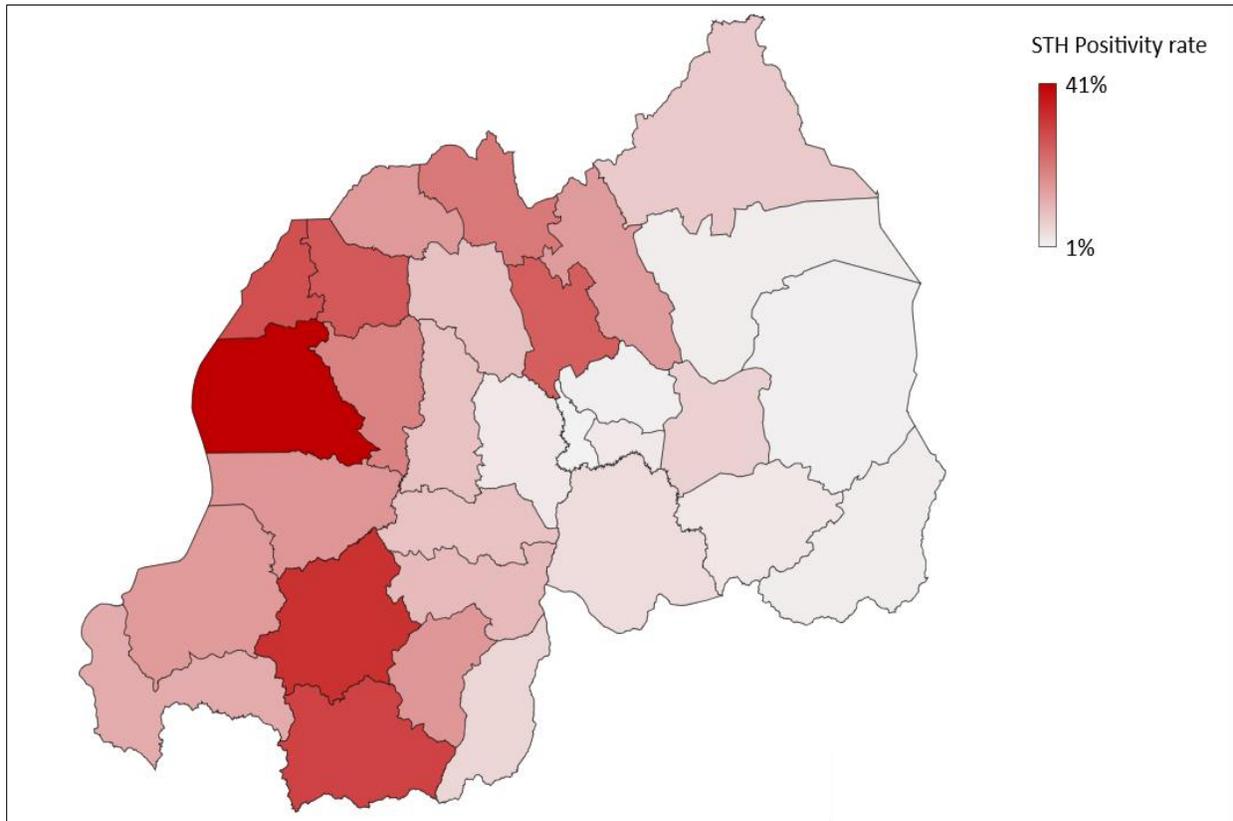


In total, 1311 patients were under treatment at 13 treatment centers, including 188 (14%) treated from home and 1123 (86%) treated at treatment centers.

3.2. Routine NTDs and OPDs Cases Management

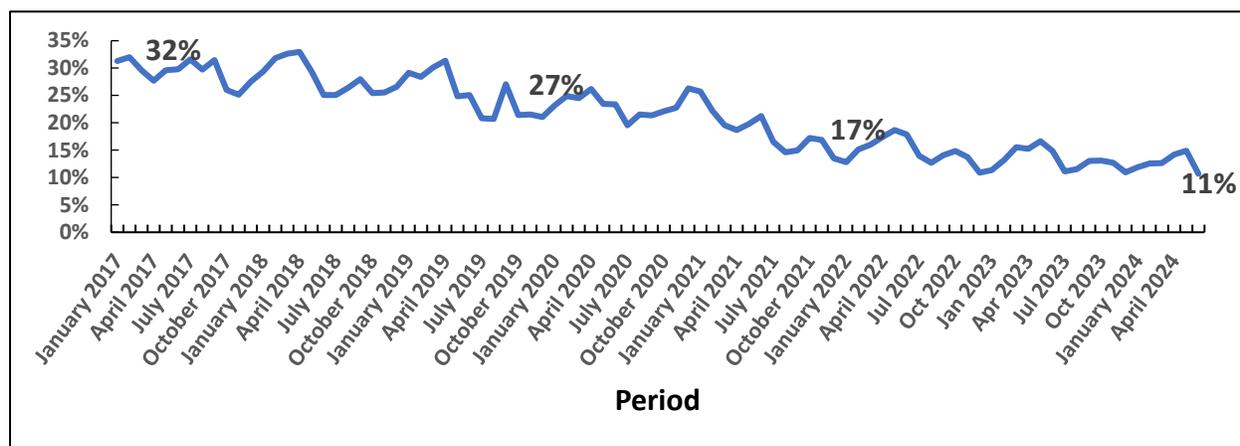
a. Soil Transmitted Helminthiasis

Figure 39: Proportion of STHs (Ascaris, Ankylostoma and Trichuris Trichiura) Cases in Stool Exams Performed in Health Facilities per District



Northern, Western and Southern Provinces are the most endemics. The high rates of STH were observed Rutsiro, Nyamagabe, Nyaruguru, Rubavu, Burera and Rulindo districts.

Figure 40: Trend of monthly STHs Positivity rate from Health Facilities Routine Data



The trend of STHs in HF's shows a decreasing tendency. The average annual positivity rate was 12% with *Ascaris* predominance 11.2%. *Trichuris Trichiura* and ankylostome species showed a positivity of rate less than 1%.

b. Other NTDs and Parasitic Diseases

Table 28: Number of Reported Diseases in 2023 - 2024

Diseases	Positive cases
Entamoeba	549,237
Intestinal Trichomoniasis	162,277
Ascariasis	161,703
Giardia	98,633
Ankylostomiasis	10,096
Taenia	9,638
Trichuris Trichiura	8,369
Strongyloides stercoralis (Angillule)	1,434
Enterobius vermicularis (Oxyure)	1,345
Schistosoma	325

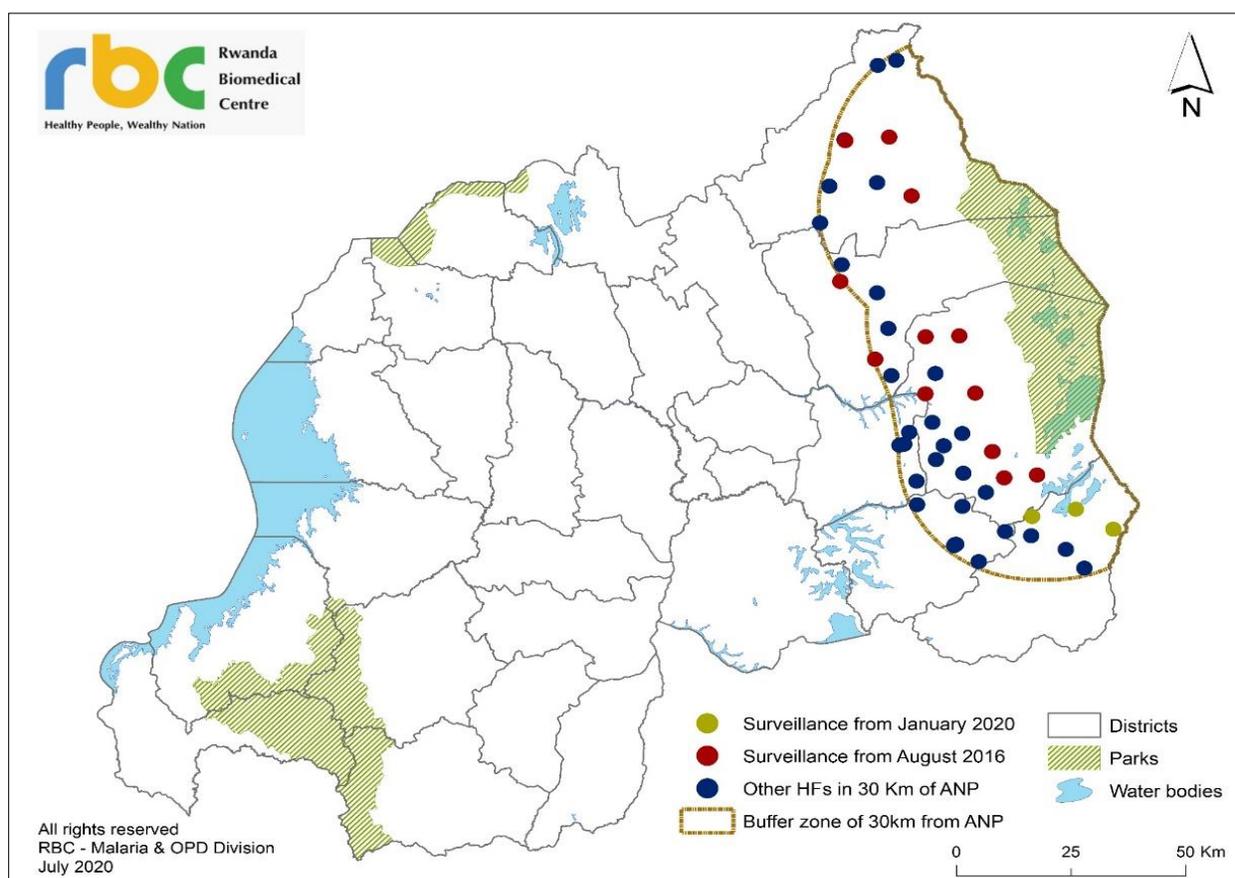
From July 2023 to June 2024, amoebiasis was the most diagnosed intestinal parasitic disease in patients visiting the health facilities followed by intestinal trichomonas, and giardiasis. The *Ascaris* was the most STH diagnosed.

4. NTDs & OPDs Surveillance, Epidemiology and Research

4.1. Surveillance of *Rhodesiense* Human African Trypanosomiasis (r-HAT)

During the FY 2023-2024, the passive surveillance was conducted for Human African Trypanosomiasis (HAT) surveillance in 16 sentinel sites from Nyagatare, Gatsibo, Kayonza, and Kirehe district.

Figure 12: Sentinel Sites for Human African Trypanosomiasis



On 26 April 2022, WHO validated Rwanda as having eliminated *rhodesiense* Human African trypanosomiasis (r-HAT) as a public health problem. Efforts were made to maintain passive surveillance in 16 sites (health centers and hospitals) surrounding the Akagera National Park where tsetse flies are present. r-HAT diagnosis is similar to the diagnosis of malaria by screening a blood smear with a microscope. From July 2023 to June 2024, 85,397 blood smears screened, no single case of r-HAT was identified.

In addition, the central level team conduct a regular supportive supervision to the surveillance site.

During the FY with WHO support, the supervision was conducted from 20 to 25 August 2023. Although the diseases are not existing, the surveillance will be maintained along with bi-annual supportive supervision to sentinel surveillance sites.

The following table provides numbers of people screened for r–HAT in Rwanda sentinel health centers and hospitals.

Table 29: Data of HAT and Malaria by Passive Surveillance in Sentinel Sites, July 2023 - June 2024

District	Surveillance Sites	Suspected	Malaria (-)	Malaria (+)	HAT Positive
Nyagatare	Nyagatare DH	4695	4412	283	0
	Bugaragara HC	7742	6578	1164	0
	Ndama HC	11942	7544	4398	0
Total		24379	18534	5845	0
Gatsibo	Kiziguro DH	3646	3589	57	0
	Rwimbogo HC	6441	6322	119	0
Total		10087	9911	176	0
Kayonza	Gahini DH	2240	2200	40	0
	Nyakabungo HC	3389	3229	160	0
	Buhabwa HC	6406	5859	547	0
	Ryamanyoni HC	6229	6156	73	0
	Rwinkwavu DH	2125	2069	56	0
	Cyarubare HC	3442	3397	45	0
	Ndego HC	2298	2249	49	0
Total		26129	25159	970	0
Kirehe	Kirehe DH	3616	3465	151	0
	Nasho HC	14017	13243	774	0
	Mulindi HC	4084	4037	47	0
	Kabuye HC	3085	2898	187	0
Total		24802	23643	1159	0
Grand Total		85397	77247	8150	0

4.2. Establishment of SCH and STHs Sentinel Villages

With support of the END Fund in collaboration with the Heart and Sole Africa/Action (HASA), ten sentinel villages were established, and baseline data collected in November 2023. Stool and urine samples were collected from randomly selected household members and tested for STH and Schistosomiasis. Below are the sentinel villages selected:

Table 30: Schistosomiasis and STH Sentinel Villages

District	Sector	Cells	Villages
Gasabo	Jabana	Kidashya	Nyamweru
Gatsibo	Remera	Kigabiro	Byimana
Gatsibo	Gatsibo	Manishya	Manishya
Gisagara	Mukindo	Nyabisagara	Butare
Gisagara	Gishubi	Nyakibungo	Nkunamo
Gisagara	Mukindo	Runyinya	Agakomeye
Karongi	Mubuga	Kagabiro	Mweya
Kirehe	Nyarubuye	Mareba	Nyacyonga II
Nyagatare	Mukama	Bufunda	Nyakajeje
Nyanza	Ntazo	Katarara	Muyenzi

Figure 13: Location of Schistosomiasis and STH Sentinel Villages

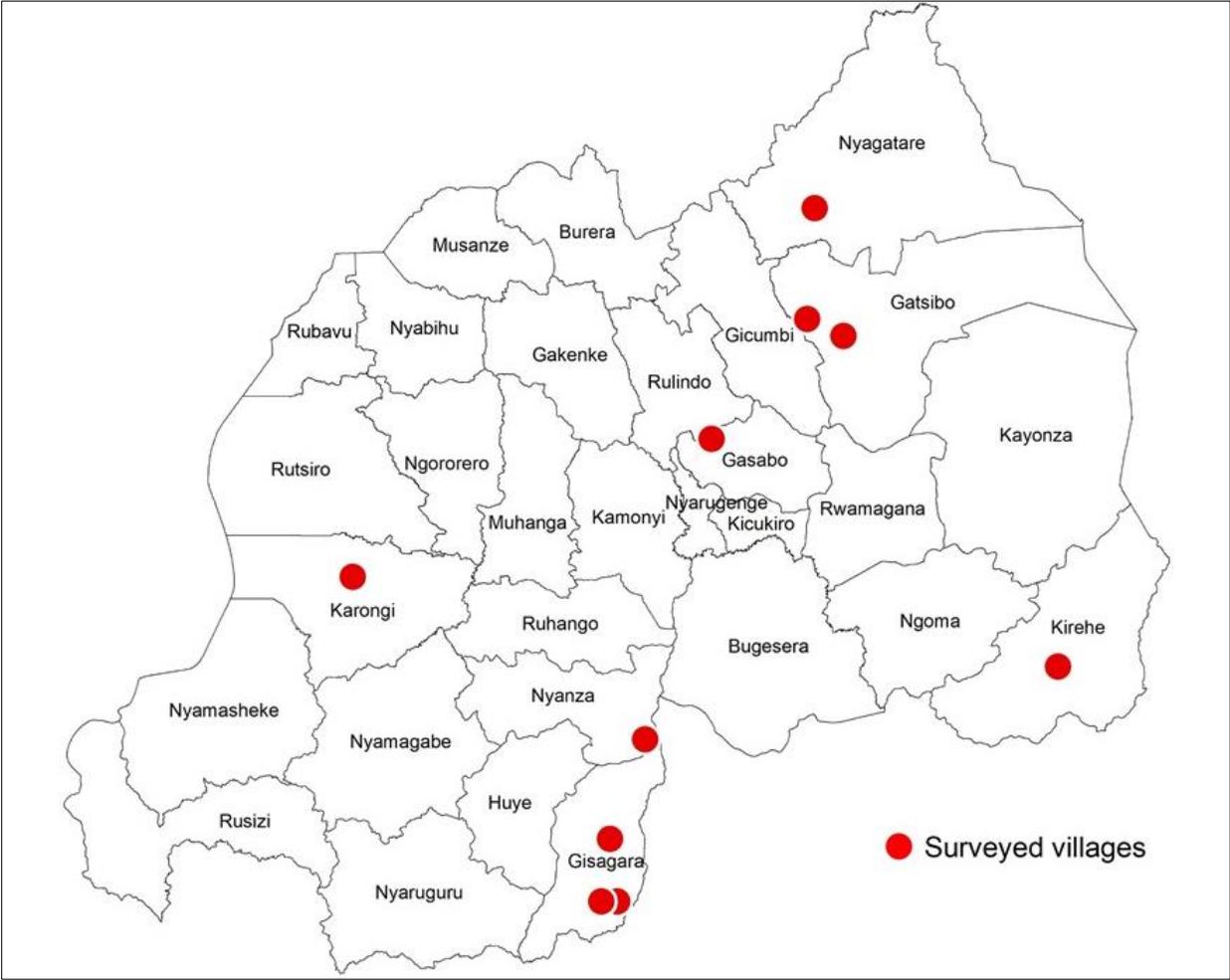


Table 31: Prevalence and intensity of infection per species

	<i>S. mansoni</i> by Kato- Katz	<i>S. mansoni</i> by CCA with trace as negative	<i>S. mansoni</i> by CCA with trace as positive	<i>Ascaris</i>	<i>Trichuris</i>	<i>Hookworm</i>	<i>Any STH</i>
N districts included in analysis	7	7	7	7	7	7	7
N villages (SS) included in analysis	10	10	10	10	10	10	10
N people with data	2499	2445	2445	2499	2499	2499	2499
Prevalence (and 95% CI)	2.4 0.02-0.03	4.9 0.04-0.06	7.2 0.06-0.08	5.8 0.05-0.07	1.6 0.01-0.02	6.4 0.05-0.07	12.6 0.11-0.14
Mean intensity in EPG (with 95%CI)*	1.2 (0.85-1.62)			52.1 (25.96-78.31)	0.8 (0.44-1.21)	7.4 (4.73-9.99)	
Heavy intensity (N, %)	0			0	0	0	
Moderate intensity (N, %)	6, 0.2%			5, 0.2%	0	0	
Light intensity (N, %)	55, 2.2%			141, 5.6%	40, 1.6%	161, 6.4%	

Overall, the results showed the prevalence of STH was 12.6% in SS while that of SCH was 2.4%. The mean infection intensity was highest for *Ascaris lumbricoides* (52.1 EPG) and lowest for *Trichuris trichiura* (0.8 EPG). There was no heavy infection intensity in all species but 0.2% of the population had moderate intensity infection of SCH and *Ascaris*. Compared to 2020 precision mapping results in the same villages, the data shows a reduction in the prevalence of any STH of 60% [mean site prevalence of 31.6% in 2020, 12.6% in 2023], with 65% for *Ascaris* [16.9% in 2020, 5.9% in 2023], 63% for hookworm [17.2% in 2020, 6.5% in 2023] and 24% for *Trichuris* [2.1% in 2020, 1.6% in 2023]. For schistosomiasis, the reduction in prevalence was 46% [4.5% in 2020, 2.4% in 2023]. While these 10 sentinel sites are not representative nationally, they provide a snapshot of the impact of the current treatment strategy on reduction in prevalence, and progress achieved under the revised treatment strategy through the inclusion of adults, a key reservoir of infection for STH. The follow-up data collection will be conducted regularly on an annual basis.

4.3. School WASH Supportive Supervision

In partnership with WFP and district authorities, RBC conducted school WASH supportive supervision in Kayonza, Burera and Kayonza Districts. WFP supported schools (13 schools in Burera and 1 in Kayonza) and 1 school not supported in Rutsiro district were supervised. The purpose of the school WASH supportive supervision was to empower school leadership and teachers on WASH improvement in their schools to back the school feeding program in Rwanda. Here are some findings:

a) Strengths

- Cleanliness in schools (classes, school compounds and school learners...),
- Management of (running/rain) water by putting in maintaining water tanks
- Functional school health/hygiene clubs
- Presence of safe drinking water inside the classroom

b) Area of improvement

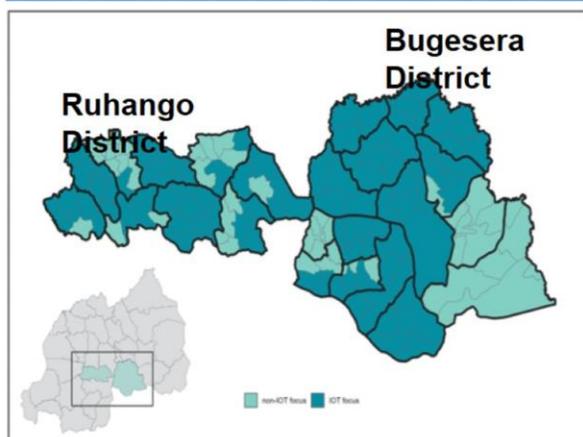
- There is wastage of water in some schools
- Presence of human excreta on latrines floor
- Lack of WASH ownership for some school leadership and teachers
- Damaged water tanks but not maintained

The supervision team is composed of RBC, WFP, World Vision representatives and staff from some health centers and sectors.

4.4. Interruption of SCH and STHs in Bugesera and Ruhango districts

With the support from the END FUND, Bugesera and Ruhango districts were selected for interruption of SCH and STH transmission. The project is being implemented in collaboration with HASA and Rwanda NGOs Forum on HIV/AIDS and Health Promotion.

Interruption of Transmission (IoT) for STHs & SCH-Focus Areas



Accelerating the achievement of interruption of transmission (<2% prevalence for SCH & STH as measured by qPCR)

District	# of STHs IoT Sectors/Cells	# of SCH IoT Sectors/Cells	Total IUs
Bugesera	7 sectors	39 cells	15 sector/ 72 cells
Ruhango	None	37 cells	9 sectors/59 cells
Criteria for IoT area	SCH Prevalence by KK <10%, STH Prevalence <20%		

IOT Focus	# IUs	Estim. pop
STH & SCH	7 sectors (32 cells)	319,995
SCH only	58 cells	312,276

The goal of IoT is to reduce to < 2% prevalence of STH and SCH as measured by qPCR in targeted areas, by 2027.

The objectives of IoT are:

- 1) To increase the correct knowledge and healthy practices of STH & SCH to at least 95% of community members in targeted areas by 2027.
- 2) To increase access to improved WASH to 100% of all households and public places in targeted areas, by 2027.
- 3) To increase to at least 95% of people with occupational risk in targeted areas having effective protective equipment, by 2027.
- 4) To reach at least 95% of all people in the IoT intervention areas with drugs for both STH and SCH per each mass drug administration (MDA) round, by 2024-2027.
- 5) To diagnose and treat 100% of suspected cases of STH&SCH according to national guidelines, in 2024-2027.
- 6) Strengthen surveillance and reporting of STH&SCH at all levels for impact measurement and timely response.
- 7) Strengthen coordination, and collaboration for STH&SCH Elimination at all levels

The IoT plan was developed during the workshop in December 2023, IoT coordinator and district coordinators were recruited. In addition, the protocol to develop need assessment was developed to generate evidence to inform IoT interventions IoT’s interventions will be implemented until 2027.

4.5. Feasibility for elimination of STHs as public health problem in high endemic areas



The study is being conducted in Mudende and Cyanzarwe sectors of Rubavu district, Western Province. The overall prevalence of STH reported in the 2020 mapping was 89% and the district with the highest prevalence. Mudende was selected as the intervention sector and Cyanzarwe as control sector. A total of 8,191 households and 35,082 household members. Per study arm, the study includes in intervention (Mudende) 7,302 households with 31,126 household members, while the control arm (Cyanzarwe) has 889 households and 3,956 household members.

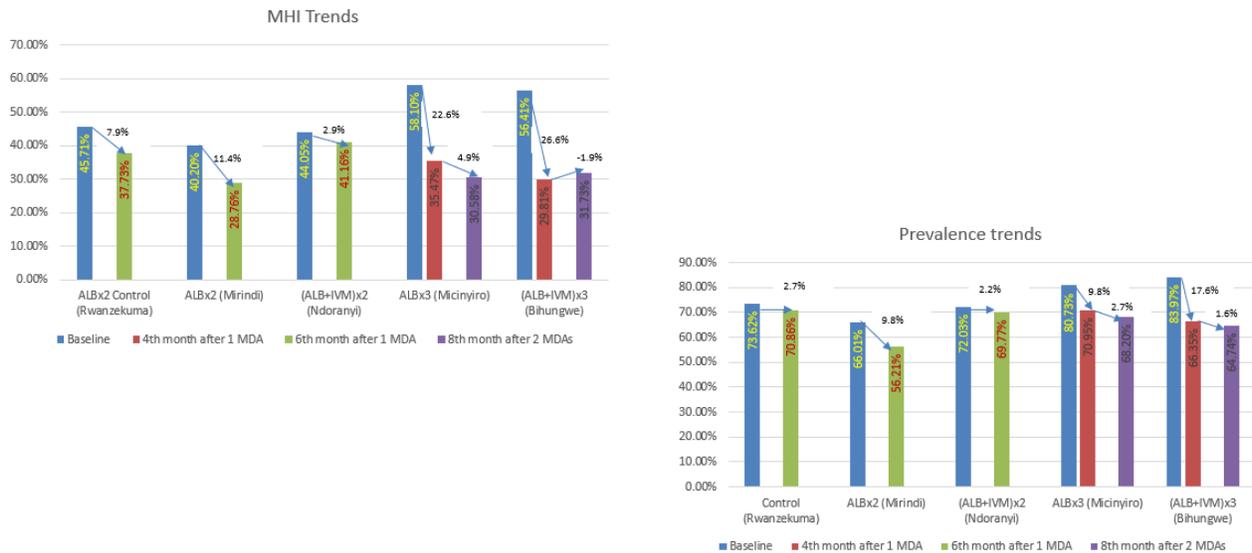
During the FY 2023-2024, the activities included a 4 months follow-up and WASH data collection at the household.

The combination of ALB and Ivermectin showed increased efficacy on *Trichuris Trichiura* as well administration of three round per year recommended by WHO.

Study sites (Mudende and Cyanzarwe) of Rubavu district

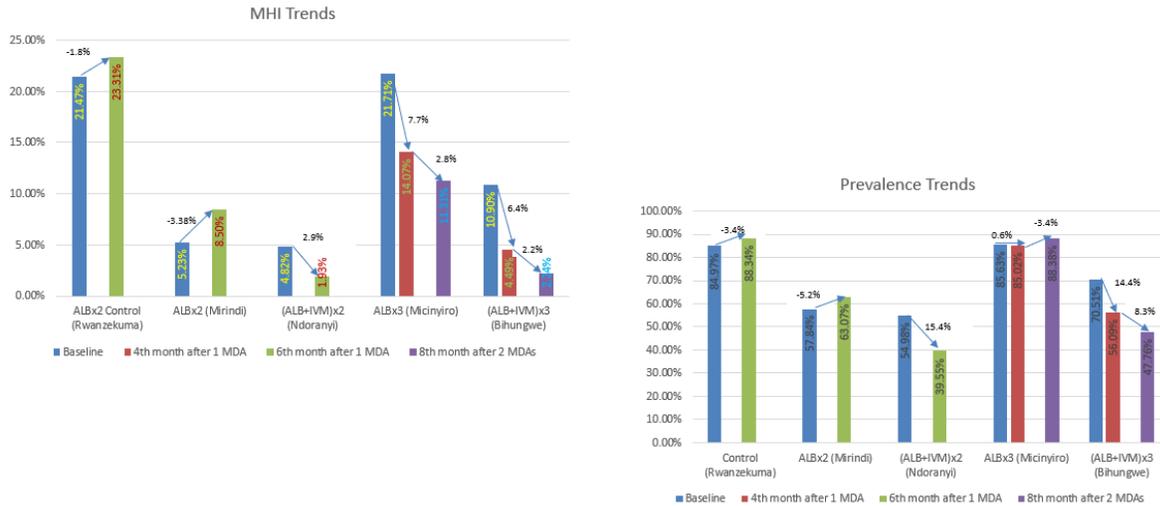
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Figure 14: Presenting Progressive Findings about Intensity of Infection & Prevalence of Ascaris Lumbricoides



At baseline, Moderate to Heavy Intensity (MHI) of infection by *Ascaris lumbricoides* was very high in all study arms, above the WHO cutoff (<2%) to get validation of elimination as a public health problem. In all study arms, these progressive findings show that MHI reduced after the first MDA treatment with the percent points reduction ranging from 2.6%-26.6%. The high percent point reduction is observed in arms with a short lag time between MDA and the next parasitological data collection. Slow reduction or increase in MHI is observed in 2 arms which implemented 3 MDA rounds. Almost similar observations are recorded with the indicator of prevalence (figure on the right). The parasitological data at year 1 will provide a clearer picture about effectiveness of each intervention package.

Figure 15: Presenting Progressive Findings about Intensity of Infection & Prevalence of Trichuris Trichiura

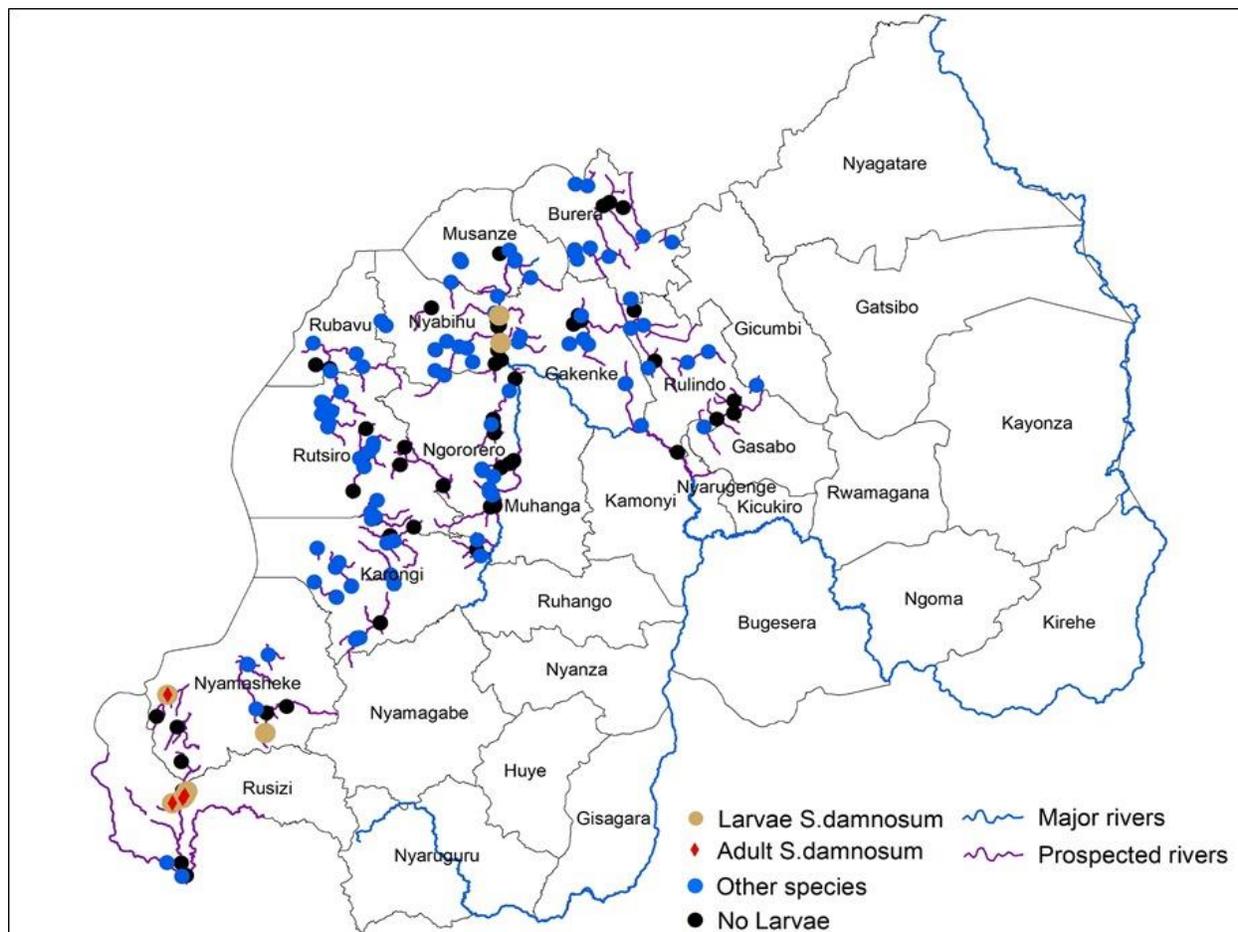


The prevalence of infection of *Trichuris trichiura* was >50% in all study arms, ranging from 54.84% to 88.38%. The moderate to heavy intensity (MHI) of ascaris infection ranges from 4.82% to 21.71%. All arms that received Albendazole alone saw an increase in *Trichuris* prevalence compared to baseline and next follow-up measurement (at 4 and 6 months). For arms treated with Albendazole in combination with ivermectin, there is a constant decrease of MHI as well as prevalence. The parasitological data at year 1 will enlighten the effectiveness of this combination after 1 year of implementation.

4.6. Onchocerciasis Control in Rwanda

We conducted the training of 16 entomologists with support of the END fund. We conducted the breeding sites mapping in support by the experts and prospected 187 river streams from western and Northern provinces. The black flies of *Simulium Damnosum* species responsible for onchocerciasis transmission were identified in Rusizi, Nyamasheke and Nyabihu districts. The team will prospect the remaining rivers from Kigali, southern and eastern provinces in the first quarter of the FY 2023-2024.

Figure 16: Rivers and Streams Prospected for the Breeding Site Mapping of Black Flies



5. WASH and NTDs Coordination

5.1 Cascading Training on WASH Improvement

Through a multi-sector collaboration approach, NTD&OPDs conducted cascading training on WASH improvement down to the community. This training was conducted in different steps. The first session was done in Rwamagana district where WASH-NTDs roadmap coordination activities were drafted which is under review. The purpose of this roadmap is to strengthen multisectoral collaboration between WASH-NTD stakeholders at national and district level to speed up STH and SCH elimination as a public health problem and other parasitic diseases.

Developed training content, M&E tools were validated by the sub-NTD TWG in the workshop held at La Palisse Nyamata on 08-12 May 2023.

These training content, monitoring and evaluation tools were presented for inputs during the consultative meeting of 29/05 to 02/06/2024 in which staff participated are from all provinces, districts, and provincial hospitals as WASH partners as well.

After validation and input to the above tools, training of trainers was conducted on 25-29 March 2023 in Muhanga and Musanze districts respectively. Staff and delegates from WASH cluster Ministries and partners, staff from hospitals and administrative districts participated in the training (**173 participants**). The above trainers facilitated the ToT of staff from administrative sectors and HCs who then conducted training at sector level (participants from villages, administrative cells and schools) in April to June 2024.

Training was conducted in 26 districts. A total of **79,881** participants from village to district level were trained. The training did not take place in Kayonza, Ngoma and Huye due to the shortage of the budget, and Kicukiro district due to conflicting agenda. The trained participants will report on quarterly basis WASH data at household level, school and Early Child Development Centers (ECD).



Mayor of Rwamagana district delivering open remarks during training of trainers at district level

PART VII: FINANCING THE MALARIA AND NTD PROGRAMS

1. Introduction

The financing of the Malaria Strategic Plan has become a high priority for the GoR. The MSP is funded by the Government of Rwanda, the Global Fund for HIV & AIDS, TB and Malaria Results Based Financing (GF), the US President’s Malaria Initiative, and the END Fund.

Through SMART FMIS (Integrated Financial Management Information System), data of the actual financial report was generated given that HRTT captured so far the budget and expenditures of the reporting period. To facilitate the collection of financial information for this year’s report, a separate data collection process was adopted using the Global Fund grant and Government contribution, and directly from in-country office for PMI.

2. Public and External Funding Sources for Malaria Program

Below a summarized table illustrates the malaria budget by source of funding with: Global Fund, PMI followed by GoR for Fiscal year 2023-2024. The total expenditures amount to USD 59 253 944 which represents 88% of the total budget of USD 67 239 123.

Table 32: Malaria Budget and Expenditures by Source of Funds, FY 2023-2024

Funding Sources	Opening balance in USD	Initial approved budget for FY 2023-2024 in USD	Budget approved for FY 2023-2024 in USD	Expenditures in USD for FY 2023-2024	Balance on 30 June 2024 in USD	Performance rate in %
Global Fund for AIDS, TB and Malaria (GFATM)	2 663 837	18 524 932	21 188 769	21 188 768	1	100%
US President's Malaria Initiative (PMI)		19 000 000	19 000 000	12 645 000	6 355 000	67%
GoR		27 050 354	27 050 354	25 420 176	1 630 178	94%
TOTAL	2 663 837	64 575 286	67 239 123	59 253 944	7 985 179	88%

3. Government Expenditures by MTEF Chapter for Fiscal year 2023-2024

The total GoR contribution to malaria expenditures is USD 27 050 354, from this budget the total expenditures are USD 25 420 176 represents 94 % of the total budget.

As presented in table below, the total expenditure was allocated to: (i) Compensation of employees, (ii) Use of goods and services, (iii) Subsidies (iv) Grants (v) Social assistance; (vi) Other expenditures; (vii) Inventory and (viii) Fixed tangible non-financial Assets MTEF Chapter.

Table 33: Government Expenditures by MTEF Chapter for Fiscal Year 2023-2024

MTEF Chapter	Approved Budget for FY 2023-2024 in USD	Committed Amount FY 2023-2024 in USD	Budget Balance end June 2024 in USD	Performance rate in %
21 Compensation of employees	965 872	965 872	-	100%
22 Use of goods and services	1 274 545	1 274 545	-	100%
25 Subsidies	11 979 487	10 373 511	1 605 976	87%
26 Grants	529 226	529 226	-	100%
27 Social assistances	5 370 892	5 327 395	43 497	99%
28 Other expenditures	5 599 619	5 653 672	- 54 053	101%
33 Inventory	1 041 357	1 041 168	189	100%
34 Fixed tangible non-Financial Assets	289 356	254 787	34 569	88%
Total	27 050 354	25 420 176	1 630 178	94%

3.1. Government Expenditures by Budget Agencies for Fiscal Year 2023-2024

As reflected in the table below, the GoR budget per budget agencies is USD 27 050 354 whereas the expenditure is USD 25 420 176. The type of budget agencies with the highest budget ceiling is Districts hospitals with USD 11 979 487, RBC with USD 5 599 619 and Ministry of Health with USD 5 370 892. The expenditures were respectively USD 10 373 511 for Districts, USD 5 653 672 for RBC and USD 5 327 395 for Ministry of Health

Table 34: Government Expenditures by Budget Agencies for Fiscal Year 2023-2024

Budget Agencies	Approved Budget for FY 2023-2024 in USD	Committed Amount FY 2023-2024 in USD	Budget Balance end June 2024 in USD	Performance rate in %
CHUB	965 872	965 872	-	100%
CHUK	1 274 545	1 274 545	-	100%
Districts	11 979 487	10 373 511	1 605 976	87%
HNN	529 226	529 226	-	100%
MINISANTE	5 370 892	5 327 395	43 497	99%
RBC	5 599 619	5 653 672	- 54 053	101%
RMH	1 041 357	1 041 168	189	100%
RWANDA FDA	289 356	254 787	34 569	88%
Total	27 050 354	25 420 176	1 630 178	94%

3.2 Global Fund contribution to Malaria Program

As reflected the table below, the Global Fund contribution, the budget for the year 2023–2024 was USD 18 524 932 , revised to USD 21 188 768 using the opening balance from previous Fiscal years; Out of this budget revised, a total of USD 21 188 768 have been spent 100 % of total budget for MALARIA National Strategic Plan.

Table 35: Global Fund Expenditures by NSP Budget Categories for July 2023 to June 2024

GF Cost categories	Opening balance in USD	Budget approved for FY 2023-2024 in USD	Revised budget FY 2023-2024 in USD	Expenditures for FY 2023-2024	Budget balance 30 June 2024 in USD	Performance in %
1.0 Human Resources (HR)		1 202 507	2 403 744	2 403 744	0	100%
2.0 Travel related costs (TRC)		3 014 090	2 447 251	2 447 251	0	100%
3.0 External Professional services (EPS)		42 000	51 957	51 957	0	100%
5.0 Health Products - Non-Pharmaceuticals (HPNP)	555 575	11 808 332	12 857 906	12 857 907	0	100%
7.0 Procurement and Supply-Chain Management costs (PSM)		1 144 011	800 055	800 055	0	100%
10.0 Communication Material and Publications (CMP)	2 108 262	276 808	2 385 070	2 385 070	0	100%
13.0 Payment for results		1 037 184	242 785	242 785	0	100%
Total	2 663 837	18 524 932	21 188 768	21 188 768	0	100%

3.3. PMI Expenditures for the Fiscal Year 2023-2024

The PMI contribution for malaria expenditures went specifically to malaria preventive intervention and malaria case management interventions. The budget for preventive interventions was spent mainly on the procurement of LLINs and IRS. Out of total budget of USD 19 000 000, the expenditures were USD 12 645 000 representing 67% of the total budget.

The low BE of PMI Funds is mainly linked to:

(1) The procurement of ITNs that were waiting for good timing to ensure the delivery date corresponds to the time of ITNs Mass Campaign planned in 2025, The budget for ACTs and Training on the New Guidelines planned in the FY2024-25.

4. Conclusion

The overall Malaria Budget execution for Fiscal year 2023-2024 is at **88%**.

PART VIII: MALARIA PERFORMANCE FRAMEWORK

A. Impact Indicators

ITEMS	INDICATORS	Baseline	Year of Baseline	2023-2024 Targets	2023-2024 Results	%
Goal	Impact Indicators					
By 2024, reduce malaria morbidity and mortality by at least 50% of the 2019 levels.	Annual Parasite Incidence per 1,000 persons	321	2018-19	127	45	100%
	Inpatient malaria deaths per 100,000 persons per year	2.1	2018-19	1	0.6	100%
	Number of confirmed malaria deaths	264	2018-19	132	67	100%

B. Coverage and Outcome Indicators

ITEMS	INDICATORS	Baseline	Year of Baseline	2023-2024 Target	2023-2024 Results	%
Objective 1:	Coverage Indicators					
By 2024, at least 85% of population at risk will be effectively protected with preventive interventions	Proportion of structures in targeted areas that received indoor residual spraying (IRS) during the reporting period	98%	2018-19	98%	99.8%	100%*
	Proportion of population protected by indoor residual spraying within the last 12 months in targeted districts	98.0%	2018-19	85%	99.8%	100%*
Objective 2:	Outcome Indicators					
Objective 2: All suspected cases are promptly tested and treated in line with national guidelines	Proportion of suspected malaria cases that receive a parasitological test at public sector health facilities	NA	2018-19	95	100%	100%**
	Proportion of suspected malaria cases that receive a parasitological test at the community level	NA	2018-19	95	100%	100%*
	Proportion of confirmed malaria cases that received first-line antimalarial treatment according to national guidelines at public sector health facilities	100%	2018-19	99	97%	98%
	Proportion of confirmed malaria cases that received first-line antimalarial treatment according to national guidelines at the community	100%	2018-19	100	100%	100%*

Note:

* The percentage was greater than 100%

**The number of tests was greater than the number of fever cases due to some tests performed with no documentation of fever by Clinicians. This is a new indicator and more efforts are needed to improve the documentation of fever

