Republic of Rwanda
Ministry of Health

Rwanda Biomedical Centre
Healthy People, Wealthy Nation

Rwanda Malaria and Neglected Tropical Diseases

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July 2021- June 2022

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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 2021-2022 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 as well as program activity reports from July 2021 to June 2022. 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, as well the strengthening of surveillance systems across all sectors at both 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 to the inputs and support provided by our partners.

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.

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

Dr. NGAMIJE M. Daniel
Minister of Health

List of Abbreviations

ACT	Artemisinin-based Combination Therapy
AL	Artemether Lumefantrine
ANC	Ante-Natal Care
SBCC	Social Behavior Change Communication
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
MCP	Malaria Contingency Plan
MDA	Mass Drug Administration

MIP	Malaria In Pregnancy
MoH	Ministry of Health
MOPDD	Malaria and Other Parasitic Diseases Division
MPPD	Medical Procurement and Provision 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
SBCC	Social Behavior Change Communication
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 with key role in Malaria, Neglected Tropical Diseases (NTDs) and Other Parasitic Diseases (OPDs) Prevention, Diagnosis and Treatment countrywide.

Despite the previously reported increase in malaria between 2012-2016, almost all 30 districts of Rwanda registered a decline in malaria during the reporting period July 2021-June 2022.
With the end of this reporting Fiscal Year 2021-2022, malaria incidence in Rwanda reduced from 114 per 1,000 person per year in FY 2020-2021 to 76 per 1,000 (33% reduction) while the Slide Positivity Rate (SPR) dropped from 27% in FY 2020/2021 to 22% in FY 2021/2022.
Uncomplicated malaria cases dropped from 1,481,698 cases in FY 2020/2021 to 998,874 cases in FY 2021/2022 (32 % reduction) with currently 55% of these cases managed at community level. Severe malaria cases reduced from 2,592 cases in FY 2020-2021 to 1,831 severe cases in FY 2021/2022 representing 29% decrease in severe malaria.

The number of deaths due to malaria decreased significantly from 94 in FY 2020-2021 to 71 deaths in FY 2021-2022 (17 % reduction). During the same period, a total of 7,377,378 LLINs were procured (4,511,048 from PMI and 2,866,330 from Global Fund) and 3,809,348 already delivered for both routine and mass distribution to ensure Universal Coverage. Those LLINs include Standard LLINs and PBO Nets. During this fiscal year, a total of 317,184 LLINs were distributed to pregnant women over 373,828 who attended the first visit of antenatal care (85%) and while 278,828 LLINs were distributed to children under one year over 325,510 who attended MR1 (86%).

Regarding the universal coverage of households, a total of 218,936 LLIN rectangular LLINs were distributed to the general population through the household's mass campaign in Nyamagabe district.
Blanket Indoor Residual Spraying (IRS) was sustained in 12 districts in the FY 2021-2022 while 8 high burden sectors of Rusizi District and few cells from Nyamagabe and Nyaruguru Districts were sprayed as an outbreak control strategy (Focal IRS). This helped the program protecting 5,170,303 people out of 5,211,467 of those targeted in these 15 districts (99.2%)

In Neglected Tropical Diseases (NTDs) control, Rwanda was validated by the World Health Organization (WHO) for rhodesiense-Human African Trypanosomiasis (r-HAT) Elimination as a public health problem in Rwanda. The communique was issued by WHO on April, 26th, 2022 and Rwanda became the first country to eliminate r-HAT – a zoonotic

sleeping sickness, due to multi-sectoral collaboration in interventions planning to monitoring.

In the same response to NTDs, Rwanda became the first country to launch the Community Mass Drug Administration (MDA) including all adults at risks, shifting from MDA targeting only children to include adults based on the 2020 mapping survey report showing that adults (16years and above) are the most affected by STH with 48% of prevalence compared to School Aged Children -SAC (5-15years old) with 41% and Pre-SAC with 31% of prevalence respectively. This shift was marked by a high coverage in adults (>85%) reached as result of multi-sectoral collaboration effort between MOH, RBC, key ministries, local government, partners, donors, communities, etc.

Podoconiosis (Imididó) is a disabling NTD which was recently mapped in Rwanda with an estimated over 6000 cases countrywide.
In line of increasing access to care to those people affected, the MOH/RBC in collaboration with partners, Heart and Sole Action/Rwanda and Footwork -International podoconiosis Initiative, and districts established eleven (11) Public Podoconiosis Treatment Centres in 11 districts. With the end of June 2022, around 250 people were enrolled into care for appropriate podoconiosis care and treatment.

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 disease through implementation of various control interventions including: mass and routine distribution of Long-Lasting Insecticide Nets (LLINs), Indoor Residual Spraying (IRS) in high endemic districts, adoption of mandatory laboratory confirmation of malaria prior to 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 2021 to June 2022. 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.

PART I: MALARIA PREVENTION

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

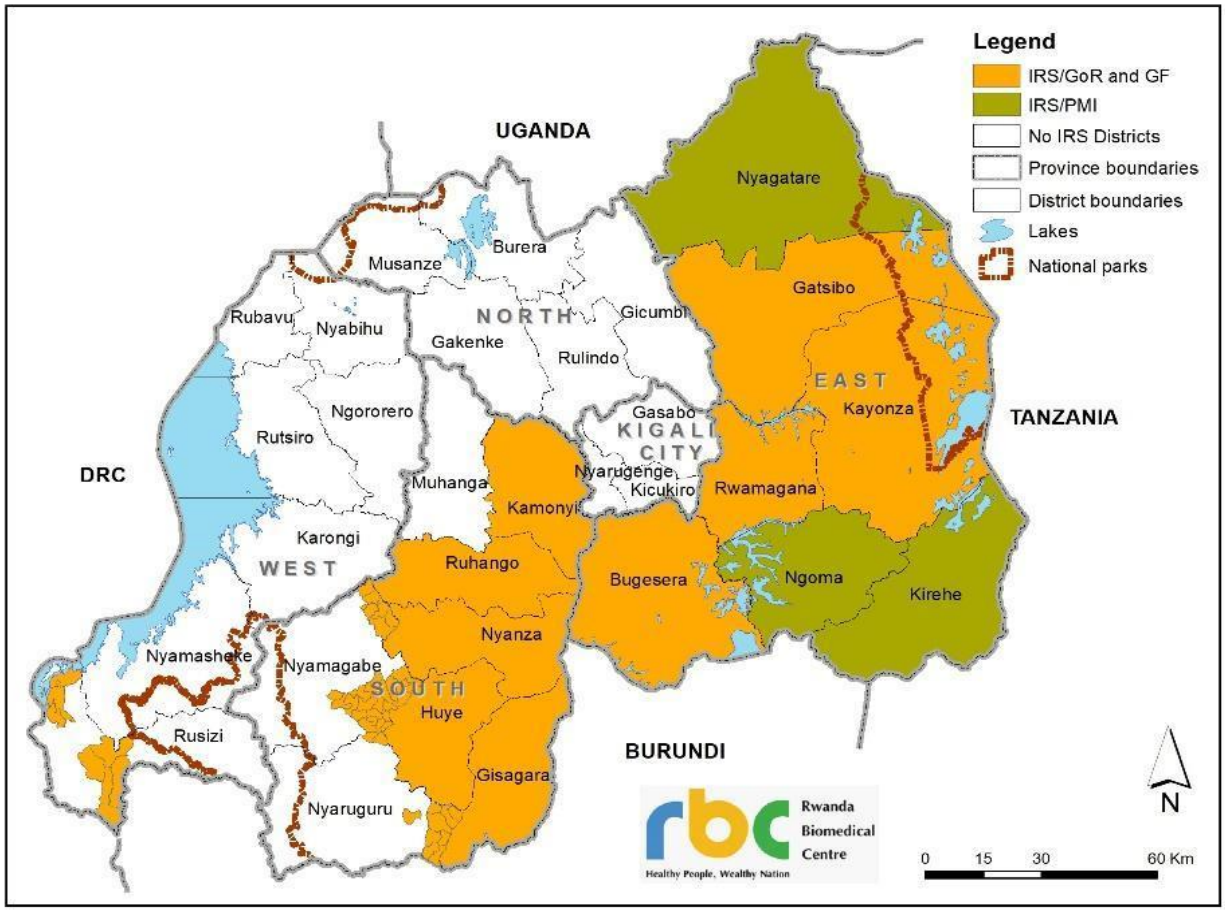
1. Indoor Residual Spraying

During the FY 2021-2022, 15 districts were sprayed. Of these, there was blanket spraying in 12 districts and focal spraying in three districts. Three out of the above districts (Nyagatare, Kirehe, and Ngoma) were supported through the President's Malaria Initiative (PMI) through the VectorLink Project. The remaining 9 districts were supported through the Global Funds and Government of Rwanda (GF/GoR) with blanket coverage of IRS (Bugesera, Gatsibo, Kayonza, Rwamagana in Eastern Province; Gisagara, Huye, Nyanza, Ruhango, Kamonyi).
Focal IRS was implemented in three districts targeting areas with malaria hotspots: Eight sectors (Gikundamvura, Gitambi, Bugarama, Nyakabuye, Muganza, Kamembe, Nkanka and Gihundwe) in Rusizi district and 17 cells from eight sectors in Nyamagabe and Nyaruguru Districts, Southern Province received. **(Fig. 1)**

Over the FY 2021-2022, a total number of 1,376,832 out of 1,387,505 structures were sprayed making a coverage rate of 99.2%. The PMI/VectorLink Rwanda project sprayed 346,277 out of 347,963 structures found with a coverage of 99.5% while the support from GF/GoR covered 1,030,555 out of 1,039,542 found structures with a coverage of 99.1%. The support from the GF/GoR represented 74.8% and 25.2% from PMI/VectorLink Project. In the targeted districts, IRS intervention was performed with blanket coverage in a total of 12 districts (153/153 administrative sectors). A focal IRS was implemented in Rusizi districts where 8 sectors (44%) were sprayed out of the 18 sectors, and in Nyamagabe and Nyaruguru districts with a target of high malaria endemic cells. **(Tab. 1)** In terms of rooms covered, 4,874,244 were sprayed from 4,962,243 rooms found with a coverage of 98.2%. The total population protected was 5,170,303 out of 5,211,467 targeted population with an estimated population coverage of 99.2% in IRS districts.

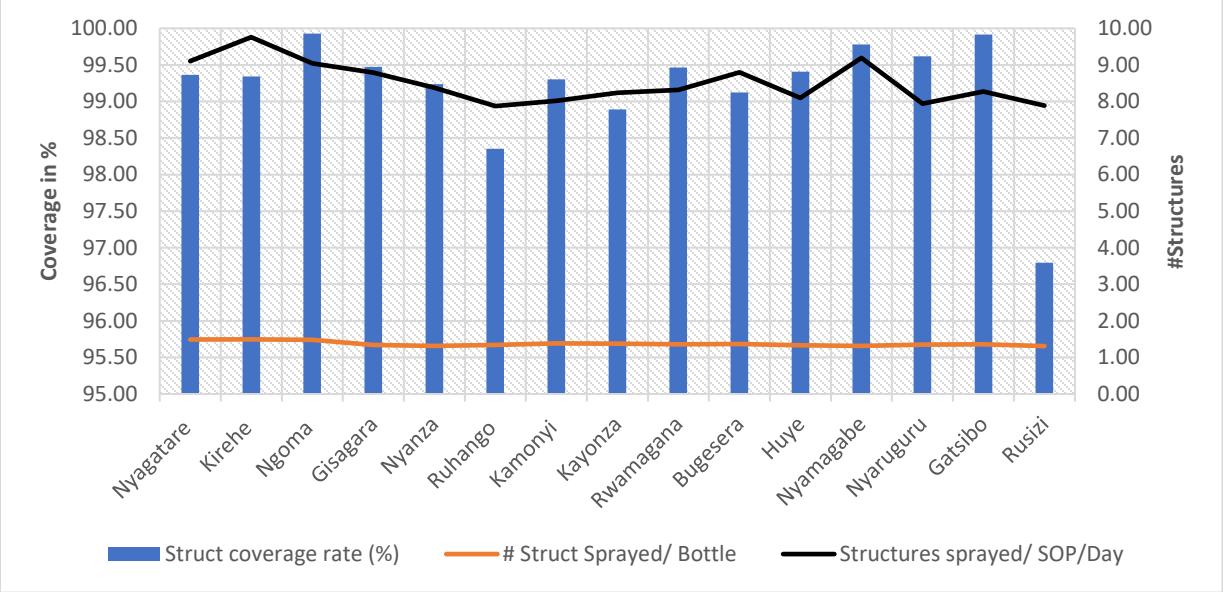
Among the population protected, 72,834 were pregnant women (1.4%) and 686,931 were children below five years (13.29%). The total insecticide used is 995,894 of Actellic 300CS. The quantity of 232,571 bottles of Actellic 300CS procured by PMI, while the quantity of 763,323 bottles of Actellic were procured by GOR/GF **(Tab.2).**

Figure 1 : Indoor Residual Spraying Districts, FY 2021/2022



In terms of performance, one sprayer operator (SOP) performed an average of 8.5 structures per day, with 9.3 and 8.3 structures/SOP/Day in districts supported by PMI and GF/GoR respectively. The highest performance was observed in Kirehe District with 9.8 structures sprayed per SOP per day. The average rooms per sprayed structure were 3.6 and ranging from 3.2 in Ruhango and 4 in Rusizi. In average, 1.38 structures were sprayed by one bottle of insecticide with 1.49 structures in districts supported by PMI and 1.35 structures in districts supported by GF/GoR and ranging from 1.49 in Nyagatare and Kirehe districts to 1.31 structures in Rusizi district **(Figure 2).**

Figure 2: IRS Performance per District, FY2021/2022



Regarding the human resources deployed in the 10 districts supported by GoR/GF, the following temporary employees were planned to support the implementation of IRS: 997 IRS managers at district and sector levels, 1,250 Team Leaders, 6,247 Spray Operators, 10,265 IEC implementers at cell and village levels, 628 washers working at 156 soak pits, and 420 security guards.

In total, 2,817,133,834 RFW were disbursed from GF/GOR and transferred to the district hospitals, with 2,577,401,806 RFW (91.5%) from GF, 239,732,028RFW (8.5%) from GoR. The GoR also contributed 1,686,439,902Frw (11.89%) to procure insecticides and other IRS supplies (Sprayer pumps & PPEs), whereas the GF contributed 12,497,758,931Frw (88,11%). For PMI in total 6,316,626,260 FRW were used to cover the IRS operational cost and commodities in Nyagatare, Ngoma and Kirehe districts. Insecticides and IRS supplies (Sprayer pumps and PPEs) cost a total of 3,805,502,680 FRW whereas 2,511,123,580 FRW to implement IRS.

Table 1: IRS Coverage per Partner and per District, FY 2021/2022

No	District	IRS Start	IRS End	# Struct. Targeted	# Struct. Found	# Struct. Sprayed	Struct. Coverage Rate (%)	Struct. Sprayed / SOP/Day
1	Nyagatare	23.08.2021	17.09.2021	137 204	143 259	142 345	99,4	9,1
2	Kirehe	23.08.2021	17.09.2021	94 827	106 088	105 389	99,3	9,8
3	Ngoma	23.08.2021	17.09.2021	95 681	98 616	98 543	99,9	9,0
	Total covered by PMI			**327 712**	**347 963**	**346 277**	**99,5**	**9,3**
4	Gisagara	23.08.2021	14.09.2021	95576	100 356	99 828	99,5	8,8
5	Nyanza	23.08.2021	14.09.2021	87920	90 638	89 946	99,24	8,4
6	Ruhango	04.10.2021	26.10.2021	104950	105 016	103 287	98,35	7,9
7	Kamonyi	04.10.2021	26.10.2021	111370	112 371	111 589	99,30	8,0
8	Kayonza	04.10.2021	26.10.2021	108098	110 803	109 575	98,89	8,2
9	Rwamagana	25.10.2021	03.12.2021	99076	102 478	101 928	99,46	8,3
10	Bugesera	25.10.2021	27.11.2021	102505	105 767	104 839	99,12	8,8
11	Huye	22.03.2021	14.04.2021	94404	96 077	95 509	99,41	8,1
12	Nyamagabe	22.03.2021	14.04.2021	5970	6814	6799	99,78	9,2
13	Nyaruguru	22.03.2021	14.04.2021	9943	9887	9849	99,62	7,9
14	Gatsibo	28.03.2021	19.04.2021	140128	142936	142814	99,91	8,3
15	Rusizi	28.03.2021	19.04.2021	55412	56399	54592	96,80	7,9
Total GF/GoR				**1 015 352**	**1 039 542**	**1 030 555**	**99,14**	**8,3**

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

No	District	Pop. Targeted	Pop. Protected	PW Protected	< 5YO Protected	Rooms Sprayed	Rooms Coverage (%)	Average Room per Struct.	Total Insecticide Used	# Struct. per Bottle
1	Nyagatare	538 138	534 445	8 100	79 658	455 827	97,7	3,3	95 500	1,49
2	Kirehe	426 582	424 254	6 312	58 391	387 202	98,4	3,7	70 524	1,49
3	Ngoma	381 863	381 582	5 095	48 472	384 422	99,4	3,9	66 547	1,48
Total PMI		**1 346 583**	**1 340 281**	**19 507**	**186 521**	**1 227 451**	**98,4**	**3,6**	**232 571**	**1,49**
4	Gisagara	386 975	385 046	5 790	53 207	380 374	99,0	3,8	74 692	1,34
5	Nyanza	329 827	327 117	4 228	41 157	299 737	98,3	3,4	68 299	1,32
6	Ruhango	351 474	345 540	4 209	41 624	323 800	97,2	3,2	77 039	1,34
7	Kamonyi	399 023	396 087	4 677	47 312	378 219	98,3	3,4	80 576	1,38
8	Kayonza	421 090	416 485	5 974	56 413	377 754	98,0	3,5	79 746	1,37
9	Rwamagana	372 401	370 409	4 877	47 573	372 218	98,6	3,7	75 225	1,35
10	Bugesera	408 317	404 465	6 340	59 638	378 324	97,6	3,7	76 688	1,37
11	Huye	354 205	351 861	4 926	44 113	357 454	98,4	3,8	71 713	1,33
12	Nyamagabe	25652	25588	344	3031	25 429	99,0	3,8	5 169	1,32
13	Nyaruguru	41412	41304	568	5258	38 194	98,6	3,9	7 302	1,35
14	Gatsibo	524117	523721	6999	67601	501 083	99,2	3,5	105 176	1,36
15	Rusizi	250391	242399	4395	33483	214 207	95,1	4,0	41 698	1,31
Total GF/GoR		**3 864 884**	**3 830 022**	**53 327**	**500 410**	**3 646 793**	**98,2**	3,6	**763 323**	**1,35**
Total		**5 211 467**	**5 170 303**	**72 834**	**686 931**	**4 874 244**	**98,2**	**3,6**	**995 894**	**1,38**

2. Insecticide Resistance Monitoring and Quality Control of IRS

2.1. Insecticide Resistance Monitoring

2.1.1. Biological Resistance

From July 2021 to June 2022, the biological resistance tests were performed in 30 different sites. The tests were conducted using WHO guidelines with cylindrical tubes method[1] for the nine 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 Alpha cypermethrin 0.05%); and two new classes of pyrrole (Chlorfenapyr 200µg) and Neonicotinoid (clothianidin 2%). Thus, larvae collections of *Anopheles* genus were performed using the dipping method as described by the WHO[2]. Mosquito larvae were subsequently reared at each site following the standard conditions of temperature (26-28°C) and relative humidity (70-80%). The susceptibility test was carried out on *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 20-25 females per insecticide, and 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. The mortality was calculated as the number 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. Resistance to at least one insecticide was found to be more prevalent in endemic districts in low land areas than in high land. **(Fig. 3)** The resistance was confirmed more to pyrethroids than other classes of insecticides with Alpha-cypermethrin 0.05% for 80%, Permethrin 0.75% for 70% and Deltamethrin 0.05% for 60% of the total sites surveyed. Resistance was not reported only on two insecticides Bendiocarb 0.1% and Fenitrothion 1%. The highest susceptibility was found on Fenitrothion 1% (100%), Chlorfenapyr 200µg (84.6%), clothianidin 2% (77.8%) and Bendiocarb (73.3%). **(Fig. 4)**

[1] WHO (2013). Test procedures for insecticide resistance monitoring in malaria vector mosquitoes

[2] WHO (2013) Malaria entomology and vector control – Learner's Guide

Figure 3 : Distribution of Insecticide Resistance to Pyrethrinoid Insecticides

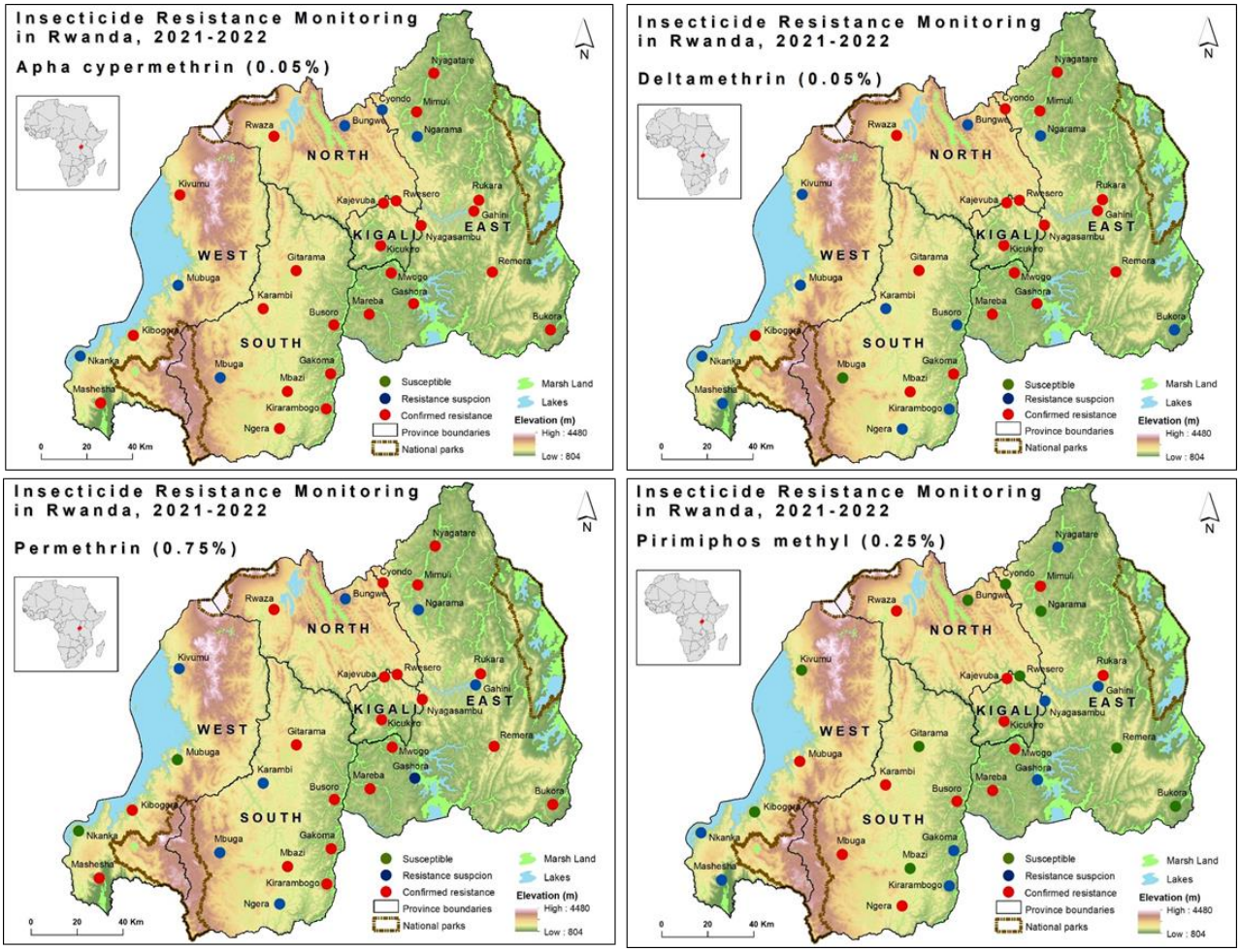
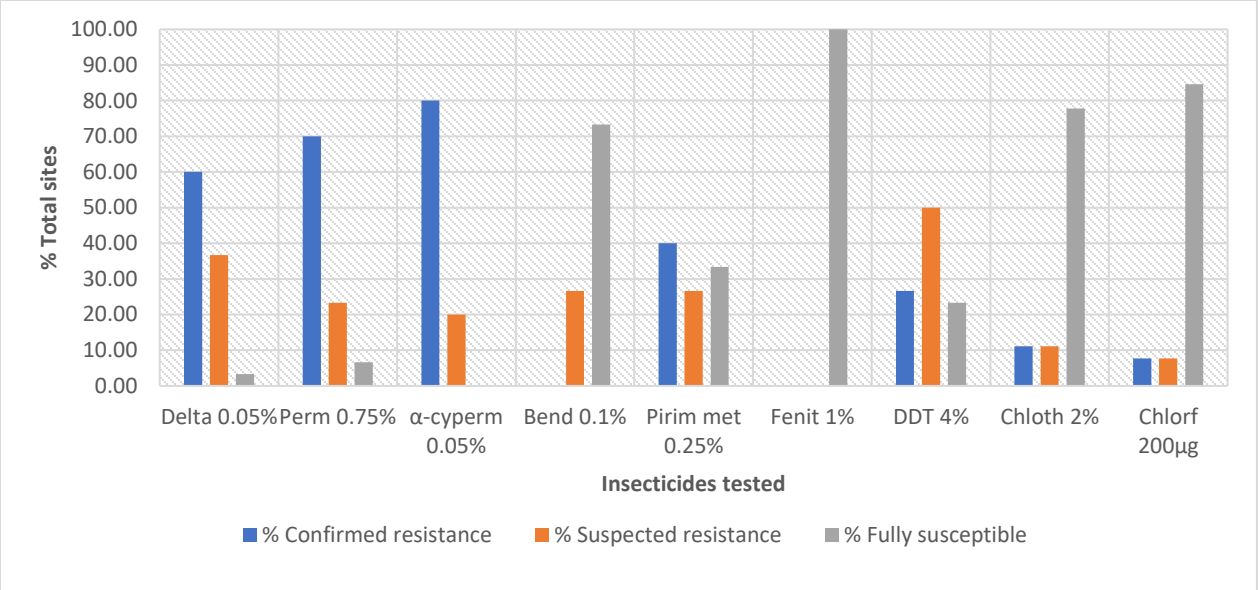


Figure 4 : Levels of Insecticide Resistance per Insecticide Product



a. Resistance Mechanisms

In the sites with confirmed resistance to pyrethroid insecticides; the addition of synergist, the Piperonyl Butoxide (PBO) restored fully susceptibility (100%) to Deltamethrin 0.05%, 95% to permethrin 0.75% and 92.3% to Alpha-cypermethrin 0.05% **(Table 3).** The results suggest a role of metabolic mechanism of resistance in mediating pyrethroid resistance in malaria vectors from surveyed sites. Out of the three insecticides tested, the susceptibility was less restored to Alpha-cypermethrin which implies the suspicion of other potential resistance mechanisms to be explored in the future **(Table 3).**

Table 3 : Results of Resistance Tests for Insecticides Performed, 2021-2022

Susceptibility Status	Product Name					
	Delta. 0.05%+PBO		***Perm. 0.75%+PBO***		***α-cyper 0.05%+PBO***	
	# Sites (n=18)	**%**	**# Sites (n=20)**	**%**	**# Sites (n=26)**	**%**
Resistance with PBO confirmed	0	0	0	0	0	0
Resistance with PBO suspected	0	0	1	5	2	7.7
Susceptibility restored with PBO	18	100	19	95	24	92.3

b. Resistance Intensity Using WHO Susceptibility Test Kits

The intensity of the resistance was also measured and tested in sites where the resistance at diagnostic doses was confirmed to pyrethroid insecticides. The intensity assays were performed at five (5x) and ten (10 x) times the diagnostic dose described for biological resistance tests. The resistance was found to be low and to high levels. The intensity to Deltamethrin was found high in one site of Nkanka, Rusizi district with 5.3% of surveyed sites. The resistance intensity was low to moderate to permethrin. The high resistance intensity was found in 6 sites (Karambi, Kicukiro, Kirarambogo, Mareba, Mimuli and Mwogo) for Alpha-cypermethrin 0.05% and representing 23.1% of surveyed sites **(Table 4).**

Table 4: Insecticide Resistance Intensity in 26 Sites with Confirmation of Resistance

Insecticides tested and concentration	Total sites surveyed	# Sites with mortality <98%	# Sites with mortality >=98%	% Sites with mortality <98%	% Sites with mortality >=98%
Deltamethrin 0.05% (5x)	13	4	9	30.8	69.2
Permethrin 0.75% (5x)	21	8	13	38.1	61.9
Alpha cypermethrin 0.05% (5x)	26	20	6	76.9	23.1
Deltamethrin 0.05% (10x)	19	1	18	5.3	94.7
Permethrin 0.75% (10x)	21	0	21	0.0	100.0
Alpha cypermethrin 0.05% (10x)	26	6	20	23.1	76.9

Remark: (5x ≥ 98% mortality = low intensity, < 98% mortality = moderate intensity; 10x ≥ 98% mortality = moderate intensity, < 98% mortality = high intensity)[3]

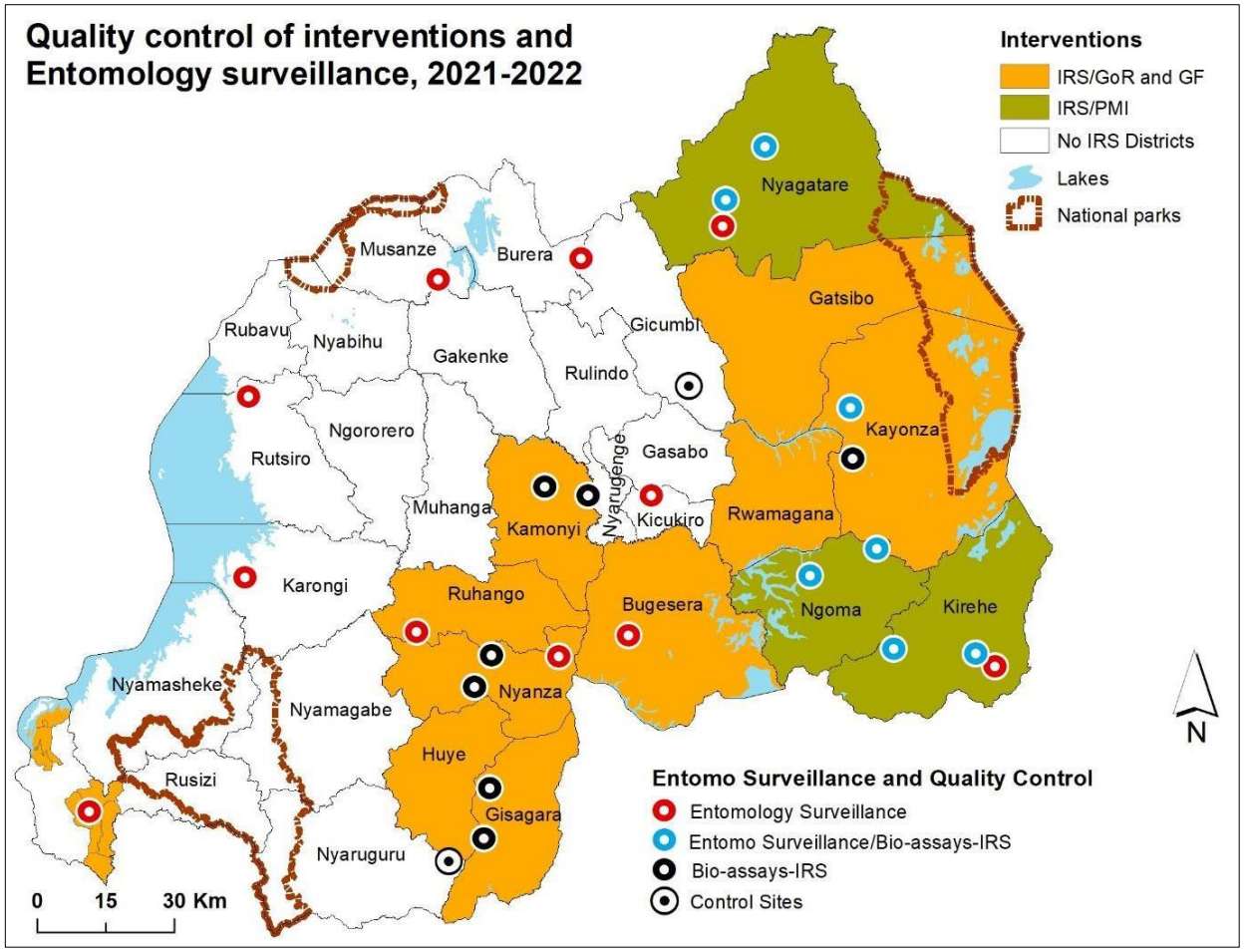
3. Quality Control of Interventions and Entomology Surveillance

3.1. Quality Control of IRS using Wall Bioassays

IRS quality control (wall bioassays) was performed one-week post IRS as well as on a monthly basis 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 were: Gisagara, Kamonyi, Kayonza, Kirehe, Ngoma, Nyagatare and Nyanza.

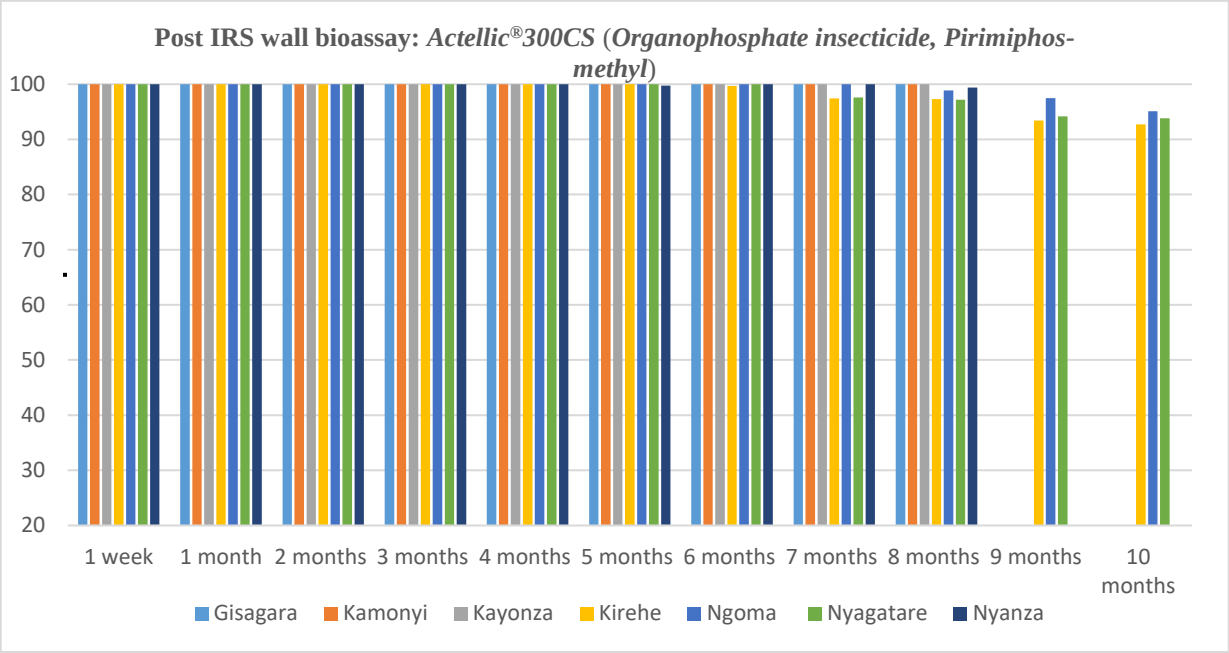
[3] WHO (2013). Test procedures for insecticide resistance monitoring in malaria vector mosquitoes

Figure 5: Quality Control of Interventions and Entomology Surveillance 2021-2022



The IRS quality control was performed in 2 sectors from each of the seven out of 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 MOPDD/RBC insectary based at the 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, the ***Actellic®300CS*** (***Organophosphate insecticide, Pirimiphos-methyl***). The mortality was calculated for both exposed and control samples.

Figure 6 : Post IRS Wall Bioassays Performed in FY 2021-2022



The results and sites of the post IRS wall bioassays are shown in figure 6 and 7. The results of the wall bioassay were available up to eight months in Gisagara, Kamonyi, Kayonza and Nyanza, ten months in Nyagatare, Ngoma and Kirehe. 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***) of more than ten months in the context of Rwanda as shown the above results from all Districts. **(Fig. 6)**

2.2. Quality Control of IRS using Entomology Monitoring

The entomological monitoring was carried out, from July 2021 to June 2022 in two sites located in each IRS district Nyagatare (Nyagatare & Rukomo), Kirehe (Gatore & Nyamugali) and Ngoma (Zaza & Remera). The control district was Nyaruguru (Ngera) from July 2021 to March 2022, and then replaced with Gicumbi (Rwamiko) from April 2022 to June 2022. Between July 2021 and June 2022, mosquitoes were collected from indoor and outdoor on a monthly basis for assessment of the following parameters: vector bionomics using human landing catching method and indoor resting behavior of mosquitoes using Pyrethrum Spraying catching method.

- As shown in tables below, during the period of activities, 18 506 mosquitoes (*Culicidae*) were collected using human landing catching method and out of them, 92.8% (n=17179) were *Culicinae* and 7.2% (n=1327) Anopheles mosquitoes. The

Anopheles gambiae s.l. were the major malaria vectors and representing 76.6% (n=1017) of the total catches of anopheles mosquitoes. Other Anopheles mosquitoes collected were respectively *An. coustani 0.2%, An. funestus 2.0%, An. pharoensis 2.2%, An. maculipalpis 2.4%, An. squamosis 4.1%* and *An. ziemanni 12.4*%. Of the *An. gambiae* s.l. collected, 55.3% (n=478) caught outside the houses while the 44.7% (n=387) of other Anophelines mosquitoes were also collected outside the dwellings.

- The biting rate by *Anopheles gambiae s.l.* varied from 0.1 to 3.0 bites per person per night within sites, the biting rate by *Anopheles* varied from 0.4 to 3.0 bites per person per night within sites with an average of 1.6 bites per person per night. The average biting rate of mosquitoes in general *(Culicidae)* was 16.7 bites per person per night and ranging from 9.9 to 27.6 bites per person per night.
- The total collected mosquitoes through PSC method were 2,736 mosquitoes including *152 Anopheles gambiae s.l.*, 35 total *Anophelines* and *1181 Culicinae* from eight sites. Among *Anophelines*, 152 (55.3%) were unfed and 68 (44.7%) were found fed. In total 33 were fresh fed, 17 half-gravid and 18 gravid. The proportion of gravid was 51% in all sites.
- The determination of parity on a sample of 547 ***Anopheles gambiae s.l.*** dissected and collected from inside and outside in IRS sites and outside in none IRS site (control) showed respectively that the parous rates were 16.3% (n=516) in IRS sites and 48.4% (n=31) in none IRS sites. The results showed that the IRS intervention affects by reducing the longevity of malaria vectors.
- 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 0.8 infected bite per person and per year for 1303 Anophelines tested with a sporozoite infection rate of 0.7 % from the eight sites.
- Out of 27 anopheles' mosquito tested for blood meal, 25.9% were fed on human, 51.9% were fed on bovine, 11.1% were fed on multiple hosts (human, bovine and goat), while 11.1% was unspecified blood source.
- The speciation of *Anopheles gambiae* s.l. was performed in the entomology lab to identify the siblings of *Anopheles gambiae* complex. Out of 797 samples analyzed using PCR-identification, 8.8% samples were found to be *Anopheles gambiae s.s.* and 91.2% were *Anopheles arabiensis*. The dominant malaria vector recently became *Anopheles arabiensis* in the most entomological monitoring sites within IRS districts.

Table 5 : Distribution of Malaria Vectors Collected Using HLC–July 2021-June 2022

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	38	83	121	5	45	50	3075	72	5	163	248	3238	3 486
2	Nyamugali	8	48	56	0	2	2	1367	0	0	104	58	1471	1 529
3	Nyagatare	44	77	121	0	8	8	2128	4	0	96	133	2224	2 357
4	Rukomo	245	191	436	1	2	3	2361	45	0	341	484	2702	3 186
5	Remera	23	31	54	3	15	18	1483	2	1	67	75	1550	1 625
6	Zaza	15	31	46	14	38	52	3879	11	6	153	115	4032	4 147
7	Ngera	8	7	15	45	88	133	1191	17	18	188	183	1379	1 562
8	Rwamiko	6	10	16	4	5	9	514	1	5	69	31	583	614
Total		**387**	**478**	**865**	**72**	**203**	**275**	**15998**	**152**	**35**	**1 181**	**1 327**	**17179**	**18 506**

Table 6 : Biting Behavior of Malaria Vectors Collected Using HLC–July 2021-June 2022

No	Site Name	Biting Behavior %				Biting Rate Person/Night				Inf Rate (%) An	EIR An. spp
		Ag. Endo	Ag. Exo	Ot.An. Endo	Ot.An. Exo	An.g	An. spp	Cnes	Cdes		
1	Gatore	31,4	68,6	10,0	90,0	0,8	1,2	21,4	22,5	0,0	0,0
2	Nyamugali	14,3	85,7	0,0	100,0	0,4	0,4	9,5	9,9	0,0	0,0
3	Nyagatare	36,4	63,6	0,0	100,0	0,8	0,9	14,8	15,7	1,6	1,4
4	Rukomo	56,2	43,8	33,3	66,7	3,0	3,0	16,4	19,4	0,0	0,0
5	Remera	42,6	57,4	16,7	83,3	0,4	0,5	10,3	10,8	0,0	0,0
6	Zaza	32,6	67,4	26,9	73,1	0,3	0,7	26,9	27,6	0,9	0,6
7	Ngera	53,3	46,7	33,8	66,2	0,1	1,4	11,0	12,4	0,0	0,0
8	Rwamiko	37,5	62,5	44,4	55,6	0,4	0,7	14,3	15,0	3,3	2,3
Total		**44,7**	**55,3**	**26,2**	**73,8**	**0,8**	**1,1**	**15,6**	**16,7**	**0,7**	**0,8**

Table 7: Results of Pyrethrum Spraying Catches: Anophelines –July 2021 to June 2022

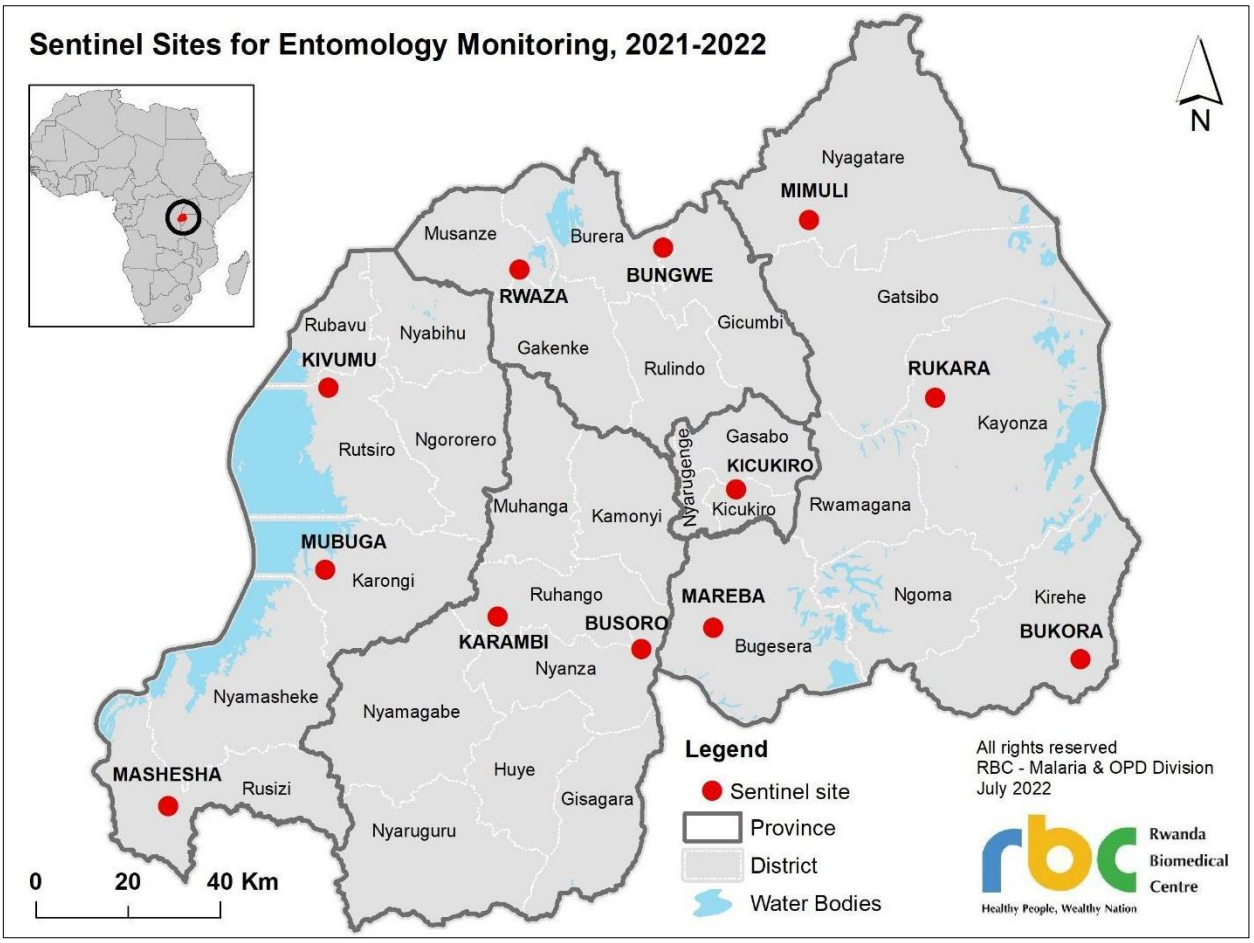
Period	Site	# Hrs	*An.g* s.l	*Ot An.*	Blood Digestion Stages				% gravid An. g	*An. g* s.l. *per house*	Fed/ house	Culicinae
					UF^	F^	HG^	G^				
July 2021 - June 2022	Gatore	180	72	5	50	6	5	11	73%	0,4	0,1	163
	Nyamugali	180	0	0	0	0	0	0	#DIV/0!	0,0	0,0	104
	Nyagatare	180	4	0	1	2	0	1	33%	0,0	0,0	96
	Rukomo	180	45	0	24	13	6	2	38%	0,3	0,1	341
	Remera	180	2	1	0	1	0	1	50%	0,0	0,0	67
	Zaza	180	11	6	5	3	2	1	50%	0,1	0,0	153
	Ngera	135	17	18	3	8	4	2	43%	0,3	0,1	188
	Rwamiko	45	1	5	1	0	0	0	#DIV/0!	0,1	0,0	69
Total		**1260**	**152**	**35**	**84**	**33**	**17**	**18**	**51%**	**0,1**	**0,1**	**1181**

Abbreviations: 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

2.3. 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 Nothern Province, Rukara, Bukora, Mareba and Mimuli in Eastern Province; Busoro, Karambi in Southern Province; Mashesha, Kivumu, Mubuga in Western Province and Kicukiro in Kigali City **(Figure 7)**. Between July 2021 and June 2022, mosquitoes were collected using human landing catching method from indoor and outdoor on a monthly basis for assessment of the different entomological parameters.

Figure 7: The Sentinel Sites for Entomology Surveillance



As shown in table 11, during the entomology activities for the FY, 95,993 mosquitoes (Culicidae) were collected out of them 19.6% were *An. gambiae* s.l., 21.3% total anopheles and 78.7% culicines. Out of 20,483 total anopheles mosquitoes, 92.0% were *An. gambiae* s.l., 1.29% *An. funestus* and 6.7% other anopheles species. The primary malaria vector for this FY 2021/2022 is An. gambiae s.l. (figure 8). Over that period, 62.2.0% *Anopheles gambiae s.l.* were collected outside and ranging from 33.3% in Karambi to 100% in

Bungwe. The average of outdoor biting was 59.1% in non IRS sites while it was 62.8% in IRS sites. Overall, 264 *Anopheles funestus* were caught with more than 96.6% of the total collections in only four sites of Bungwe (34.8%, n=92%), Kivumu (32.6%, n=86), Kicukiro (16.3%, n=43 and Mubuga (11.7%, n=31). 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 24.8 (Mashesha) bites per person per night (b/p/n), with an average of 3.6 b/p/n. The average human biting rate of *An. gambiae s.l.* was found respectively 1.6 and 5.1 b/p/n in IRS and non IRS sites while it was 18.5 b/p/n in *Culicidae* and ranging from 3.5 (Rukara) to 39.9 (Mashesha) b/p/n with 13.7 and 25.3 b/p/n in IRS and non IRS sites. There was respectively a decrease of mosquito density of 44% in *An. gambiae* s.l. (from 6.5 to 3.64 b/p/n) and of 29.8% in total *Culicidae* in comparison with mosquito catches of 2020/2021. Except for Kicukiro in Kicukiro District, where the increase of *An. gambiae* s.l. was observed (from 3.6 to 6.98 b/p/n), 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 mainly in Kabuye sampling site located in Jabana sector, Gasabo district. The general endophagic rate of *An. gambiae* s.l. was 37.8% and varying from 37.2% in IRS districts and 40.4% in non IRS districts **(Fig. 9).**
Regarding the detection of sporozoite infection rate (SIR), in total, 7095 An. mosquitoes were tested using ELISA to detect *plasmodium* infection and 11 specimens were found positive with an average SIR of 0.16%. Out of 5792 Anopheles belonging to 15 species collected from non IRS sites, 7 were positives to plasmodium infection with a SIR of 0.12%. In IRS sites, 1303 specimens from 8 An. spp were tested and 4 were carrying Plasmodium infection with an SIR of 0.31% **(Table 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 1.6 ib/p/y for *An. gambiae* s.l. and 0.12 ib/p/y for *An. funestus*. The *An. gambiae* s.l. carrying *Plasmodium* sp infections were found in four sites of Mashesha and Busoro in IRS districts, Kicukiro and Mubuga in non IRS districts. The infection in *An. funestus* was only reported from Kicukiro sentinel site with 5.88 ib/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 8: Comparison of An. gambiae s.l. and total Anopheles collected vs to total Anopheles spp and Culicidae FY 2021/2022

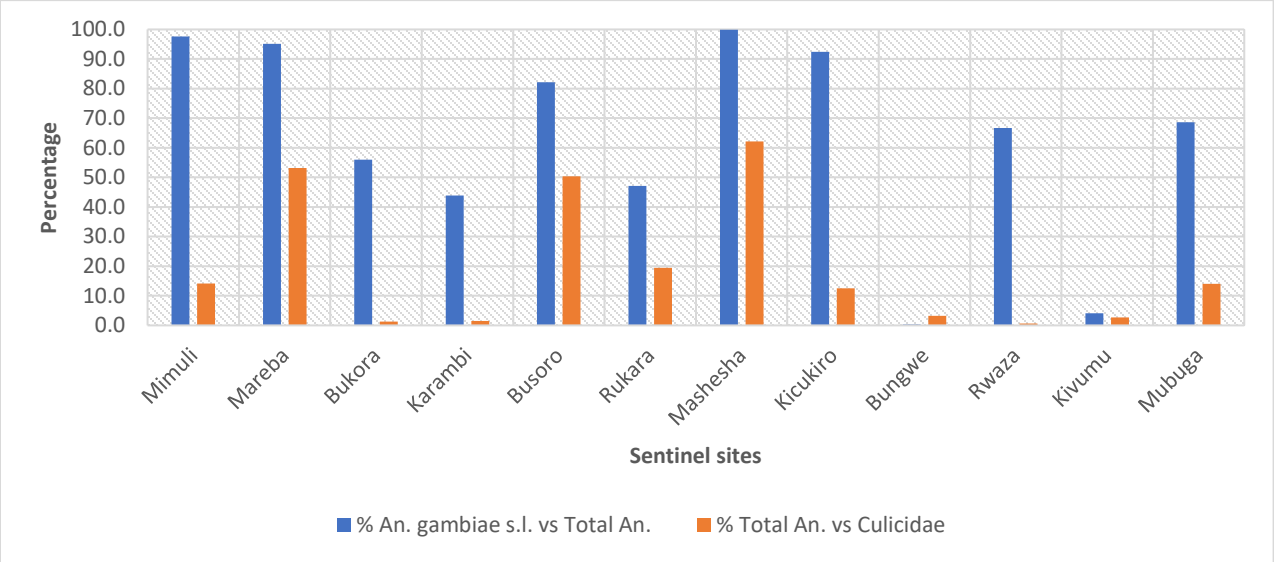


Figure 9: Trends of Endophagic Rate of An. gambiae s.l. per Site 2021/2022

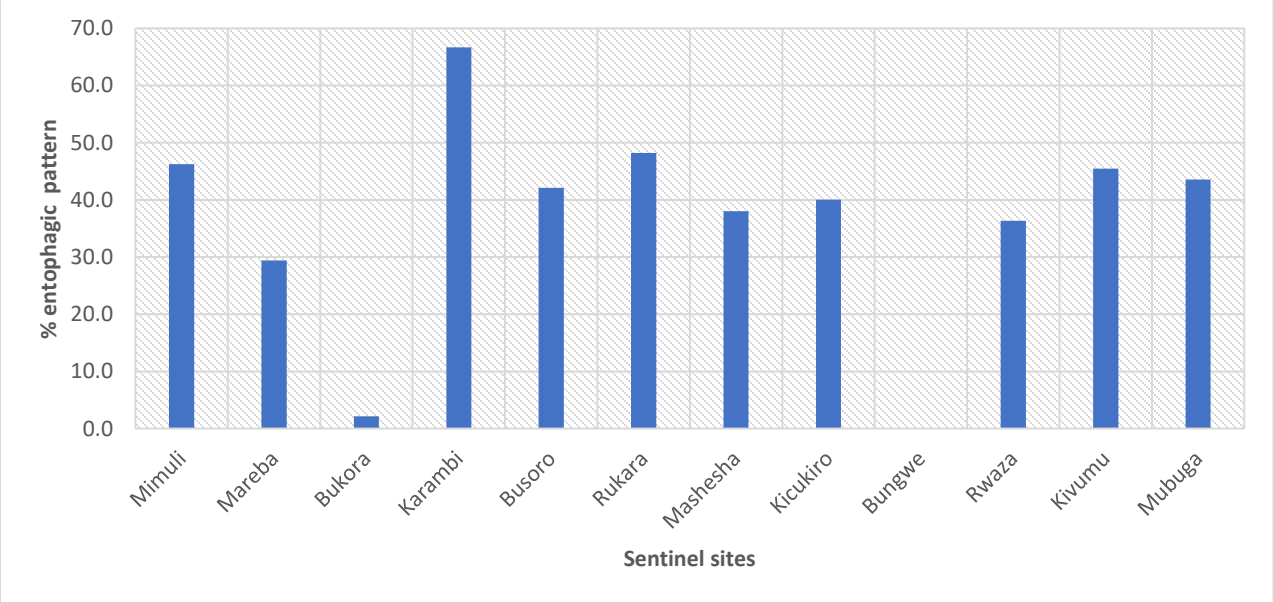


Table 8: Distribution of Malaria Vectors in 12 Sentinel Sites in Number

#	Site name	An. gambiae s.l.			An. funestus s.l.			Total Anopheles	Total Culicinae	Total Culicidae	% An. gambiae vs Total An.	% Total An. vs Culicidae	% Culicines vs Culicidae.
		Inside	Outside	Total	Inside	Outside	Total						
1	Mimuli	325	378	703	0	0	0	720	4,378	5,098	97.6	14.1	85.9
2	Mareba	790	1,897	2,687	2	1	3	2,826	2,484	5,310	95.1	53.2	46.8
3	Bukora	1	46	47	0	0	0	84	6,535	6,619	56.0	1.3	98.7
4	Karambi	12	6	18	0	0	0	41	2,749	2,790	43.9	1.5	98.5
5	Busoro	481	662	1,143	0	0	0	1,392	1,371	2,763	82.1	50.4	49.6
6	Rukara	67	72	139	0	0	0	295	1,220	1,515	47.1	19.5	80.5
7	Mashesha	4,071	6,639	10,710	0	0	0	10,722	6,527	17,249	99.9	62.2	37.8
IRS Districts		**5,747**	**9,700**	**15,447**	**2**	**1**	**3**	**16,080**	**25,264**	**41,344**	**96.1**	**38.9**	**61.1**
8	Kicukiro	1,208	1,809	3,017	26	17	43	3,263	22,749	26,012	92.5	12.5	87.5
9	Bungwe	0	1	1	26	66	92	327	9,778	10,105	0.3	3.2	96.8
10	Rwaza	8	14	22	4	5	9	33	4,743	4,776	66.7	0.7	99.3
11	Kivumu	5	6	11	37	49	86	269	9,856	10,125	4.1	2.7	97.3
12	Mubuga	153	198	351	18	13	31	511	3,120	3,631	68.7	14.1	85.9
Non IRS Districts		**1,374**	**2,028**	**3,402**	**111**	**150**	**261**	**4,403**	**50,246**	**54,649**	**77.3**	**8.1**	**91.9**
Total		**7,121**	**11,728**	**18,849**	**113**	**151**	**264**	**20,483**	**75,510**	**95,993**	**92.0**	**21.3**	**78.7**

Table 9: Distribution of Malaria Vectors in 12 Sentinel Sites

#	Site name	Biting behavior (%)				Human biting rate (b/p/n)			SIR (%) An. g	EIR An.g	SIR (%) An.f	EIR An.f
		An.g Endo	An.g Exo	An.f Endo	An.f Exo	An.g	An.f	Culicidae				
1	Mimuli	46.23	53.77	0.00	0.00	1.63	0.00	11.80	0.00	0.00	0.00	0.00
2	Mareba	29.40	70.60	66.67	33.33	6.22	0.01	12.29	0.00	0.00	0.00	0.00
3	Bukora	2.13	97.87	0.00	0.00	0.11	0.00	15.32	0.00	0.00	0.00	0.00
4	Karambi	66.67	33.33	0.00	0.00	0.04	0.00	6.46	0.00	0.00	0.00	0.00
5	Busoro	42.08	57.92	0.00	0.00	2.65	0.00	6.40	0.22	2.08	0.00	0.00
6	Rukara	48.20	51.80	0.00	0.00	0.32	0.00	3.51	0.00	0.00	0.00	0.00
7	Mashesha	38.01	61.99	0.00	0.00	24.79	0.00	39.93	0.15	13.51	0.00	0.00
IRS Districts		**37.20**	**62.80**	**66.67**	**33.33**	**5.11**	**0.00**	**13.67**	**0.07**	**1.37**	**0.00**	**0.00**
8	Kicukiro	40.04	59.96	0.00	0.00	6.98	0.10	60.21	0.19	4.86	5.88	2.14
9	Bungwe	0.00	100.00	28.26	71.74	0.00	0.21	23.39	0.00	0.00	0.00	0.00
10	Rwaza	36.36	63.64	44.44	55.56	0.05	0.02	11.06	0.00	0.00	0.00	0.00
11	Kivumu	45.45	54.55	43.02	56.98	0.03	0.20	23.44	0.00	0.00	0.00	0.00
12	Mubuga	43.59	56.41	58.06	41.94	0.81	0.07	8.41	0.25	0.73	0.00	0.00
Non IRS Districts		**40.39**	**59.61**	**42.53**	**57.47**	**1.58**	**0.12**	**25.30**	**0.20**	**1.16**	**0.66**	**0.29**
Total		**37.78**	**62.22**	**42.80**	**57.20**	**3.64**	**0.05**	**18.52**	**0.12**	**1.58**	**0.62**	**0.12**

Abbreviations: In: Inside; Out: Outside; An.: *Anophelines*; An.g: *Anopheles gambiae* s.l.; 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

A. Non-IRS Districts				
#	**Anopheles species**	**Total tested**	**Tested Positive**	**SIR**
1	*An. gambiae s.l.*	4,211	5	0.12
2	*An. funestus s.l.*	321	2	0.62
3	*An. ziemanni*	482	0	0.00
4	*An. maculipalpis*	38	0	0.00
5	*An. pharoensis*	176	0	0.00
6	*An. coustani*	87	0	0.00
7	*An. christyi*	385	0	0.00
8	*An. squamosus*	13	0	0.00
9	*An. moucheti*	3	0	0.00
10	*An. broheri*	2	0	0.00
11	*An. rhodesiensis*	52	0	0.00
12	*An. demeilloni*	3	0	0.00
13	*An. marshallii*	3	0	0.00
14	*An. rufipes*	5	0	0.00
15	*An. spp*	11	0	0.00
	Total	**5,792**	7	0.12
B. IRS Districts				
#	**Anopheles species**	**Total Tested**	**Tested Positive**	**SIR**
1	*An. gambiae s.l.*	1006	3	0.30
2	*An. funestus s.l.*	23	0	0.00
3	*An. ziemanni*	162	1	0.62
4	*An. maculipalpis*	28	0	0.00
5	*An. pharoensis*	28	0	0.00
6	*An. coustani*	3	0	0.00
8	*An. squamosus*	53	0	0.00
Total		**1303**	**4**	0.31
Grand Total		**7095**	**11**	**0.16**

3. Climate Surveillance

3.1. Climate Surveillance

Table 11: Annual Rainfall, Temperature, and Relative Humidity for Ten Sites

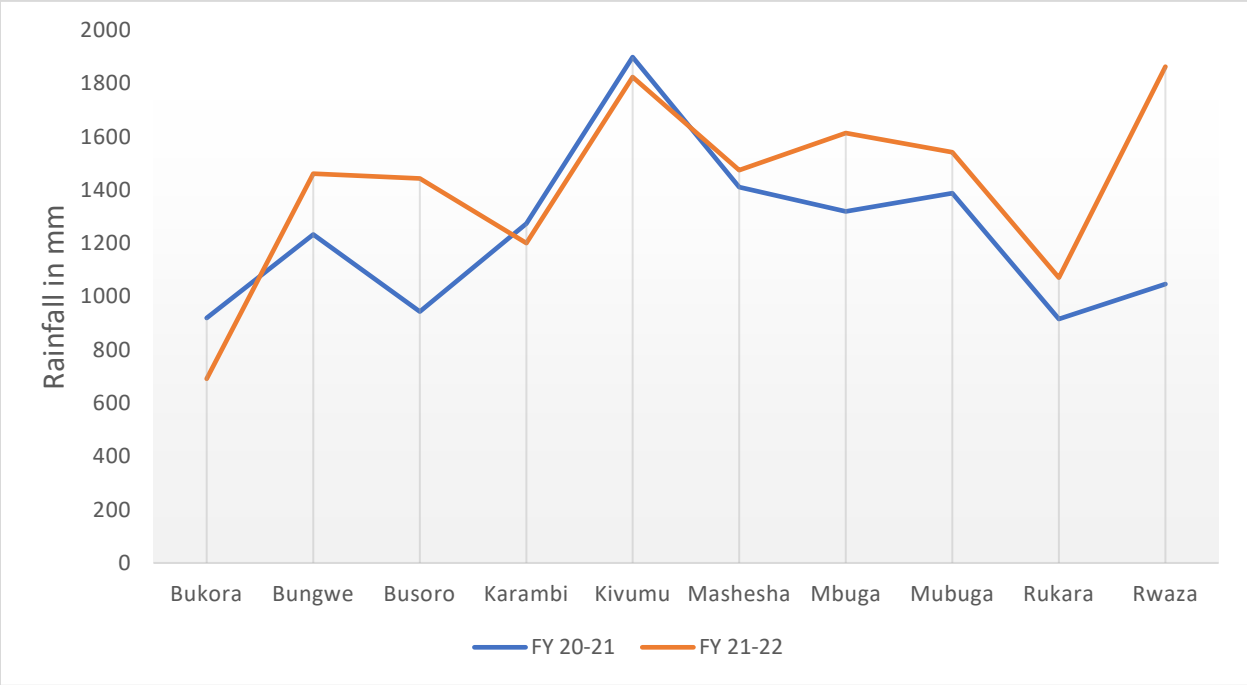
District	Station	An. Max Temp	An. Min Temp	An. Mean Temp	An. Rainfall	R. Humidity (%)
Kirehe	Bukora	29,49	14,72	22,11	691,4	67,30
Burera	Bungwe	20,39	14,08	17,21	1461,0	-
Nyanza	Busoro	27,05	12,16	19.57	1443,7	59,10
Ruhango	Karambi	26,05	13,27	19,65	1201,2	57,05
Rutsiro	Kivumu	22,80	12,23	16,99	1824,7	72,33
Rusizi	Mashesha	30,45	11,49	20,92	1475,1	67,43
Nyamagabe	Mbuga	22,51	12,07	17,29	1613,9	-
Karongi	Mubuga	25,82	10,82	18,32	1541,8	66,46
Kayonza	Rukara	26,44	15,54	20,98	1071,1	65,55
Musanze	Rwaza	24,54	13,14	18,79	1863,0	60,03

This spatial variation of the three climatic variables (temperature, rainfall, and R. humidity) is mostly contributing to the distribution of *Anopheles* mosquitoes. Bukora (Kirehe District) and Rukara (Kayonza District) are the highest warmed stations with respectively 22.11°C and 20.98°C.

The annual rainfall increased in 2021-2022 compared to the previous year. Six stations out of ten registered a high rainfall depth varying between 1440-1863mm. These are Busoro (Nyanza District, 1444mm), Bungwe (Burera District, 1461mm), Mashesha (Rusizi District, 1475mm), Mubuga (Karongi District, 1541.8mm), Mbuga (Nyamagabe District, 1614mm), Kivumu (Rutsiro District, 1825mm) and Rwaza (Musanze District, 1863mm). The short dry season of mid-January to end February was not occurred but it was at that period when the peak of rainfall was reported **(Figure 10).** This latter climate phenomenon was abnormal compared to the normal peaks of rainfall usually observed in April-May and November-December of each year.

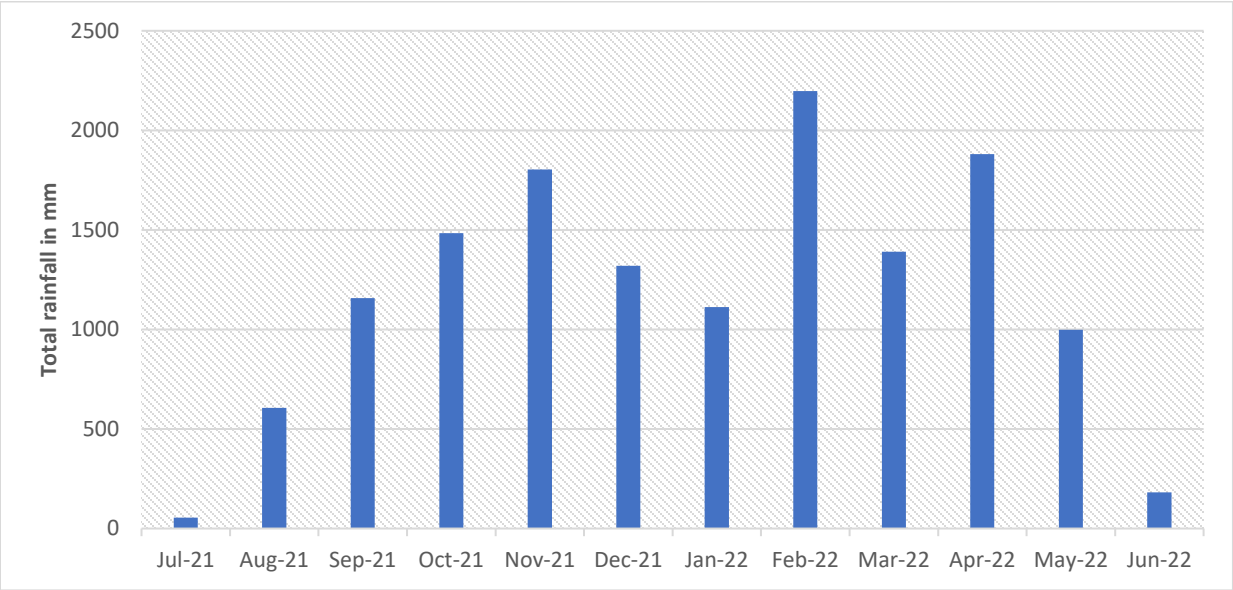
The data indicate that climatic parameters collected in 10 sentinel sites remain a risk factor of malaria transmission in many areas. It has been confirmed that malaria transmission is more likely to occur where temperature ≥18 ≤ 35°C, rainfall > 80 mm, and Relative humidity > 60 %[4] if prevention interventions are not optimized.

Figure 10: Comparison of Rainfall between 2020-2021 and 2021-2022



[4] 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

Figure 11: Annual Rainfalls Patterns Reported from 10 Sites, 2021/2022



The combination of climate parameters indicates that Kicukiro sentinel site of Kicukiro district reported more mosquitoes (Culicidae) with 27.1% (n=95,993) of the catches and while Mashesha sentinel site reported 56.8% (n=18,849) of the total *an. gambiae* s.l. collected from the 12 sentinel sites. is more likely to host more vectors compared to the other nine sites. Consequently, 60.21 % of all *Anopheles* collected at 12 sites were reported from Mashesha sentinel site **(Table 8).**

4. Maintenance of Insectary and Laboratory Animals

The susceptible Kisumu strain of *Anopheles gambiae* s.s. were maintained at the Mal&OPDC/RBC insectary based at National Entomology Laboratory of Kicukiro which comply with the WHO mosquito rearing standards. The total of 67,000 including *Anopheles gambiae s.s* and wild Anopheles mosquitoes were supplied for the following activities. 52000 females *Anopheles gambiae s.s.* 2-5 days old were supplies for IRS quality control in sprayed districts. 12000 females *Anopheles gambiae s.s.* 2-5 days old were supplies for LLINs bioassay and 3000 wild Anopheles mosquitoes 2-5 days old were also collected, reared at sentinel sites to be used in LLINs bioassay as resistant mosquitoes. During the IVM training at Sector level, estimate of 120,000 wild larvae mosquitoes (L3 &L4, Pupae) were collected at different sites of training and were used as demonstration materials of mosquito life cycle and mosquito position in the water and on wall.

During the period of July 2021 to June 2022, the total of 103 Guinnea pigs were kept at insectary for feeding mosquito colony. Out of them 84 were supplied in the community to

improve food deficiency for the poor families around the entomology Laboratory. Current 19 are kept healthy and ready to supply blood for mosquitoes.

5. Supplemental Interventions, Capacity Building and Research

5.1. Supplemental Innovations

- The MOPDD in partnership with Society for Family Health (SFH), distributed through social marketing mosquito repellents and bed nets countrywide. In total 30,835 Baygon coils, 16, 705 Off soft & Scented tubes, 30,241 Off soft & Scented sachets as mosquito repellents were distributed while 1,874 bed nets were distributed through private sector channels such as pharmacies and supermarkets and trading shops.

- RBC/MOPDD in collaboration with CHARIS UAS and SFH, conducted a field reconnaissance for the assessment and mapping of potential mosquito habitats in five districts with currently high malaria incidence namely Gasabo, Kamonyi, Huye, Nyamasheke and Rusizi. The main purpose of the survey was to estimate the real size of areas to be targeted for larval source management. The flooded water and rice cultivation areas will be sprayed using drones because of accessibility difficulties while the non-flooded areas with accessibility to human will be treated using hand applications of larvicides. In Gasabo district, the targeted areas to be sprayed with Bti was estimated to 964,8 ha with 426,4 ha covered with water bodies or cultivated with seasonal irrigated rice. The later size will be sprayed using drones while remaining size of 538,4 ha will be sprayed using hand application **(Table 12)**

Table 12: Estimated Areas for Larviciding in Targeted Districts

District	Site	Total size of Marshlands (Ha)	Rice-Cultivated (Ha)	Water Bodies (Ha)	Rice & Water Bodies (Ha)
Gasabo	Rugende	396,2	228,1	16,1	244,2
Gasabo	Kabuye	568,6	119,6	62,6	182,1
Kamonyi	Kamonyi	404,4	111,7	0,0	111,7
Huye	Huye	448,9	361,2	3,6	364,8
Nyamasheke	Nyamasheke	338,4	289,6	3,0	292,5
Rusizi	Bugarama	1625,6	1565,8	0,0	1565,8
Total		**3782,0**	**2675,9**	**85,3**	**2761,3**

- In Collaboration with Rwanda Agricultural Board (RAB) and MINAGRI, a restocking of 38,303,270 larvivorous fingerings of Tilapia were restocked in water bodies with respectively 2,184,713 in water dams, 3,7070,616 in fish ponds and 32,410,941 in cages fish farming.

5.2. Capacity Building

Within the framework of Integrated Vector Control through inter-sectorial collaboration, capacity building and entomology surveillance, the following activities were achieved:

a. Training on Integrated Vector Management (IVM)

The MOPDC in collaboration with USAID/Ingobyi Activity and CSOs (SFH Rwanda, CARITAS-Rwanda, Profemmes Twese Hamwe, URUNANA, RDO and RICH) conducted a training on IVM in 22 districts. The training targeted different stakeholders at sector level and covered 110 high endemic sectors out of the 321 total sectors (34.3%) in those districts. In total 1,202 participants have been trained as IVM Trainers to support the awareness and training on IVM approach to the identified targets of the community grassroots **(Table 13).** The training used mixed training methods involving in class sessions and on field practices for mosquito larval collection and their physical identification through **"Learning by Doing or Seeing".** Participants were identified in collaboration with districts, Ingobyi Activity and CSOs and included In Charge of Agriculture and Livestock (Agronome)**,** Rice Famers**,** Fish Famers**,** Mining Cooperatives Members**,** In Charge of Social Affairs, In Charge of Education, In Charge of CHWs at Health Centres, Heads of Health Centers, Malaria Focal Persons and CHWs Representatives at sector level **(Table 13).**

Table 13: People Trained in IVM Approach per District

#	District	Total Sectors	# Sectors Covered	# Trainees	Partners
1	Karongi	13	3	24	Caritas
2	Nyamasheke	15	3	34	Caritas
3	Rusizi	18	3	34	Caritas
4	Kamonyi	12	10	85	Ingobyi
5	Muhanga	12	6	63	Ingobyi
6	Ruhango	9	9	123	Ingobyi
7	Nyamagabe	17	8	90	Ingobyi
8	Nyaruguru	14	5	56	Ingobyi
9	Rwamagana	14	3	48	Ingobyi
10	Bugesera	15	15	149	Ingobyi
11	Gicumbi	21	4	31	Ingobyi
12	Rubavu	12	1	13	Ingobyi
13	Rutsiro	13	4	38	Ingobyi
14	Ngororero	13	2	28	Ingobyi
15	Rulindo	17	1	9	Pro-Femme
16	Gakenke	19	4	35	Pro-Femme
17	Nyarugenge	11	3	33	RDO
18	Gasabo	15	1	11	RDO
19	Gisagara	13	13	142	RICH
20	Nyagatare	14	3	34	SFH
21	Kayonza	15	7	90	SFH
22	Kirehe	19	2	31	SFH
	Total	**321**	**110 (34.3%**	**1201**	

b. Workshop on IRS Planning

With the support of Abt Associates/VectorLink Rwanda Project, a technical workshop for the planning of the 2022-2023 IRS implementation in the targeted districts was conducted at Dereva Hotel (Rwamagana), from 15-17 June 2022.

The main goal of the workshop was to carry out a planning exercise for the IRS campaigns for the FY 2022/2023 with all GF and GOR implementing hospitals with three following objectives: **(1)** Identify the past IRS campaigns gaps, challenges, and recommendations, **(2)** Assess the IRS structure, staffing and develop a detailed implementation plan, **(3)** Establish the IRS logistical needs, funds, procurement processes and procedures, reporting and financial compliance.

Participants to the Workshop included RBC/MOPD Division, PMI/VectorLink Project Rwanda_ Abt Associates, IRS District Hospitals (Kibilizi DH, Nyanza DH, Kabutare DH, Gitwe DH, Ruhango District, Remera Rukoma DH, Nyamata DH, Rwamagana PH, Rwinkwavu DH, Kiziguro DH, and Mibilizi DH). At each district hospital, the following were invited: Hospital DG, Hospital DAF, Procurement Officer, Accountant, and IRS Focal Person.

5.3. Research and Monitoring

- LLIN Durability Monitoring activities were performed for the 24 months post LLINs distribution respectively in Bungwe, Masaka and Kinazi in March-April 2022 for the bednets distributed in February-March 2020 and in Mubuga in June 2022 for bed nets distributed in June 2020.
  The following parameters were assessed: (1) Loss of LLINs, (2) Physical deterioration of nets, (3) Bio-efficacy of nets on susceptible mosquitoes reared at insectary and wild anopheles collected from field.
  The samples for assessing the insecticide content were sent to the Laboratory of CDC-Atlanta.
- Implementing the New Net Project (NNP) evaluation for the entomological component. Vector control contributed to the monthly entomological monitoring using two methods, respectively human landing catching (HLC) and Pyrethrum Spraying catching (PSC). The entomological surveys were organized in three sites of Mbuga in Nyamagabe district, Karambi in Ruhango district and Mubuga in Karongi district. The molecular tests were also performed to identify the sibling species of *Anopheles gambiae* s.l. collected and insecticide resistance annually performed in the three sites and the tests were performed on 7 insecticides.
- A support to Rwanda Agricultural Board (RAB) for entomological investigations of Rift Valley Fever (RVF) was provided in 10 districts of Eastern Province and Southern Province for 6 consecutive weeks. At each district that reported RVF, one sector was randomly selected and mosquito sampling was conducted in three villages per district. Adult mosquitoes were caught in 4 houses from 3:00 pm to 6:00 am of the next morning for two consecutive nights using BG sentinel trap, BG Pro sentinel and CDC-light traps as sampling traps.

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

A. Long Lasting Insecticide Treated Nets

Based on the National Malaria Strategic Plan 2020-2024 and as recommended by WHO, the focus is on universal coverage (UC) of the population at risk through the LLINs. These LLINs are distributed through mass campaigns in households with low and moderate incidence of malaria as well as routine distribution channels focusing on the most vulnerable groups (children under five years and pregnant women) countywide.

- **LLINs Procurement**

For the period 2021-2022, a total of 7,377,378 rectangular LLINs were procured using Global Fund support through RMS and USAID/PMI through GHSC-PSM. Table 13 shows the types of nets and quantities procured:

Table 14: Number of LLINs Procured by Type and Source of Funds

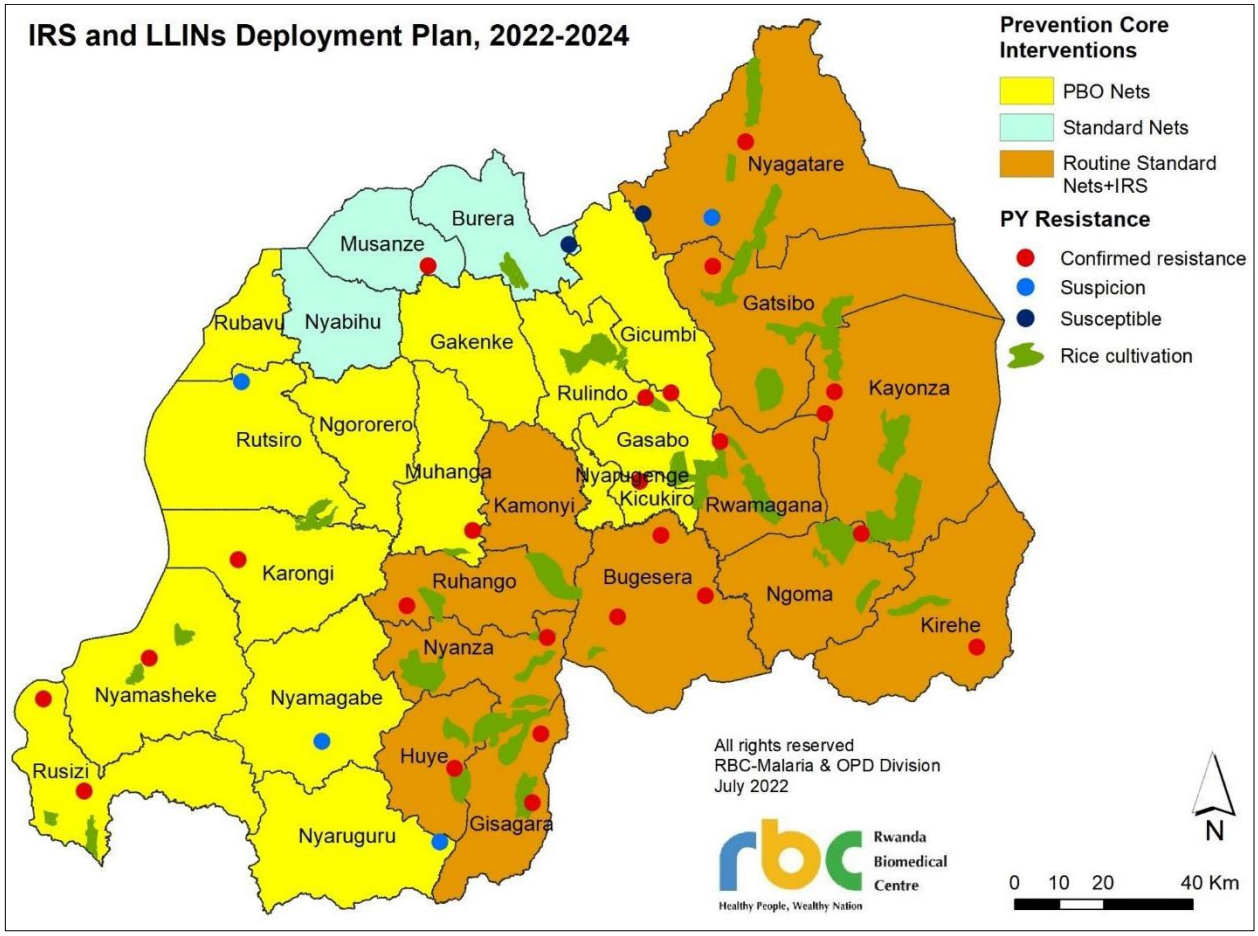
Source of Fund	LLINs Type	Procured	Delivered	Accepted	Distributed		Total
					HH	Routine (ANC&EPI)	
Global Fund	Standard	1,782,242	0	0	0	0	0
Global Fund	PBO Nets	1,084,088	0	0	0	0	0
SAID/PMI	Standard	1,142,263	1,142,263	1,142,263	218,936	923,327	1,142,263
USAID/PMI	PBO Nets	3,368,785	2,667,085	Not yet inspected	0	0	0
Totals		**7,377,378**	**3,809,348**	**1,142,263**	**218,936**	**923,327**	**1,142,263**
Total Districts Covered				1 District (HH), 18 Districts (Routine)			

The procurement of LLINs planned on the GF grant was affected by COVID 19 pandemic. As a result of the increase of the initial unit price of LLINs in the market, the number of LLINs planned for procurement was decreased from 3,665,899 LLINs to 2,866,330 LLINs, a decrease of 21,8%. This has implications in terms of protecting the targeted population and also in reaching the indicators as agreed in the RBF for malaria with the Global Fund. A management decision will need to be reached on how to mitigate this situation.

- **Geographical Distribution Plan of LLINs by Type (PBO and Standards)**

The MOPDD has prioritized the deployment of one effective preventive measure for the universal coverage of households by district. Thus, LLINs are deployed in 18 non-IRS districts with moderate and low morbidity, 15 districts with high malaria infection prevalence rate received PBO nets while 3 districts with low prevalence rate received standard nets.

Figure 12: IRS and LLINs Deployment Plan, 2022-2024



The contracts for the above-mentioned quantity have been signed and the purchase orders have been placed in 2021-2022 to the qualified bidders according to the requirements from RMS. The delivery and the distribution of 1,142,263 LLINs was done during this fiscal year while for the remaining quantity is planned in the fiscal year 2022-2023.

- **LLIN Reception and Quality Control**

During this FY 2021-2022, RBC trough RMS received a total number of 3,809,348 including 1,142,263 Standards LLINs and 2,667,085 PBO LLINs from USAID/PMI over 7,377,378 LLINs rectangular which were procured with funds from Global Funds and USAID/PMI but only 1,142,263 Standards LLINs passed all the process of the physical inspection. The remaining quantity of 2,667,085 PBO LLINs will follow the reception process during the starting of the fiscal year 2022-2023.

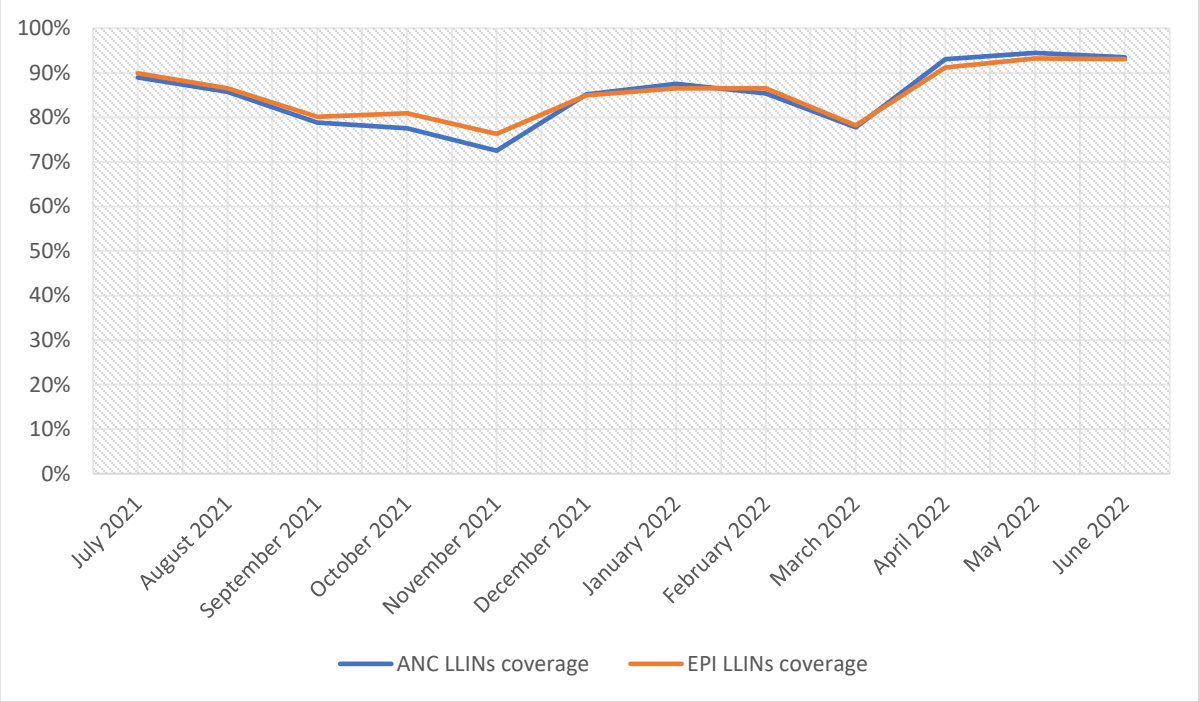
For 1,42,263 Standards LLINs the full process of the physical inspection was done by the technical team of RBC based on the ISO 2859-1 protocol and the Acceptance Quality Limit (AQL) of 2.5 for major defect and 4.0 for minor defects. All consignment has passed

and recommended for the distribution. The received quantity was distributed to Nyamagabe district for the universal coverage of households (218,936LLINs) 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 Distribution to Pregnant Women and Children Under 1 YO**

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, 317,184 LLINs were distributed to pregnant women over 373,828 who attended the first visit of antenatal care (85%) and 278,828 LLINs were distributed to children under one year over 325,510 who attended MR1 (86%)

Figure 13: National Coverage of LLINs through ANC and EPI



Using HMIS and Scorecard Data, and with support from USAID/Ingobyi Activity and 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.

The national distribution target through routine ANC and EPI which is 95% and above was not achieved because of the stock outs in some districts, due to delays of LLINs procurements and delivery related to different challenges including the COVID-19 pandemic and the delay of the LLINs availability funds from USAID/PMI intended to LLINs procurement from MOP19, or non-compliance of health facilities to the national guidelines.

- **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 exceeds 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 ….).

- **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.

PART II: MALARIA CASE MANAGEMENT

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

Diagnosis and treatment are primary components in malaria control; the following activities were implemented through program strategies to improve access to early diagnosis and appropriate case management to reduce malaria morbidity and mortality.

In this FY 2021-2022, MOPDD in collaboration with partners are strengthening health care providers in diagnostic testing to ensure that all patients with malaria are properly diagnosed and can receive timely and appropriate treatment. All suspected malaria cases are parasitologically confirmed by either Malaria Rapid Diagnostic Test or Blood Smear and categorized either as, uncomplicated, simple malaria with minor digestive symptoms or severe malaria for the purpose of prescribing appropriate treatment.

Since October 2016, the roll out of Home-based Management of Malaria (HBMm) to all ages enabled Community Health Workers (CHWs) to provide timely treatment in the community for all cases of uncomplicated malaria, preventing severe malaria, and limiting malaria transmission. By following early diagnosis and treatment at all levels of health care, all suspected malaria cases were tested and underwent appropriate management according to National Malaria Treatment Guidelines.

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

1. Distribution of the Integrated Malaria Control Guidelines

In this Fiscal Year, the MOPDD with the support of PMI Impact Malaria (IM) printed and disseminated 1,600 copies of the Rwanda Malaria Treatment Guidelines to all public and some private health facilities. Two copies were provided per health center and five per hospital, for a total of 1,289 copies for public health facilities, 250 copies for private health facilities, and 61 copies for central level and malaria stakeholders.

2. Conduct Malaria Microscopy Refresher Training for Targeted Districts

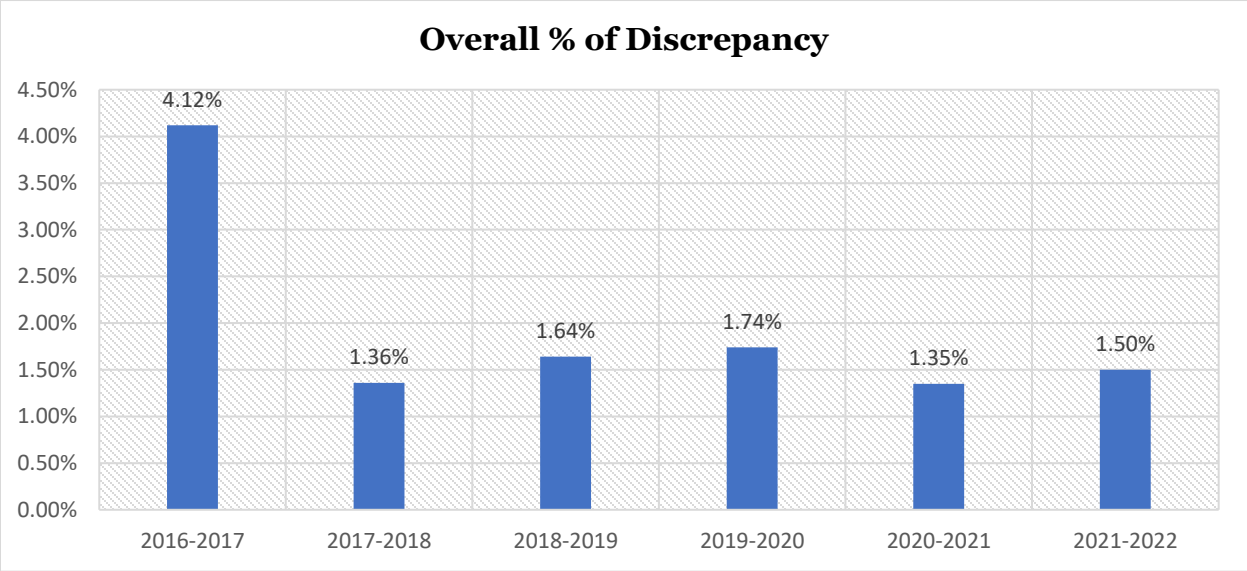
From March to June 2022, RBC/MOPDD in collaboration with RBC/National Reference Laboratory and Impact Malaria organized a training for 100 Lab Technicians from all 30 districts on performing malaria microscopy diagnosis with aim to equip trainees with skills in malaria microscopy, focusing on differentiation of malaria species and quantification of parasites. A post-training follow-up is planned to be conducted in the FY2022/2023 based on the performance of health centers.

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

3.1. Quality Control of Blood Smears at District Hospitals

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 14: External Quality Control Results at Hospital level, 2016-2022



Among the 50 hospitals in which EQA/QC of blood smears was conducted during the FY 2021-2022, discordant slides results from two observers were noticed in 19 Hospitals. Results over the years from 2016-2017 to 2021-2022 demonstrate that discrepancy remained below the cut off of 5% acceptable range **(Figure 14)** except for Nyagatare district hospital (6.7%) and Rwanda Military Hospital (8.9%) which exceeded the acceptable range in FY 2021-2022.
In addition to the slide retesting, a general assessment of malaria microscopy laboratory setting was undertaken in 42 Hospital Laboratories by MOPDD staff in collaboration with NRL staff from January to March 2022. 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 88% of the laboratories assessed had enough working space with running water and electricity

(100%). They were equipped with, on average of 3 functioning microscopes per hospital lab, gloves and frosted end slides (97%). Giemsa used was kept out of light (83%), the staining SOPs were followed (88%) and immersion oil was of good quality (92%). The report of Blood smear results recorded the parasite species, development stage of the parasites and the quantification of parasites. 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 2022-2023.

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. From January to March 2022, a total of 804 CHWs from 30 districts and 82 Nurses from 82 Health Posts (HPs) were supervised. All steps of performing an RDT were assessed. Results show that 92% of CHWs were trained on RDT testing. RDT test kits were securely kept in cupboards (89%). The main steps of performing RDTs such as wearing gloves, cleaning the pricking site with alcohol swab, pricking the right finger, taking the right amount of blood, depositing the blood and buffer solution in the correct hole (95%) and interpreting results according to the guidelines (88%) were performed very well. Feedback including correct use of RDT Job Aid, verifying the expiration date of the test, explaining the procedure to the client, observing 15 minutes waiting time to reading results and improving waste disposal was immediately provided to the supervised staff.

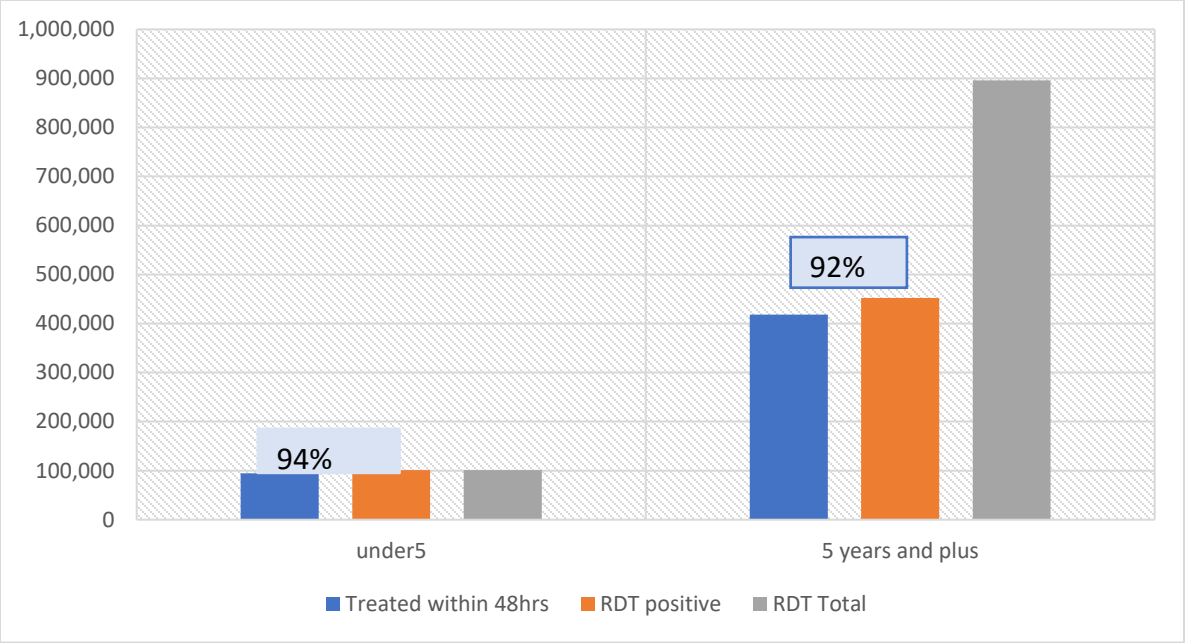
Strategy 2: Strengthen Prompt Access to Diagnosis and Treatment of Malaria

1. 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 2021-2022, 94% of children under five and 92% of children above five and adults sought treatment within 48 hours of onset of symptoms at community level, Figure 16. Patients seeking care at the community were diagnosed by an RDT and treatment provided only when a positive RDT was observed.

Figure 15: Community Malaria Case Management in FY 2021-2022



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 55% in 2015-2016 and 2021-2022 respectively, Figure 15 and 16. During this scale up period, a decline in severe malaria cases and malaria deaths was observed, Figure 16.

Figure 16: Impact of Extended HBM on Severe Malaria Cases and Malaria Mortality, 2014-June 2022

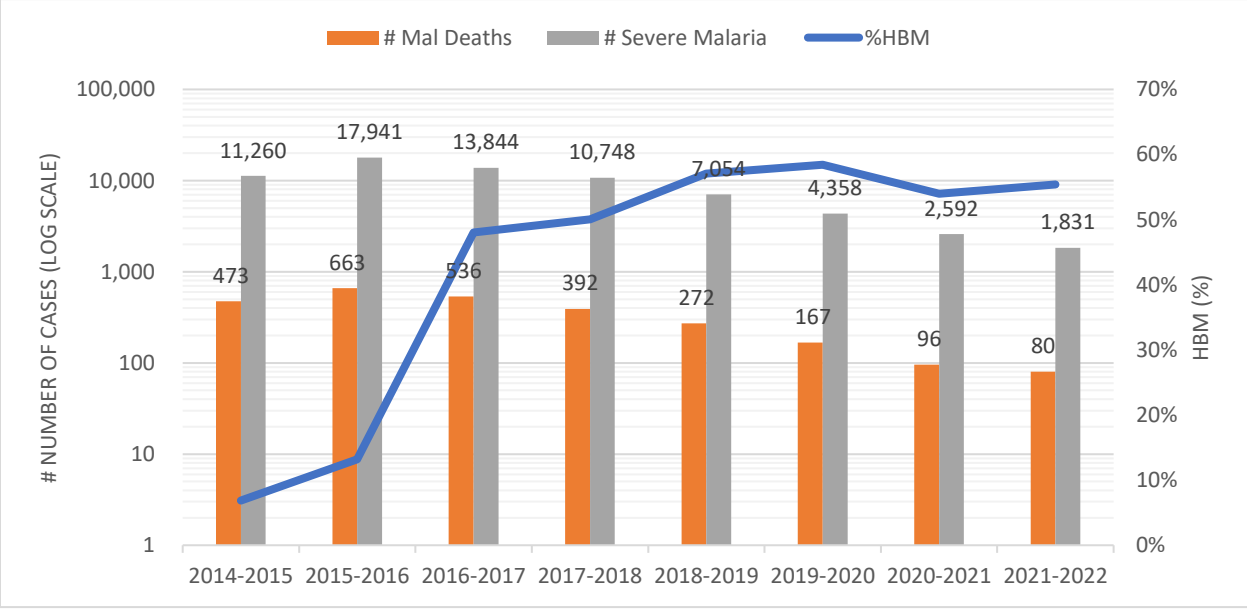
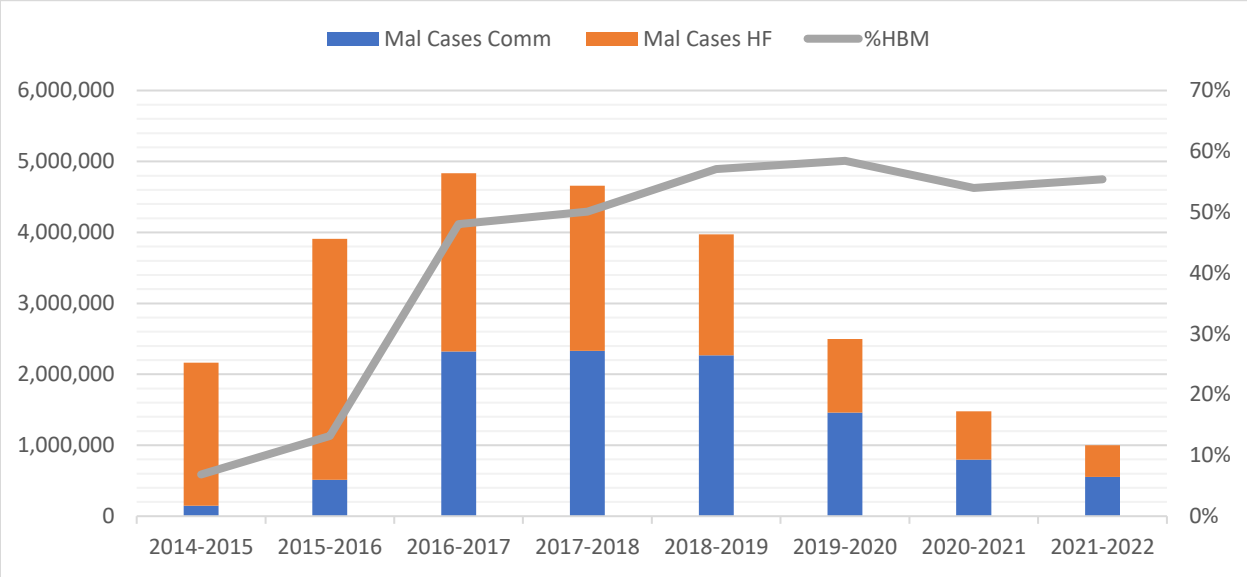
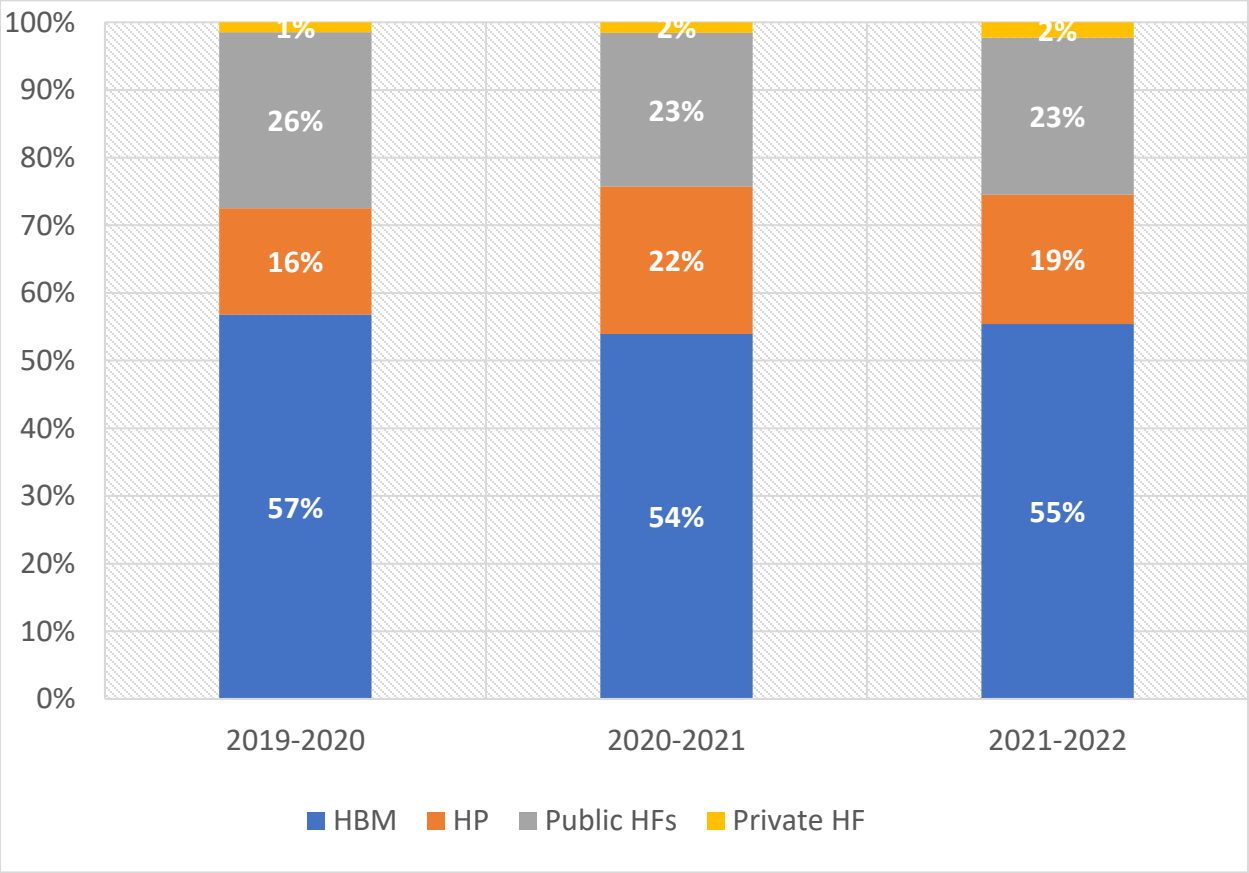


Figure 17: Proportion of Malaria Cases by Level of Service Delivery, 2014-Jue 2022



Although a slight decrease in the proportion of malaria cases treated in the community was observed in FY 2021-2022, the decrease in severe malaria cases by 29% from FY 2020-2021 to FY 2021-2022 and a decrease in malaria death from 94 to 71, (Figure 16), indicate that the impact of early diagnosis and treatment on malaria outcome was not compromised. The proportion of malaria cases treated in the community in FY 2021-2022 (55%) does not vary from the last FY 2020-2021 (54%). This is due mainly to 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. Figure 17.

Figure 18: Contribution of Health Facilities and CHWs to Malaria Cases Management, 2019-2022



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

1. Strengthening of Health Facility and Community Case Management through Supportive Supervision

During the FY 2021-2022, MOPDD in collaboration with partners continued to strengthen the delivery of quality malaria services through supportive supervision. At the HC level, 3,055 health center staff (1,878 nurses and midwives, 446 laboratory technicians, 227 HC data managers, and 228 CEHOs) were reached. At the hospital level, 43 doctors, 159 nurses and midwives, 40 laboratory technicians, and 34 pharmacists were reached.

Additionally, 168 nurses and 17 laboratory technicians from 185 health posts were mentored on malaria diagnosis and treatment, supply chain management, and referral procedures according to malaria treatment guidelines.

CHWs were continually equipped with the knowledge and skills to deliver quality PHC to their communities. During this reporting period, 18,910 binomes from 20 districts were

mentored on assessing and identifying danger signs (for severe malaria, pneumonia, and diarrhea), using diagnostic tools (mid-upper arm circumference tapes, timers, thermometers, RDTs, and Malaria algorithms), interpreting results, adhering to treatment protocols, and completing ICCM/HBM treatment registers for Management of Malaria in Children and Adults.

2. Training of Community Health Workers

In FY 2021-2022, there was an introduction of a Polyvalent Community Health Model, where community health activity will transition from specialized CHWs to polyvalent CHWs who can provide a comprehensive community health package to the served population. In collaboration with MCCH, CEHO and OPD nurses from HCs in 6 district catchment areas were trained on the polyvalent model. For malaria management, the trained CEHOs and nurses trained ASM and Health Promotion CHWs on ICCM and Management of Malaria Cases in Adults, Table 15.

Table 15: Training of Health Care Providers in Malaria Case Management

SN	Training	Target Group	Achievement
1	Training of Trainers on Integrated Malaria Control Guidelines at Hospital level.	Nurses (1 per Hospital) Doctors (1 per Hospital) CHWs Supervisors (1 per Hospital)	18 Medical Doctors, 18 Nurses and 20 CHW supervisors from 20 District, Provincial and Referral Hospitals were trained and were able to adapt training tools for the training of health center.
2	Training of Health Center level Clinicians on Integrated Malaria Control Guidelines	Health Center Nurses (1) Health Center CEHO (1) Head of Health Center (1)	1179 health providers from 26 hospitals and 326 health centers were trained.
3	Training on malaria diagnosis. Species identification and parasites density quantification.	Hospital Laboratory Technicians	50 Hospital laboratory technicians from 46 Referral, Provincial and District Hospitals were trained.
4	Training on malaria diagnosis. Species identification and parasites density quantification.	Health Center Laboratory Technicians	50 Health Center lab technicians from Nyagatare, Gatunda, Ngarama, Kiziguro and Gahini District Hospitals were trained.
5	On job training of health providers in malaria prevention and treatment	Nurses, Midwives and laboratory technicians	1,722 providers including nurses and midwives and laboratory technicians from HCs and 742 hospital providers (including medical staff, nurses and midwives, and laboratory technicians) from 20 hospitals were trained on prompt malaria diagnosis, quality testing, correct treatment of malaria cases.

Table 16: Capacity Building of Community Health Workers

SN	Training	Target Group	Achievement
1	Training of CEHO, OPD nurses on iCCM and HBMa Component	CEHO of HCs OPD Nurses in Health Centers (one/HC)	In collaboration with MCCH, 102 CEHOs and 102 nurses from HCs of Nyamaheke, Gakenke, Nyabihu, Nyamagabe, Nyanza and Nyaruguru catchment area, were trained on Polyvalent Model, 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	4816 ASM and Health Promotion CHWs from HCs in Nyamaheke, Gakenke, Nyabihu, Nyamagabe, Nyanza and Nyaruguru catchment area were trained.

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-I'M 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, IM supported the MOPDD to obtain approval from Institutional Review Boards (IRB), including Johns Hopkins University IRB, the Rwanda National Health Research Committee, the Rwanda National Ethics Committee, and the Rwanda Food and Drugs Authority (RFDA), for the implementation of the study.

Enrollment of study participants started in June 2021, after setting up the three study sites, procuring study supplies and commodities, and hiring and training study teams. The study teams experienced challenges in enrolling patients due to the decrease of malaria cases seen at health facilities. However, strategies were put in place to facilitate patient enrollment which included working closely with CHWs and replacing one of the study sites with no enrollment for many months (Rukara HC) with Ngoma HC.

The TES implementation is ongoing in the three sites: Masaka, Ngoma and Bugarama with a total of 212 children enrolled out of 528 sample size targeted (Table 17).

Table 17: Table : Enrollment per TES Study Site

Study Site	Screened cases	Enrolled children	Sample size target
Ngoma	181	43	176
Masaka	281	78	176
Bugarama	323	91	176
Total	**785**	**212**	**528**

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

14. Quality Control of Malaria Rapid Diagnostic Tests Along the Supply Chain

MOPDD in collaboration with WHO and Rwanda FDA conducted a quality control of malaria RDTs kits sampled across different supply chain levels including the community. The objective of the activity was to assess the quality of RDTs kits distributed throughout the supply chain levels. The RDT sample collection was conducted in March 2022 in 8 selected districts (Nyagatare, Kirehe, Burera, Ruhango, Gisagara, Rubavu, Rusizi, and Gasabo) and from the RMS (Central Medical Store) Headquarter representing all five Rwanda provinces. A total of 16 samples were collected by a team composed of staff from RFDA and MOPDD.

Samples were sent, through the Rwanda Post Office, to the Research Institute for Tropical Medicine based in the Philippines, a WHO accredited laboratory. The testing took place in June 2022.

Among 4 RDT Lots tested, (05EDF053C, 05EDF060A, 05EDG001A, 05EDG002A) two (05EDG002A and 05EDF060 A) showed insufficient amount of buffer in individual buffer vials due to evaporation. The investigation of the cause is ongoing.

15. 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 2021-2022, 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 18: Malaria Commodities Procured in FY 2021/2022

Product	Quantity Procured	Source of Funds
Artemether-Lumefantrine 1x6, Blisters	143,040	PMI
Artemether-Lumefantrine 2x6, Blisters	270,000	PMI
Artemether-Lumefantrine 3x6, Blisters	120,000	PMI
Artemether-Lumefantrine 4x6, Blisters	450,000	PMI
Artesunate 60mg/ml Vials	107,688	PMI
Malaria RDTs	3,655,200	GF
Quinine 300mg Tablets	0	GOR

16. 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 2021-2022, the validation exercise was conducted, and the report was handed over to the MOPDD validation team.

17. Stock Status of Malaria Commodities, End June 2022

By the end of the FY 2021-2022, the stock status of malaria commodities was good; there were no products at risk of stock out, Table 19. However, there was a slight overstock for ACTs and Artesunate due to the overall decrease in malaria cases observed in the country.

Table 19: Stock Status of Malaria Commodities

Product	RMS HQ	RMS Branches	Qty (HFs)	Stock all Levels	AMC all Levels	MoS all Levels	MOS in Shipment
A/L 1 x 6	17,280	141336	137,912	296,528	11,208	26.5	0
A/L 2 x 6	94170	138031	125,397	357,598	14,462	24.7	0
A/L 3 x 6	1950	70231	127,549	199,730	12,900	15.5	0
A/L 4 x 6	223890	136292	151,401	511,583	37,988	13.5	0
Artesunate Inj.	76381	22,088	13,684	112,153	5,395	20.8	0
Quinine Tab	39100	116,410	199,577	355,087	13,671	26.0	0
mRDTs	2797470	685822	651,758	4,135,050	262,777	15.7	0

18. 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 2021-2022, the monitoring allowed the program to plan for redistribution of AL 6x3 and Artemether-Lumefantrine 6x2 from districts with over stock (Kayonza, Karongi, Burera and Gatsibo for ACTs) to the districts in need of stock to minimize the risk of expiration.

7. Challenges

The procurement of Quinine injection and Dihydro-Artemisinin Piperaquine failed due to lack of a WHO Prequalified bidder. The tender process will resume in FY 2022-2023.

General Statement:

MOPDD has made significant progresses in Case Management of Malaria cases during FY 2021-2022 through strengthening of malaria diagnosis to all suspected malaria cases at all levels, ensuring prompt access to treatment of severe malaria, prompt and correct treatment of uncomplicated malaria at all levels and quantification and distribution of quality assured malaria commodities. As a result, severe malaria cases and deaths due to malaria reduced significantly.

PART III: MALARIA SURVEILLANCE AND EPIDEMIOLOGY

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

Malaria is by far the most common tropical parasitic disease today. The World Health Organization (WHO) African Region, reported an estimated 215 million cases in 2019, accounting for about 94% of the global cases.

Today, malaria remains also a major public health challenge in Rwanda, with the entire population at risk. From 2013, malaria morbidity has been increasing in Rwanda despite efforts deployed in malaria control activities.

A malaria surveillance system in a burden reduction setting 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 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, operational research such as surveillance of antimalarial drug efficacy and drug resistance, entomological surveillance and vector control monitoring, Malaria Indicator Surveys and other studies are conducted on regular basis to support evidence decision making to fight against malaria

2. Key Malaria Program Indicators

Health facilities report malaria data on a weekly and monthly basis through 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.

Real time notification of stock out and severe malaria cases is done by CHWs via RapidSMS. This system enables CHWs to manage malaria cases without any interruption and hospitals and health centers to intervene in a timely manner in order to prevent deaths due to Malaria.

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 2021-2022 compared to previous reporting period:

Table 20: Key Malaria Program Indicators

Nº	Indicators	FY 2019/2020	FY 2020/2021	FY 2021/2022
1	Malaria Incidence per 1,000 persons per year	198	114	76
2	Slide Positivity Rate (%)	35	27	22
3	Uncomplicated Malaria Cases	2,495,890	1,481,698	998,874
4	Severe Malaria Cases	4,358	2,592	1,831
5	Malaria Deaths	168	94	71
6	Case Fatality Rate (per 100,000 Malaria cases)*	6.7	6.5	7.0
7	Proportion of malaria cases treated at community	58%	54%	55%

Key Malaria Program

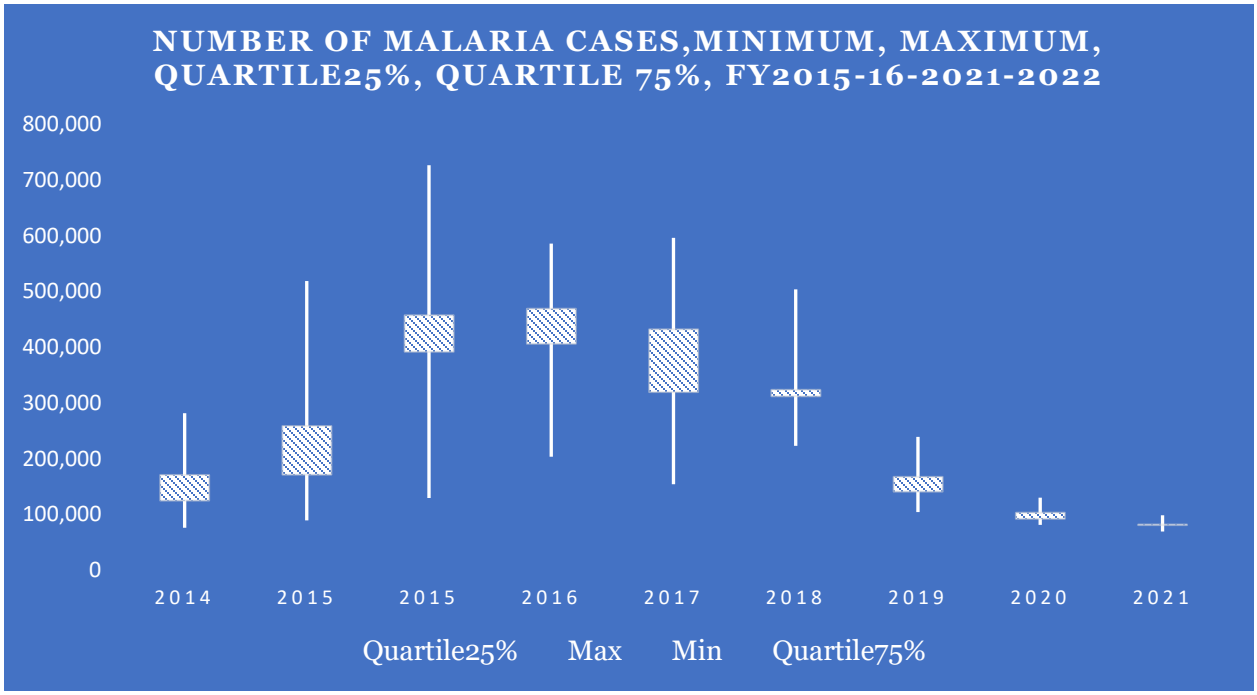
33% Reduction of in Malaria Incidence from 2020/2021 to 2021/2022
32% Reduction in Uncomplicated Malaria Cases from 2020/2021 to 2021/2022
29% Reduction in Severe Malaria Cases from 2020/2021 to 2021/2022
17% Reduction in Malaria Deaths from 2020/2021 to 2021/2022
Today, 55% of all malaria cases are being treated at Community Level by CHWs compared to 54% during the FY 2020-2021

Note*: CFR: The CFR reflects the # of malaria deaths over the # malaria cases. Even if both Malaria cases and deaths decreased from 2020/2021 to 2021/2022, but the ratio of decrease was bigger in malaria cases (0.33) compared to deaths (0.26) justifying why the CFR increased. More efforts are needed to reduce malaria related deaths**.**

Summary Statistics of Malaria Cases, 2015-2022

Figure 19 below gives summary statistics on malaria cases reported on a monthly basis since 2015. It shows the minimum cases, the maximum cases and the interquartile range, where the box represents the range around the 50% value of malaria monthly cases. We observed a progressive decrease in malaria cases from 2016 to 2021. The maximum number of malaria cases notified in 2015 was 726,433 while in 2021; it was 98,197.
The minimum monthly number of malaria cases was 129,192 in 2015 and 69,209 in 2021. Fifty percent of monthly malaria cases lie between 391,688 and 457,365 in 2015 while in 2021, 50% of malaria cases 80,747 and 81,977 cases.

Figure 19: Summary Statistics of Malaria Cases, FY2015-16 to FY2021-2022



3. Malaria Incidence

Malaria incidence has been calculated using the average medium projected population of 2021 and 2022. Data shows that the national malaria incidence in Rwanda reduced from 114 cases per 1,000-person year in FY 2020-2021 to 76 cases per 1,000-person year FY 2021-2022, Figure 20.

Figure 20 : Trends in Malaria Incidence per 100 Persons Year, 2008-2022

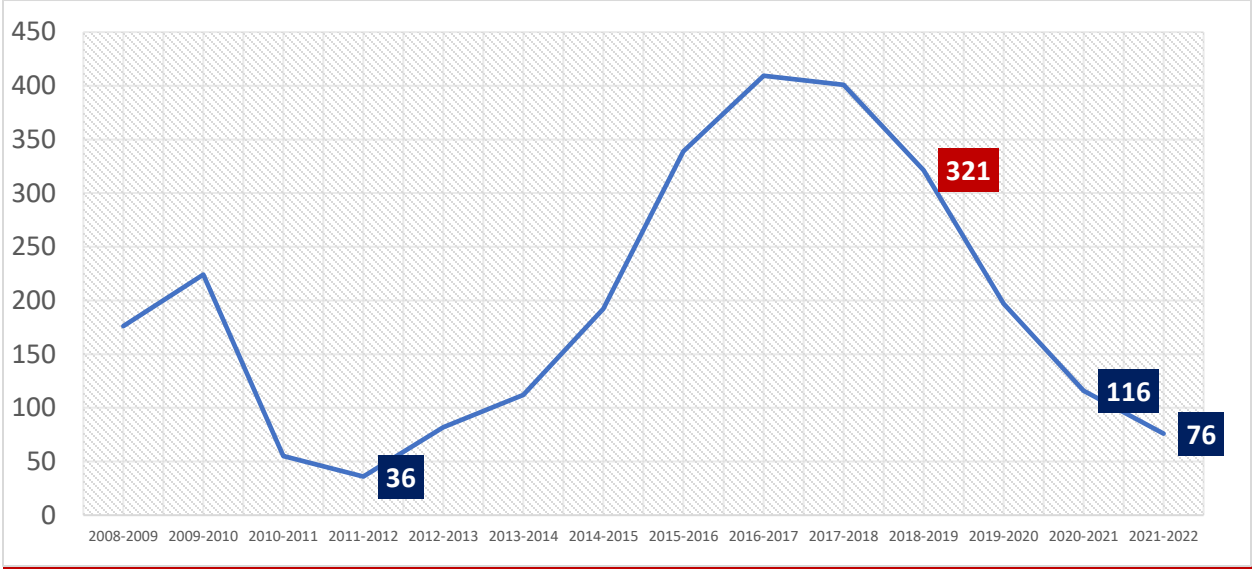


Figure 21 : Malaria Incidence (per 1000) by District, FY2021-22

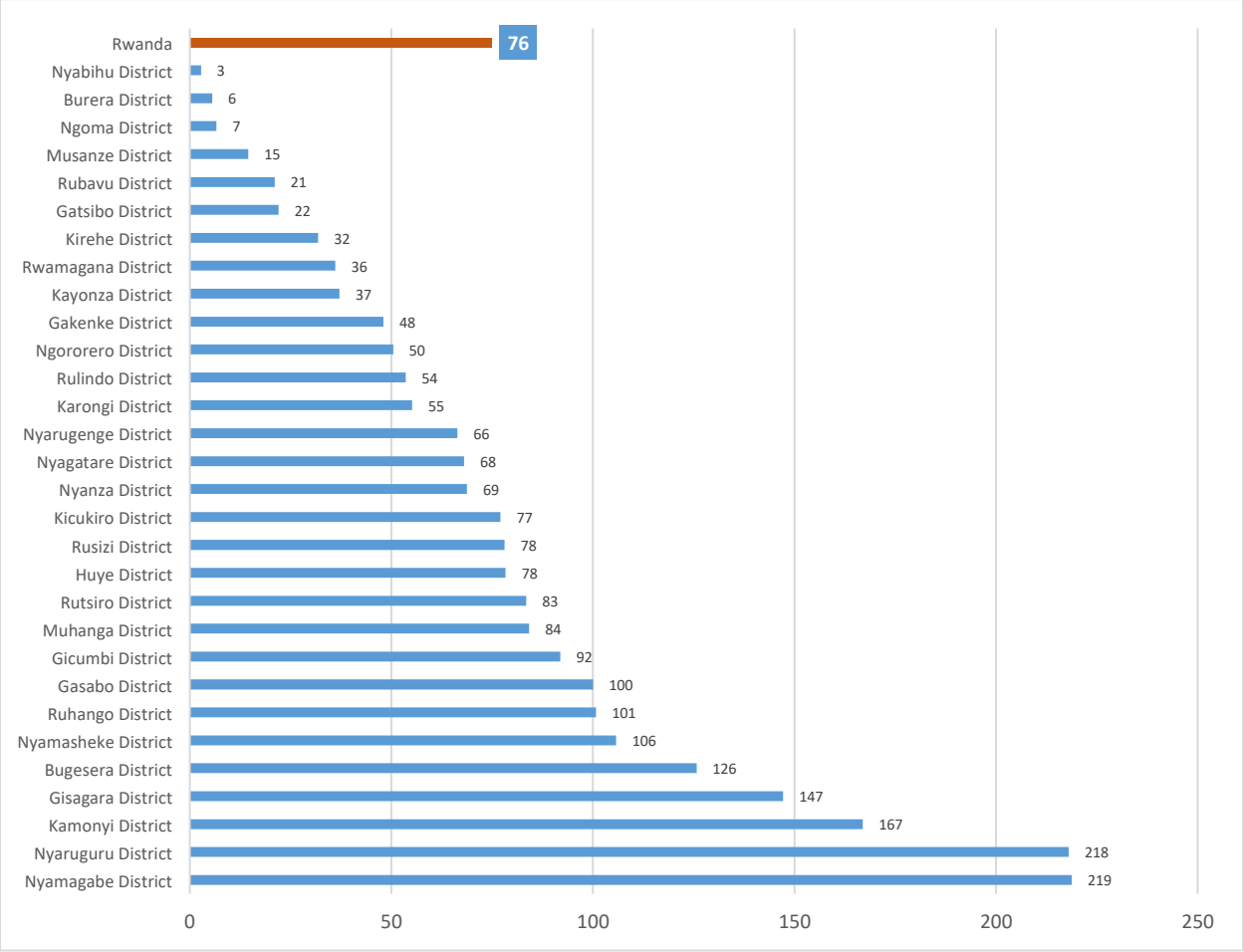
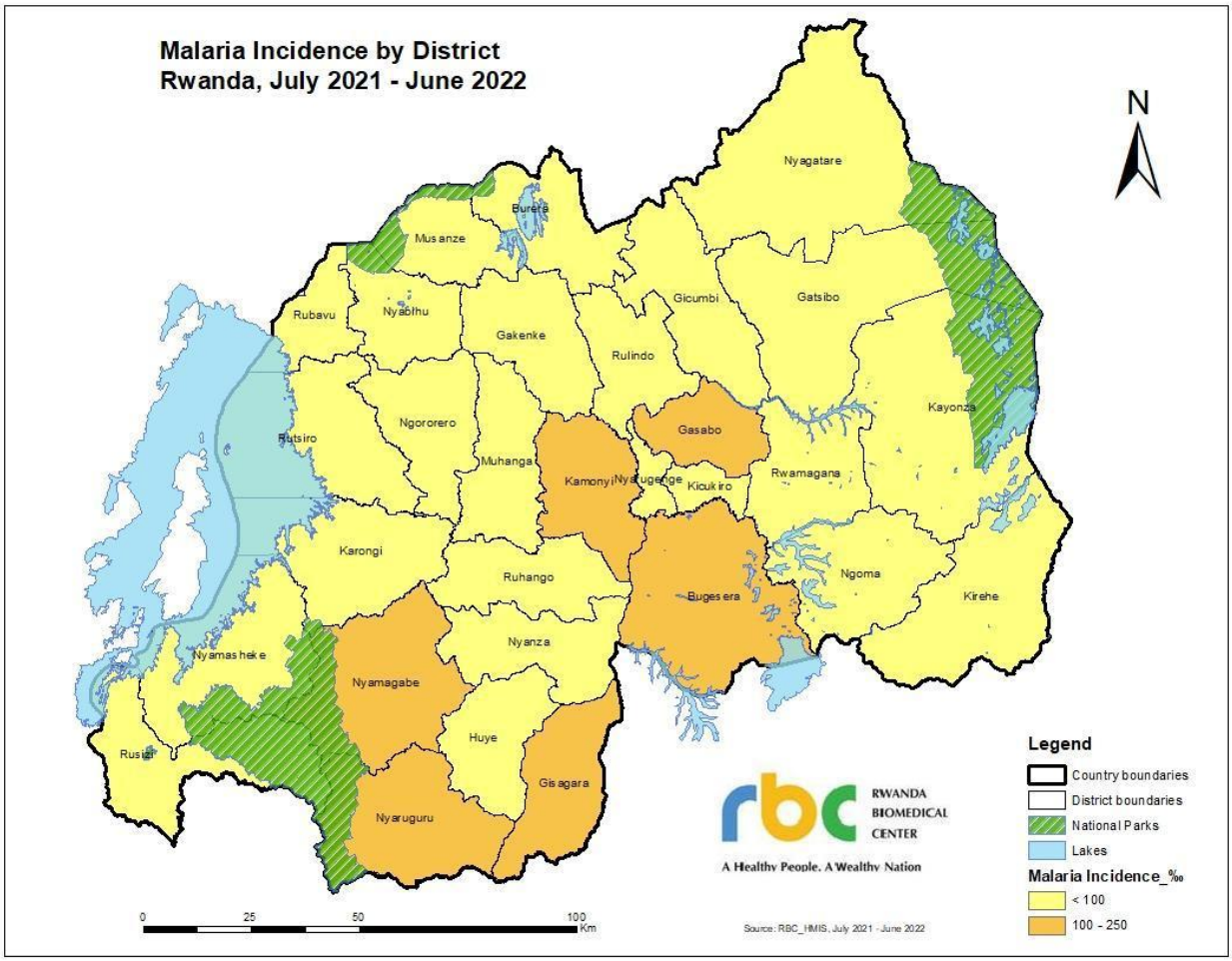


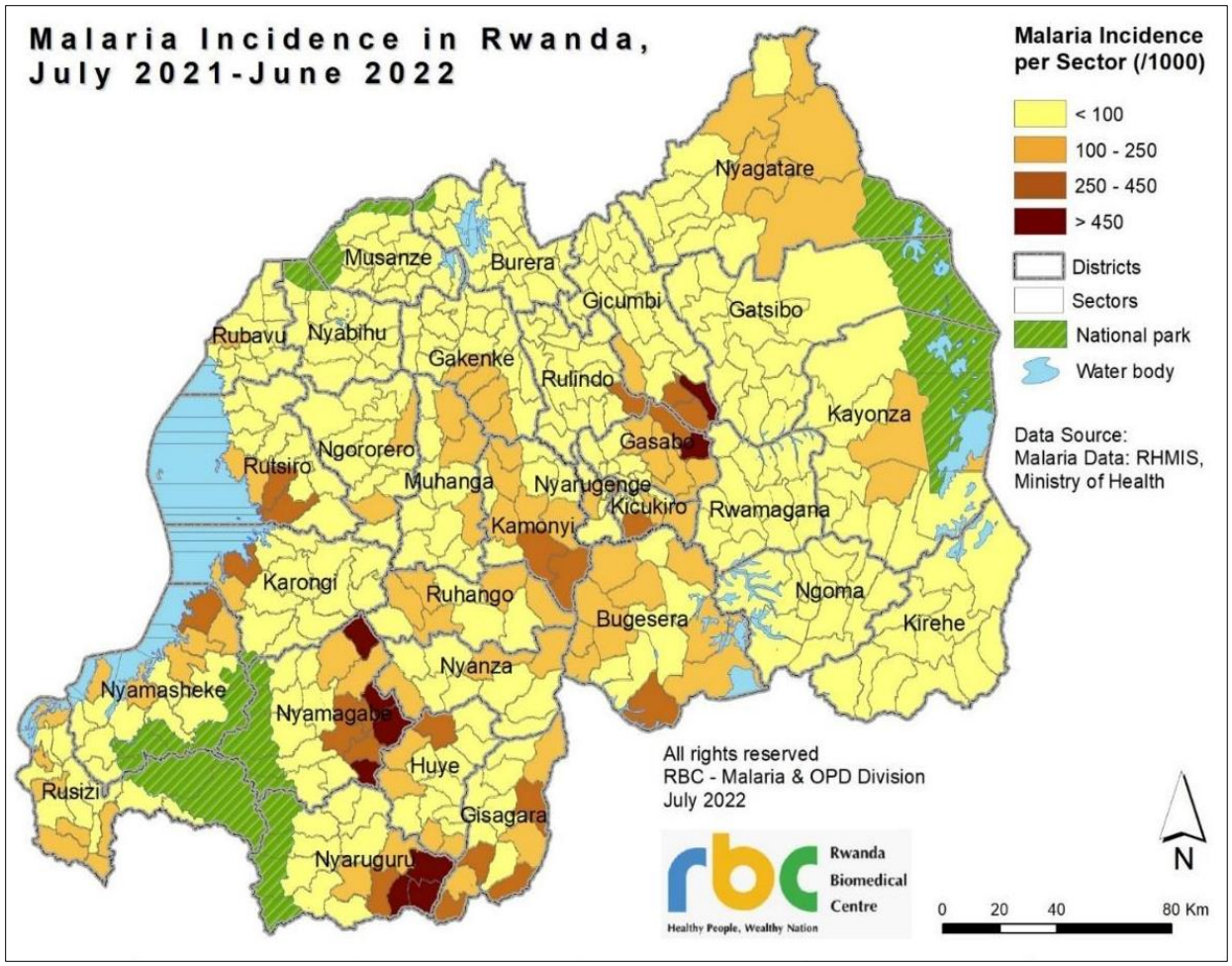
Figure 22: Malaria Incidence (per 1000) by District, FY2021-22



Six districts have incidence above 100 per 1000 persons during the FY 2021-2022 compared to 12 districts reported in FY 2020-2021, Figure 21&22 . Districts with malaria incidence greater than 100 per 1000 persons per year are : Nyaruguru (219), Nyamagabe (215), Kamonyi (169), Gisagara (143), Bugesera (132) and Gasabo (123). None of the districts have malaria incidence greater than 250 per 1000 persons per year compared to four districts during the last FY 2020-2021.

The program has proposed to change the IRS period from February in previous year to September in this reporting period because the peak of malaria is typically between October and December; this may have contributed to the reduction of malaria incidence in Gisagara district. During this fiscal year a total of 9 sectors have malaria incidence greater than 450 per 1000 persons compared to 23 sectors during the FY 2020-2021, Figure 23.

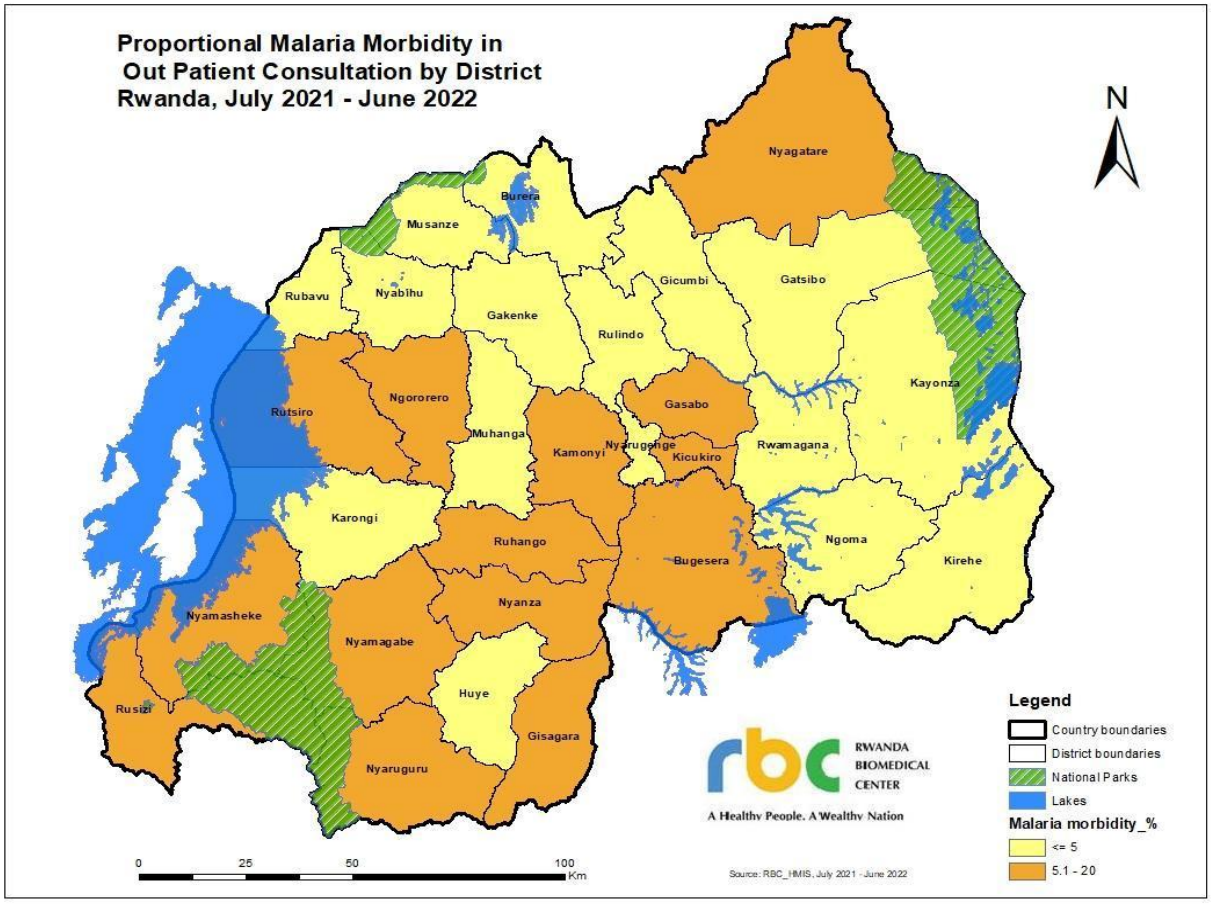
Figure 23: Malaria Incidence (per 1000) by Sector, FY2021-22



4. Malaria Morbidity

During the FY 2021-2022, malaria OPD cases represented 5% of all OPD new cases of consultation compared to 9% reported in FY 2020-2021. The proportional morbidity of malaria varies across districts from less than 1% in Nyabihu and Burera districts to more than 10% in Nyaruguru, Gisagara and Nyamagabe districts, Figure 23.

Figure 24: Malaria Proportional Morbidity by District in the FY 2021-2022



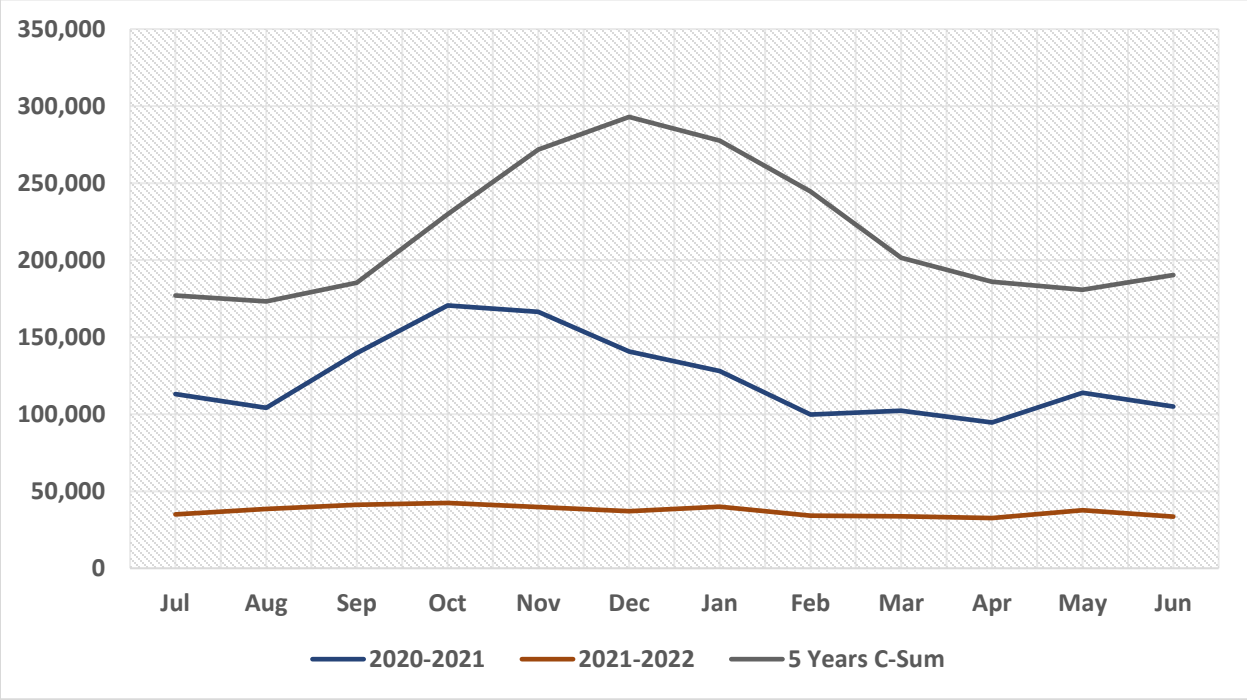
5. Malaria Test Positivity Rate

During the FY 2021-2022 at total of 4,462,753 lab tests were performed compared to 5,578,079 in FY 2020-2021, representing a decrease of 20% of lab tests. This includes 2,930,701 blood smears and 1,532,052 RDTs. The number of RDTs done by community health workers was 1,213,769 representing 27% of all malaria tests performed. The overall slide positivity rate was 22% compared to 27% for last fiscal year. The positivity rate was 45.6% and 8.3 % at community and health facility level, respectively compared to 54% and 17% during the FY 2020-2021. The Annual blood examination rates (ABERs) was 34% compared to 43% during the last FY 2020-2022

6. Trends in Uncomplicated Malaria Cases

From July 2021 to June 2022 a total of 998,874 outpatients were reported compared to 1,477,696 during the FY 2020-2021, representing a decrease of 32%. Malaria cases treated at the community level represent 56% of all cases. The private health facilities account for 22,401 (2.2%) and health posts accounted for 190,784 (19%). Children under five years accounted for 159,429 malaria cases (16%) and pregnant women 5,727 (0.57%). Figure 23 shows the monthly trends of malaria cases of FY 2021-2022 compared to FY 2020-2021 and the monthly average cases for the last 5 years using the C-sum method. We noticed a reduction of malaria cases during the FY 2021-2022 compared to the last 5 years (Figure 25).

Figure 25: Trends in Malaria Cases, FY 2020-2021, 2021-2022 and Previous 5 Years cumulative monthly average



Note: The 5 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, 1,831 cases of severe malaria were reported at the facility level compared to 2,592 reported in the FY 2020-2021, representing a 29% reduction of severe malaria cases. This indicates that interventions such as home-based treatment of children and adults that contributed to early diagnosis and treatment have been successful in decreasing the number of severe cases and consequently the number of malaria deaths. The free treatment of poor people in Ubudehe Category I and II also removed the financial barriers for access to health care.

2. Malaria Mortality

Over the FY 2021-2022, 71 malaria deaths were recorded following hospitalization for severe malaria compared to 94 deaths in the FY 2021-2022. The number of malaria deaths was 24 among under 5Years (33%). Report from malaria deaths audit shows that 83 % had severe malaria cerebral form and 17% severe malaria anemic form. The decrease in malaria deaths may be a result of the malaria HBM interventions and free treatment of malaria for Category I and II of Ubudehe and the quality of care at health facility level.

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

The malaria integrated supportive supervisions (ISS) were carried out by Malaria Program in collaboration with its partners in the fight against Malaria (Ingobyi Activity and Impact Malaria) at hospital, selected health center and community levels.
This ISS is designed to be conducted at district RMS branch, hospital, health center and community levels using data to guide targeted supervisions.

The ISS aimed at assessing availability of tools, policy and guidelines, materiel and commodities; LLINS availability 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 an year per facility. The implementing partners in collaboration with district hospital also conduct included targeted addition supervision within their supported district.
In addition to routine ISS conducted on quarterly basis by hospital and implementing partners, Thirteen Districts RMS blanch, 23 Hospitals, 105 health center and 420 CHWs were reached out.

The ISS revealed that 80% of hospitals are able to report species and quantifications of malaria parasite while recording blood smear results. All visited HF have reported weekly integrated disease surveillance and response (IDSR) report through HMIS. However, some health facilities failed to document hardcopy of the IDSR report due to stock out of registers. Fifty seven percent of assessed health centers have malaria drugs updated in E-LMIS, 67% of assessed HC provided pre-transfer treatment for severe malaria cases, 87% of all health centers visited notified all malaria cases on weekly basis through IDSR. Due to stock out of IDSR register.
93% of visited HCs have submitted monthly HMIS report to DH and a copy available at HC. The ISS also identified drugs at risk of being expired and conduct redistribution of malaria drugs and commodities. Some of HCP did not receive training on the updated Malaria treatment guidelines but the training is planned to be conducted in next quarter. The ISS also identified data discrepancy between distributed and reported LLINS where ISS recommended to use the LLINS distribution guidelines.

b. Data Quality Review Meeting

Malaria Program in collaboration with the Hospitals organized data quality review meetings to respond to identified gaps on data elements newly introduced in HMIS in 2020-2021 fiscal year.
The participants invited to these meetings were M&E team at the Hospital, Titulaire, the data managers, C-EHOs and nurse in charge of OPD services at health center level 43 Out 45 (95.5%) hospitals conducted quarterly data quality review meetings.

During the meeting, the participants were oriented on new data elements definitions, reporting, and triangulation methods. However, there is a need to continue to provide capacity building to all HCP on indicators definition, data collection process and reporting in general.

c. Training on New Community PBF Indicators

The Performance Based Financing (PBF) is one of the pillars of health financing aiming to improve the quantity and quality of health care services in accordance with established standards and norms.

MOH in collaboration with RBC/ MOPDD and hospital organized two weeks training on malaria community PBF indicators. The first week was dedicated to PBF indicators while the second was for establishment of the reporting channel of CHW 's PBF evaluation. In addition, participants received orientation on CHWs PBF payment process.

The following indicators were selected to be included in community PBF:

- Proportion of Malaria Cases Treated by CHWs (HBM Performance);
- Number of Malaria suspected Cases received and tested (Diagnosis) by CHWs during HBM;
- Proportion of Households visited;
- Proportion of Pregnant Women who received LLINs in ANC Services;
- Proportion of U1 who received LLINs in EPI;

In total the 55 participants attended the workshop including 45 community supervisors from all hospital at hospital level, 10 from MOH and RBC.

d. Malaria 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. A triangulation of data by district, and health facility between malaria indicators revealed discrepancies and poor data quality. The analysis report is shared with to all concerned health facilities in order 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.

If not corrected, the Heads of health centers and data managers, are called and helped them to correct the errors before the systems is closed on 15th day of the month.

Despite the effort of the government and partners, COVID-19 hindered the quality of services including data reporting process due to overwhelmed of health care provider's staff.

During this year on-time reporting was 87.2% at health centers, 89.9% at hospitals, 48.9% at health posts and 30.8% at private health facilities. The reporting rate was 96.9%

at hospitals, 99.6% at health centers, 69.1% at health posts and 43.2% at private health facilities.
This was improved the reporting system in quality of data reported and increased the reporting rate for both private and public health facilities

e. Training in Malaria Surveillance

During the FY 2021-2022, with support from PMI through Impact Malaria, two staff from MOPDD attended a training on "Atelier de formation en Surveillance, Suivi et et Évaluation(SSE) des programmes de lutte contre le paludisme." in Burkina Faso in from 29th November to 11th December 2021

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 initiated:

Study Title	**Status**
Therapeutic Efficacy Study	Implementation ongoing
Estimating the Malaria Prevention Impact of New Nets: Observational Analyses to Evaluate the Evidence Generated During Piloted New Nets Distribution In Rwanda	Implementation ongoing
Assessing the Durability of Long Lasting Insecticidal Treated Nets (LLINs) Post Mass Distribution in Rwanda	Implementation ongoing
Assessment of Malaria Case Management in Rwanda: Health Facility Survey, 2021-2022	Implementation ongoing

PART IV: PROGRAM COORDINATION AND MANAGEMENT

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

To sustain gains made by 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 2021 to June 2022, 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

- **Malaria Operational Plan 2023 (MOP23)**

In collaboration with the Presidential Malaria Initiative (PMI) and CDC, the Rwanda Malaria Control Program developed and submitted the Malaria Operational Plan 2023 (MOP23) amounting to $18 Million to cover key malaria control interventions as per the National Strategic Plan 2020-2024.

- **Development of Malaria Social Behavior Change and Communication Strategic Plan 2022-2024**

Following the Malaria Matchbox Assessment for malaria high-risk and vulnerable groups in Rwanda, the National Malaria Control Program with support from USAID Ingobyi Activities, the Roll Back Malaria Partnership to End Malaria (RBM) developed the National Malaria SBCC Strategic Plan 2022-2024 addressing the needs in malaria control for the general population and malaria high risk or vulnerable groups in Rwanda.
This strategic plan was validated by the Rwanda Health Promotion Technical Working Group and will be used by the Program for resources mobilization from the Fiscal Year 2022/2023.

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

From July 2021 to June 2022, two (2) Malaria Technical Working Group Meetings were organized to discuss key malaria control program issues including the need for new malaria first line treatment options, the new LLINs distribution plan based on evidence on PBO and G2 Nets impact, etc.
In this line, the protocol of Pyronaridine–Artesunate (Pyramax) Safety,
tolerability, and effectiveness in Rwanda: A single arm, open-label Study was developed and waiting for implementation.

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

The program procurement plan FY2021/22 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.
It is important to note that COVID-19 has impacted on the unit prices of different commodities such as Insecticides, LLINs, etc. leading to a decrease in quantities of products to procure (financial gap amounting to $550,000 for IRS).

Strategy 4: Strengthen Regional Collaboration

Rwanda joined the rest of the EAC Member States in the Launch of the Great Lakes Malaria Initiative on the border between Uganda and Kenya (Busia, April 2022) and participated to different regional Malaria Experts Meetings (Mombasa in July 2021, Busia in April 2022, Nairobi in June 2022).

Photo: Launch of the GLMI, 14th April 2022, Nairobi-Kenya

Roll Back Malaria Partnership Surveillance Monitoring & Evaluation and Reference Group and the Case Management Working Group meetings

From May 10-13th June 28-30th 2022, Rwanda hosted the RBM partnership to end malaria 33th annual meeting Surveillance Monitoring & Evaluation and Reference Group and the 11th annual meeting of the case management working group in Kigali. MOPDD in collaboration with partners prepared the RBM case management site visits. The meeting focused on different important aspects of malaria case management including the management of severe malaria, drug resistance, diagnostic testing, monitoring of case management. On June 29th, 2022, IM, in collaboration with MOPDD organized a field visit to showcase Rwanda community health activities with a focus on integrated Community Case Management (iCCM) and Home-based Management of Malaria (HBMm) conducted in Bugesera and Rwamagana districts located in the Eastern province of the Country. More than 60 participants from different countries and institutions participated in this visit.

Photo 4: Dr Aline Uwimana, Director of Case Management Unit at the MOPDD explaining malaria case management to RBM CM WG during the site visit. (Credit: Noella Umulisa)

Strategy 6: Conduct Coordination and Planning Sessions for the Malaria Program and Key Stakeholders

The Malaria control program joined the Malaria Operational Planning session for the year 2023 (MOP23) organized by USAID, PMI to secure around $18 Million.

Following key findings from the Malaria Matchbox Assessment on Malaria Vulnerable and high risk groups in Rwanda, it was recommended to ensure that Local NGOs and CSOs are engaged in addressing the needs of those key populations. In this line, seven (7) Local NGOs were selected by Rwanda CCM and are currently deployed in all districts to support the National Malaria Control Program in implementing Social Behavior Change (SBC) strategies in the general population and vulnerable groups. In this fiscal year, all those NGOs were trained on Key Program Indicators and priorities, then initiated on Malaria NGOs Scorecards jointly developed with support from ALMA. These new scorecards are now guiding different stakeholders in implementing targeted interventions and measuring impact or performance.

Figure 26: Screenshot of NGOs Scorecards per Sector in Bugesera District

Malaria Scorecard

Priority Indicators, Province: East, Period: June 2022

District	Sector	(1) Coverage (%) of LLINs in ANC	(2) Coverage (%) of LLINs in EPI	(3) Malaria Incidence (Per 1000)	(4) Proportion of suspected Malaria cases that receive parasitological test at Community level	(5) Severe Malaria Referred to Higher level	(6) HBM (Tests)
Bugesera District	Nyamata	64%	100%	225.3	100.0%	2	17.8%
	Mwogo	94%	100%	100.9	100.0%	0	15.8%
	Kamabuye	97%	100%	424.7	100.0%	0	44.7%
	Mayange	99%	105%	64.5	100.0%	0	16.9%
	Juru	100%	102%	63.7	100.0%	0	41.1%
	Mareba	100%	100%	67.7	100.0%	0	31.5%
	Musenyi	100%	100%	55.8	100.0%	0	23.8%
	Ngeruka	100%	100%	77.8	100.0%	1	14.5%
	Ntarama	100%	100%	169.8	100.0%	1	28.0%
	Nyarugenge (Bugese	100%	100%	101.8	100.0%	0	27.7%
	Ririma	100%	100%	30.8	100.0%	0	14.9%
	Ruhuha	100%	100%	42.5	100.0%	1	13.9%
	Rweru	100%	100%	166.1	100.0%	0	28.1%
	Shyara	100%	100%	73.6	100.0%	0	35.6%
	Gashora	137%	119%	75.6	100.0%	0	22.7%

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

Recently, the Ministry of Health/RBC/MOPDD, in collaboration with partners have conducted an in-depth analysis using the Roll Back Malaria (RBM) Matchbox Toolkit as a guide to ensure that the interventions being implemented are addressing the documented barriers, to identify any additional specific human rights or gender barriers in the context of malaria and to provide guidance on specific interventions to address any barriers. The findings of the assessment show that the NMCP Strategy for malaria control amongst vulnerable groups in the country appears comprehensive, and program data suggest some success in reaching most of the at-risk population, but gaps may persist. These vulnerable groups include Prisoners, Refugees, Pregnant Women, Mothers/Nannies of U5, Rice Farmers, Fishermen, Mining workers, truck drivers, Health Care Providers, Students at School, Hotels Staff and Clients, Female Sex Workers, Security Staff, People with disabilities and travelers, etc.

Following the successful implementation of Malaria prevention interventions across the country, The Ministry of Health as the Principal Recipient (PR) of the Global Fund has mobilized more funds to consistently implement key SBCC priority interventions for Malaria prevention.

Subsequently, The Ministry of Heath through The Country Coordinating Mechanism (CCM) and Rwanda Biomedical Centre (RBC) recruited Seven Eligible Civil Society Organizations to implement integrated social behavior change communication interventions towards community engagement and reinforcement in general population and Malaria high risk groups for proper use of malaria control strategies recommended in Rwanda. The later focus on Bed Nets acceptance and proper use by communities, early diagnosis and treatment of malaria, integrated malaria vector control at all levels.

Thereafter, Rwanda Biomedical Centre (RBC) signed Grant agreements with the following Seven Civil Society Organizations (CSOs) deployed countrywide as follows:

No	Organization name	Location	District covered	Targeted groups
1	Rwanda Development Organization (RDO)	City of Kigali	All Districts	General population
2	Society for Family Health (SFH)	Eastern Province	All Districts	General population
3	Caritas Rwanda	Western Province	All Districts	General population
4	Rwanda Interfaith Council for Health (RICH)	Southern Province	All Districts	General population
5	Pro-Femmes Twese Hamwe	Northern Province	All Districts	General population
6	ASOFERWA (Association de Solidarité des Femmes Rwandaises)	Country wide	All Districts	High risk groups
7	Rwanda NGO's Forum for health Promotion	Country wide	All Districts	High risk groups

2. Strengthen the Malaria SBCC Framework

During this year, MOPDD in collaboration with malaria implementing partners and stakeholders including local leaders at provincial and district levels, conducted technical orientation meetings with 579 participants on malaria SBCC interventions to increase awareness around malaria disease burden, call for support and appropriation and ultimately engage community members to address the gaps identified in SBCC around Malaria prevention and control strategic interventions. Additionally, in order to support the implementation of Malaria Strategic plan (MSP), RBC/MOPDD in collaboration with its partners developed an updated SBC malaria strategy which will serve as guidance to effectively implement SBCC interventions.

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

During the FY2021-2022, Malaria social behavior change, and communication strategies were used at Provincial, District, Sector, and community levels, to promote community ownership in malaria prevention and control which is considered as a key aspect to fast track the current "***Zero Malaria Starts with Me/Kurandura Malariya bihera kuri Njye***" slogan.

In this regards, different meetings were organized as platforms where challenges were discussed by all concerned parties plotting channels and solutions for both short and long term.

Malaria district supervisors supported health care providers to conduct 5,806 malaria health education sessions alongside facility staff reaching 173,727 clients. At health facility level, the supervision was helpful to address the problem identified in LLINs distribution in ANC and EPI services.
To increase community awareness and ownership about malaria prevention and control interventions, the following SBCC strategies were implemented: Radio talk shows 43, audio spots 8, video clips 17, radio sketches 7, Urunana Radio Soap Opera 22 episodes, and Umuhoza Radio Magazine 8. There was also production and dissemination of IEC materials including Flex banners 28, Pull up banners 35, T-shirts 2,542, Caps 700.

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.
RBC-MOPDD in partnership with Civil Society Organizations (CSOs) successfully organized the World Malaria Day at National level on 25th April 2022, held in Gisagara District, whereby Rwanda joined the rest of the World to celebrate World Malaria Day (WMD) with a Theme "**Zero Malaria Starts with Me"**.
The celebration of the World Malaria Day in Rwanda served as:
a) An opportunity to combine efforts in the community mobilization to fight against malaria and to continuously increase awareness of the community and all stakeholders in malaria response and control interventions in all districts.
b) A chance to shine a spotlight on the global effort to control malaria.
c) An occasion to highlight the need for continued investment and sustained political commitment for malaria prevention and control.

Photo: Celebration of the World Malaria Day 2022, Gisagara

Promote Community Engagement in Malaria Prevention and Control Interventions

SBCC activities implemented by CSOs generated outstanding contributions with regards to Malaria prevention and control, leading to outcomes such as early diagnosis and treatment at community level. Malaria messages on malaria prevention and control were developed and disseminated through various communication channels. The disseminated messages focused on creating awareness on the role of community in malaria prevention and control, including sleeping under Long Lasting Insecticides Nets (LLINs), Households environmental hygiene to eliminate peri-domestic mosquito breeding sites and seeking early treatment. In addition to this, implementing partners in collaboration with RBC /MOPDD through SBCC conducted a training on Integrated Vector Management (IVM) for key stakeholders at sector level, whereby a total number of 1,201 participants have been trained. Despite the achievements, there are some challenges encountered during this fiscal year such as financial constraints and COVID-19 pandemic.

Table 21: Key SBCC Malaria Activities Implemented by MOPDD and Partners , FY2021/22

№	Activities	Quantity
1	Organize the SBCC meeting interventions for Malaria prevention and control at district level	304
2	Organize the SBCC meeting interventions for Malaria prevention and control at provincial	275
3	Conduct targeted supervision visits to health centres with low coverage of LLINs distribution in ANC and EPI Programs to boost the coverage of LLINs distribution	478
4	Organize 2 days Training of religious leaders on malaria specific messaging	64
5	Conduct Training of Cascade trainings on IVM at sectors level	1,201
6	Mainstreaming Malaria messaging through preaching and teaching and other religious gatherings	16
7	Organizing interreligious gatherings on malaria messaging	64
8	Organizing targeted Malaria IPC sessions at community level through existing community platforms in hot spots	58
9	Conduct community mobilization on Malaria prevention and control in hot spots using mobile sound system	209
10	Organize Radio talk shows	41
11	Production of educative video spots with key Malaria messages to be used on social media and other platforms	13
12	Radio spots airing on (LLIN utilization, Malaria Early treatment, environmental management and HBM)	8
13	Production of IEC materials:	
	# of Banners produced	28
	# of Pull up banners	35
	# of T-Shirts	2,042
	# of Caps	200
	# of Tear drop	30
	# of Jacket	8
14	Organize management meeting for the orientation of grant coordination and implementation of Malaria planned activities	17
15	Conduct National targeted supportive supervision (From Central level to District) in district hospitals with low HBM and LLINs in EPI and ANC	3
16	Conduct Joint supervision at community level with IVM team members	64
17	Conduct Joint supervision on IRS implementation in targeted districts at community level (HH visits)	239
18	Supervision of Malaria Case Finding, analysis and supply chain Management of Malaria commodities in Hotspots	147
19	Malaria week Edutainment activities (sport competitions, poems, debates …) in hotspots sectors on Malaria prevention in the districts with highest Malaria cases.	8
20	Conduct health education sessions at health facilities	5,806

PART VI: NEGLECTED TROPICAL DISEASES & OTHER PARASITIC DISEASES

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 amibiasis and giardiasis.

According to 2020 remapping of Soil Transmitted Helminthiasis (STH) commonly known as intestinal worms and schistosomiasis, STH are the most common NTDs with the overall national prevalence of 41%. The same remapping shows that adults (16years 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 is 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 respond to single dose of benzimidazoles using in mass deworming.

For Schistosomiasis, 1016 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 National Strategic Plan 2019-2024 seeks to eliminate those NTDs, which continue to pose a threat to the health and social and economic development through the following objectives:

Objective 1: By 2024, eliminate the following NTDs as a public health problem in Rwanda: schistosomiasis, Human African Trypanosomiasis, Onchocreciasis, Trachoma, Lympatic filariasis, Yaws, Leprosy
Objective 2: By 2024, eliminate podoconiosis (Imidido) in endemic Districts with <1% prevalence of untreated podoconiosis among individuals aged ≥ 15 years and > 95% of lymphoedema cases are treated adequately
Objective 3: reduce by 100% death related to rabies (Zero death of dog-mediated rabies)

Objective 4:
By 2024, reduce to <20% the prevalence of intestinal worms
By 2022, reduce by 20% the morbidity of tungiasis (jigger disease),
By 2024, reduce by 25% the morbidity of scabies and Cysticercosis/Taeniasis
By 2024, reduce by 50% the morbidity and mortality of Snake Bites Envenoming (SBE)

The following section provide details of this FY achievements per covered strategic priorities:

Strategic Priority 3. Scale-up Access to NTDs Interventions, Treatment and System Capacity Building

Under this strategic priority No 3 of the Rwanda NTD strategic plan 2019-2024, the achievements made during this reporting FY are reported per the following strategic objectives.

To strengthen NTD Case Management and Chronic Care

- **Scaling up NTD Case Management Interventions for Chronic NTDs**

In this year, eleven (11) Podoconiosis treatment centers were established to provide screening, treatment and preventive services nationwide with currently a total of 248 patients are enrolled for podoconiosis treatment services (Figure 27&28).

In line of improving the quality of care and treatment to people with Podoconiosis, the National Treatment Guidelines, awareness materials and reporting tools were developed.

In addition, twenty-two health professionals (11 Nurses and 11 Physiotherapists) were trained on the management of podoconiosis in November 2021.

Figure 27: Distribution of Podoconiosis Treatment Centers in Rwanda, 2021-2022

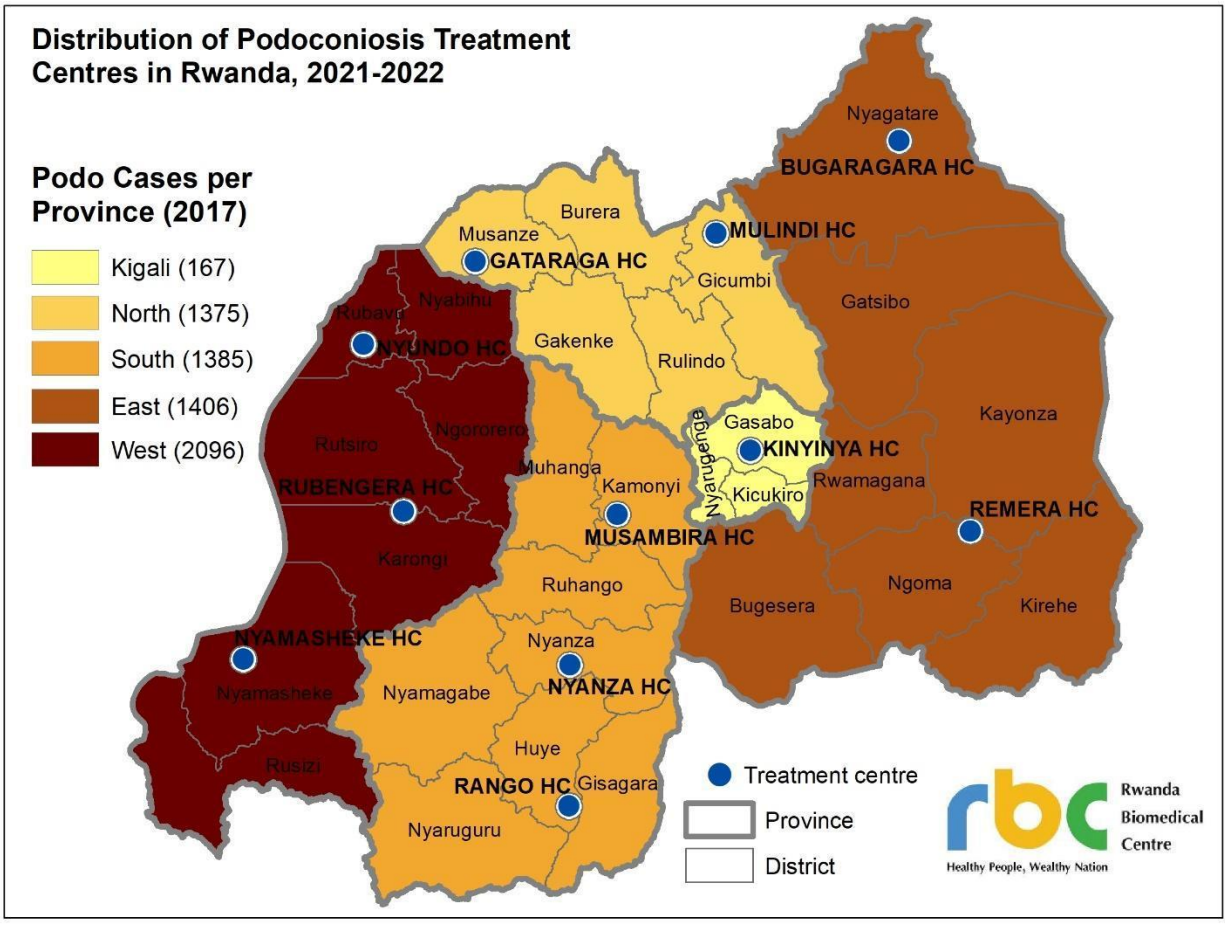
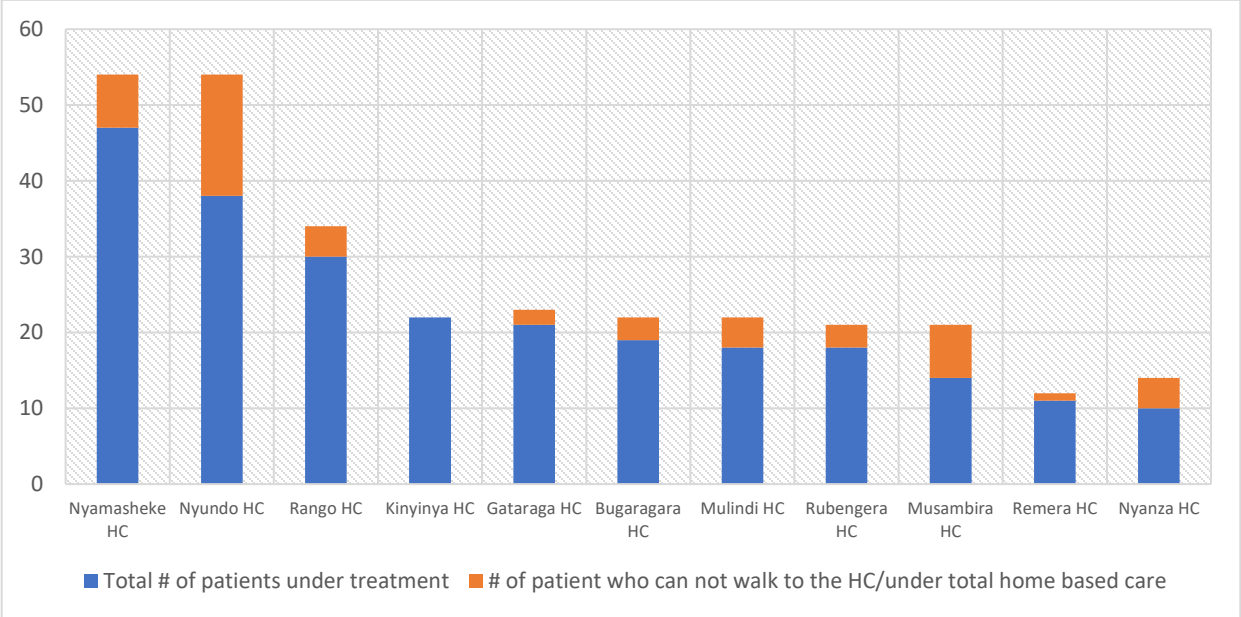


Figure 28: Number of Podoconiosis per Treatment Center, Jan-June 2022



Objective 3.3 Scale up NTDs Integrated Care and Treatment Interventions

1. Drug Management and Distribution to Districts and Health Facilities

Routine Supply Chain: Distribution of NTDs drugs including Mass Campaign drugs are integrated in the national supply chain of other medicines. Active Distribution (AD) is usually the approach used to take medicines from central level to districts or Districts level warehouses order and pick drugs for their districts (passive distribution).

Special Supply Chain: In case of emergency, a program can hire vehicles and take drugs to those district level warehouses. The last option was used in this Fiscal year because drugs reached the country in delay compared to schedule distribution campaigns.

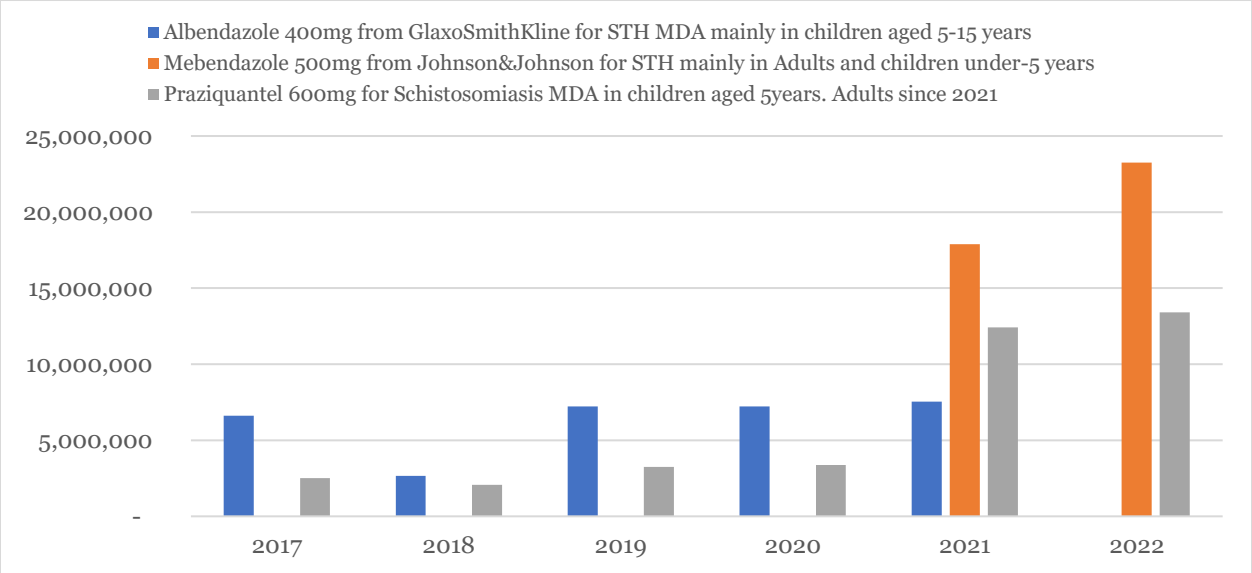
Innovative Supply Chain: Drones from the Zipline company have supported the delivery of campaign and routine but emergent medical products (anti-rabies vaccines) in remote areas when there was a stockout or emergency case.

2. 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 drugs donation was remarkable in 2021 (Figure 29) as donations included drugs for adults' population.

Donation of Albendazole from GlaxoSmithKline dropped in 2022 because WHO decided to provide Mebendazole 500mg which is known to be more efficacious to trichuris trichiura, still prevalent in 10 districts despite 12 years of mass deworming using Mebendazole 50mg in children aged 12 to 59 months and Albendazole 400mg in children aged 5 to 15 years (10 top districts with trichuris trichiura occupy 90% of all trichirus cases of the country).

Figure 29: Number of Tablets Received for NTDs Control per Year



3. Community and School-based Mass Drug Administration

With the new deworming strategy, MDA in adults was launched in 2021 by the Hon. Minister of Health (See Picture 1) alongside deworming in children.

Picture 1: Dated 15/11/2021 , Hon Minister of Health launched the MDA of adults in line with elimination of intestinal worms and schistosomiasis

For Schistosomiasis, in 2021 a total of over 3 million people were treated -almost three times of 2018 -the highest in last 5 years schistosomiasis using praziquantel with the overall coverage of 90%.

Figure 30: Number of people who received deworming tablets for Intestinal worms over the last 5 years

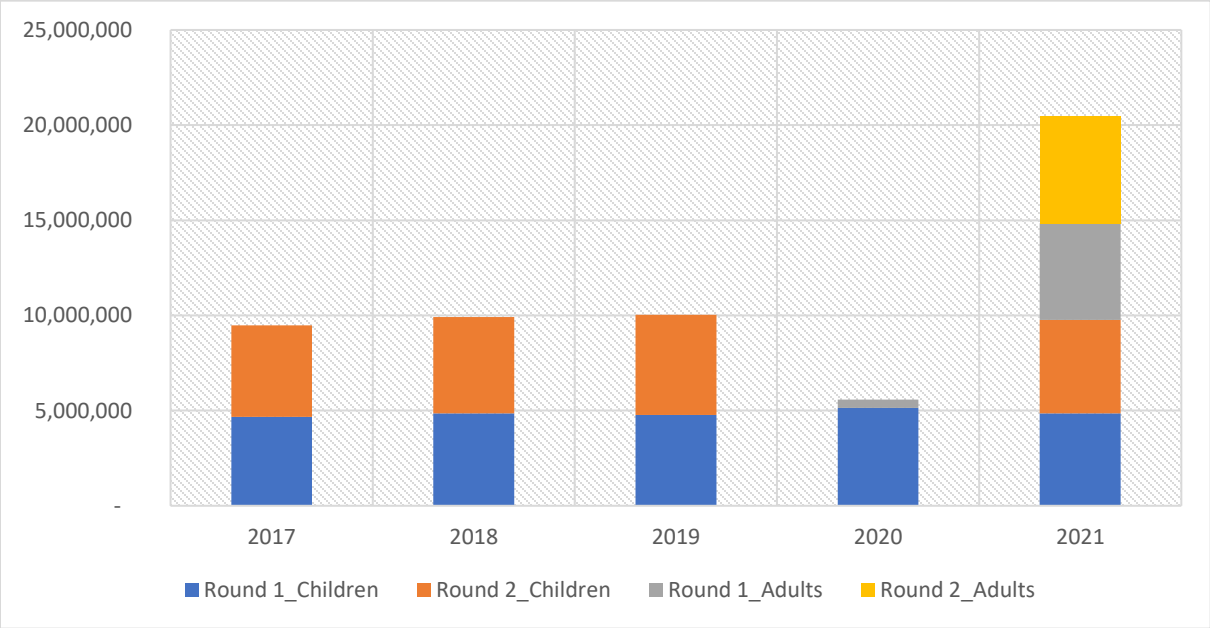
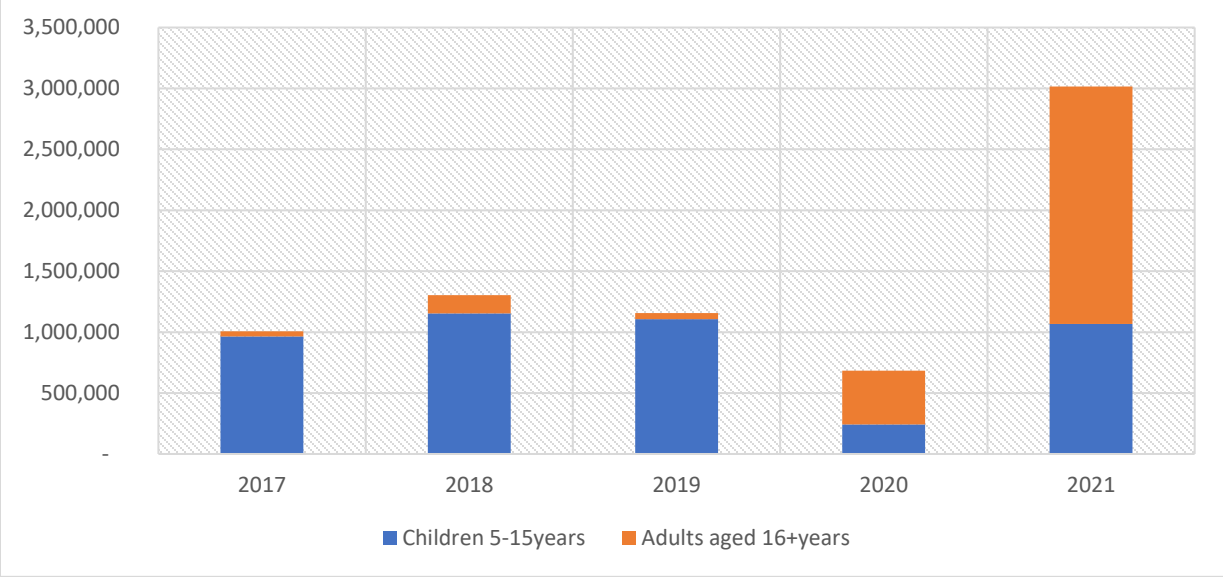


Figure 31: Number of people who received deworming tablets for Schistosomiasis over the last 5 years



Objective 3.4: To implement WASH and education for behavior change at community and school level

1. **Development and production of communication tools for education towards behavior change**

All messages related to NTDs were finalized from the existing draft. The 5S project funded by NIHR and operating in UR supported this workshop (Picture 2).

A booklet, posters and radio spots were produced and remaining awareness are being finalized with the support of the END Fund through AIHD. Those awareness materials were needed to combat NTDs and related neglect &stigma among communities.

Picture 2: Group photo of Delegates from RBC/NTD Programme and RBC/RHCC, delegates from University during a workshop to develop key messages on skin NTDs and other key NTDs.

2. Education for behavior Change and assessment regarding hygiene/ hand washing, sanitation and clean water

Fight against NTDs require more than treatment. Education for behavior change and engagement of the community to identify factors favoring persistence of intestinal worms and other WASH related diseases and to identify local feasible measure to reverse the situation. It is in this line that education and assessment of WASH door to door was conducted in May 2022 to inform on the current status to explore areas for WASH-NTDs coordination.
The following table highlights the findings from the enumeration of WASH indicators in households.

Variable	Number	%
Number of households visited/ Umubare w'ingo zasuwe	2,427,772	
Number of households with adequate latrine [with slab, lid, roof, door]/ Umubare w'ingo zifite ubwiherero bwujuje ibyangombwa [Utinze, upfundikiye,usakaye, ukinze]	1,747,757	72.0%
Number of households without latrine (without any kind of latrine)/ Umubare w'ingo zidafite ubwiherero namba	45,325	1.9%
Number of households with dirty latrine (by human excreta)/ Umubare w'ingo zifite umusarane wandujwe n'umwanda w'abantu?	109,875	4.5%
Number of households with toilet paper or any other hygienic means after toilet (water, etc.)/ Umubare w'ingo zifite uburyo bwo kwihanagura mu musarane nyuma yo kuwukoresha (urupapuro, amazi,…)	1,512,824	62.3%
Number of households with hand washing facilities [lavabo, local made kandagira ukarabe, etc.] with soap and water/ Umubare w'ingo zifite aho bakarabira intoki [kandagira ukarabe-lavabo-Akajerekani] byujuje ibyangombwa [amazi n'isabune]	1,152,464	47.5%
Number of households accessing water within 500m in rural areas and within 200m in urban areas/ Umubare w'ingo zibona amazi meza kuri metero 500 mu cyaro na metero 200 mu mujyi	1,357,474	55.9%
Number of households accessing water within household premices/ Umubare w'ingo zifite amazi mu rugo	398,573	16.4%
Number of households with water treatment capabilities [boiling, chemical treatment: Sûr-eau, Bottled water]/ Umubare w'ingo zifite uburyo bwo gusukura amazi yo kunywa [Guteka, Sûr-eau, Bottled water]	1,357,597	55.9%
Number of households with adequate storage of drinking water [any covered container]/ Umubare w'ingo zifite uburyo bwo kubika amazi yo kunywa meza [Agakoresho-Akajerekani gapfundikiye]	1,567,037	64.5%

An orientation meeting with all local leaders and health workers will help to look at individual data and how engaging the community would solve this issue.

Strategic Priority 4. Enhance NTD Monitoring and Evaluation, Surveillance& Response

Objective 4.2 Promote an integrated NTD M&E framework and surveillance based on existing health information systems

1. Health Facility-based Surveillance for Monitoring of MDA Drug Efficacy

The recent mapping data (2020) showed that there is no significant decrease of STH prevalence in the past 6 years (45% in 2014 to 41% in 2020 among school aged children). Although different hypotheses are possible (including rapid re-infestation of dewormed children by non-dewormed adults and known inefficacy of Albendazole/Mebendazole to *Trichuris* trichiura), there is fear that those MDA drugs in use are not effective enough. In order to ensure that MDA drugs are still effective, STH&SCH sentinel sites were trained (March-April 2017) and started to monitor the efficacy of Albendazole and Praziquantel for recruited patients who tested positive for STH or SCH using Kato Katz technique (microscopy).

2. WHO Validation of Trypanosomiasis Elimination as a Public Health Problem and Current Surveillance Activities

On 26 April 2022, WHO validated Rwanda as having eliminated rhodesiense Human African Trypanosomiasis (r-HAT) as a public health problem. Efforts were made in one health approach to conduct a passive and active surveillance. The active search of r-HAT cases was conducted in people at risk surrounding or working in Akagera National Park (ANP) where r-HAT vectors (Tsetse flies) are still prevalent. People at risk that were targeted included mainly livestock keepers, farmers and people working in ANP.

The last was paused after 4 years of active search without finding any single case. The passive surveillance is still underway in Eastern province where tsetse flies are available.

r-HAT diagnosis is similar to the diagnosis of malaria by screening a blood smear with microscope. In the 2021 and 2022 (January-June), this reporting year, among >195,000 blood smears screened, no single case of r-HAT identified.

PART VII: FINANCING THE MALARIA AND NTD PROGRAMS

1. Introduction

The financing of Malaria Strategic Plan (MSP) becomes a high priority for the Government of Rwanda. The MSP is funded by The Government of Rwanda and other development partners including The Global Fund funded projects (HIV/AIDS, TB and Malaria) using results-based financing model along with The US President's Malaria Initiative (PMI) and END Fund.

The national financial management system commonly known as Integrated Financial Management Information System (IFMIS) which is used by all Rwandan public institutions including Ministry of Health and Rwanda Biomedical Centre (RBC). The above mentioned financial system helps to generate reports related to planning, budgets and expenditures on regular basis. It also generates data that could be used to prepare annual financial statements for each ended fiscal year.

Note also that, above aforementioned system helps to manage national budget as well as all external projects including Global Fund funded Projects.

2. National and External Funding Sources for Malaria Program

The summarized table here below, highlights different sources of funds, planned budgets, expenditures, variance, and performance rate in % as well. The total planned budgets for FY 21/22 was USD 85 984 695 for all sources of funds, and the expenditures incurred was USD 71 218 568 which represents 82,8%.

Table 22: Malaria Budget and Expenditures by Source of Funds, FY2021-22

Sources of Funds	Budget Approved in USD FY 2021-2022	Expenditures in USD FY 2021-2022	Variance in USD	Performance Rate in %
GLOBAL FUND	35 965 803	22 490 626	13 475 177	62,5%
PMI	18 000 000	18 000 000	0	100%
GoR	31 378 930	30 547 621	831 309	97,4%
END Fund	639 961	180 320	459 641	28,2%
TOTAL	**85 984 695**	**71 218 568**	**14 766 127**	**82,8%**

Note: Due to delayed procurement process of drugs and digital systems, The END FUND planned budget was only utilized at 28,2% and the variance of USD 459 641 will be used in the next Fiscal Year.

3. Government Expenditures by MTEF Chapter for Fiscal Year 2021-2022

The total GoR contribution to malaria program is amounting to USD 31 378 930. From this budget the total expenditures were USD 30 547 621 which represents 97. 4 %. The GoR budget contribution to Malaria program was allocated to the following MTEF chapters.
(i) Compensation of employees, (ii) Use of goods and services, (iii) Subsides (iv) Grants (v) Social assistance; (vi) Other expenditures; (vii) Inventory and (viii) Fixed tangible non-financial Assets.

MTEF Chapter	Budget Approved in USD FY 2021-2022	Expenditures in USD FY 2021-2022	Variance in USD	Performance Rate in %
21 Compensation of employees	14 749 185	14 714 256	34 339	100%
22 Use of goods and services	5 015 313	4 386 699	186 416	87%
25 Subsides	812 376	758 124	0	93%
26 Grants	2 487 572	2 600 070	-119 201	105%
27 Social assistance	3 335 880	3 295 881	28 309	99%
28 Other expenditures	898 110	973 623	-67 535	108%
33 Inventory	12 059	9 861	2 099	82%
34 Fixed tangible non-financial Assets	4 068 436	3 809 107	171 625	94%
Total	**31 378 930**	**30 547 621**	**236 052**	**97,4%**

4. The Global Fund Contribution to Malaria Program

The Global Fund contribution to Malaria Program for FY 21/22 was USD 35 965 803, from this budget USD 22, 490, 625 were spent representing 62.5%. The variance of USD 13,475,177 was mainly allocated for health products (IRS products and LLINs) . The variance of USD 13 475 177 is mainly for procuring health products (IRS products and LLINs) but due to delayed tendering and delivery process were not fully implemented.

Table 23: The Global Fund Expenditures by NSP Budget Categories for July 2021 to June 2022

GF Budget categories	Budget Approved in USD FY 2021-2022	Expenditures in USD FY 2021-2022	Variance in USD	Performance Rate in %
1.0 Human Resources (HR)	1 202 507	1 273 288	-70 781	106%
2.0 Travel related costs (TRC)	3 632 209	3 632 584	-376	100%
3.0 External Professional services (EPS)	42 000	0	42 000	0%
5.0 Health Products - Non-Pharmaceuticals (HPNP)	28 147 144	15 826 853	12 320 291	56%
7.0 Procurement and Supply-Chain Management costs (PSM)	1 582 496	1 462 549	119 947	92%
10.0 Communication Material and Publications (CMP)	282 701	282 701	0	100%
11.0 Indirect and Overhead Costs	39 562	12 650	26 912	32%
13.0 Payment for results	1 037 184	0	1 037 184	0%
Total	**35 965 803**	**22 490 626**	**13 475 177**	**62,5%**

5. PMI Contribution to Malaria Program, FY 2021-2022

The PMI contribution to Malaria program was USD 18,000,000 and were specifically allocated to malaria preventive and case management interventions. The budget for preventive interventions went mainly on the procurement of Long Lasting Insecticides Nets (LLINs) and Indoor Residual Spraying (IRS). The total budget of USD 18 000 000 was fully utilized.

6. Conclusion

The overall budget allocated to Malaria and NTDs Program during FY 21/22 was utilized at 82,8%.

PART VIII: MALARIA PERFORMANCE FRAMEWORK

Table 24: Malaria Program Performance Framework

A. Impact Indictors

ITEMS	INDICATORS	Baseline	Year of Baseline	2021-2022 Targets	2021-2022 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	156	76	100%*
	Inpatient malaria deaths per 100,000 persons per year	2.1	2018-19	1.5	0.6	100%*
	Number of confirmed malaria deaths	264	2018-19	198	71	100%*

B. Coverage and Outcome Indictors

ITEMS	INDICATORS	Baseline	Year of Baseline	2021-2022 Target	2021-2022 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%	100%*
	Proportion of population protected by indoor residual spraying within the last 12 months in targeted districts	98.%	2018-19	85%	99%	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	90	100%	100%**
	Proportion of suspected malaria cases that receive a parasitological test at the community level	NA	2018-19	90	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	99%	100%
	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 were 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 needed to improve documentation of fever

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