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Rwanda Biomedical Centre
Healthy People, Wealthy Nation

The Impact of COVID 19 on Malaria Program in Rwanda: Rapid Assessment of Knowledge, Attitudes, Perspectives on COVID 19, and Situation of Malaria Services Provision in Three Districts in Rwanda

Principal Investigators:

Dr. Christian NTIZIMIRA
Principal Investigator (PI)
Health Concepts and Innovation Solutions (HCIS)
Gacuriro, Kigali
Telephone: 0788415225
Email: ntizimira77@gmail.com

Mr. Pascal BIRINDABAGABO
Investigator (PI)
Health Concepts and Innovation Solutions (HCIS)
Gacuriro, Kigali
Telephone: 0788648668
Email: pbirindab@gmail.com

Dr. Aimable MBITUYUMUREMYI, MD Msc.
Principal Investigator (PI)
Division Manager of Malaria and Other Parasitic Diseases Division, Rwanda Biomedical Center
Gasabo, Kigali
Telephone: 0788486256
Email: amiable.mbituyumuremyi@rbc.gov.rw

Administering Institutions:

Health Concepts and Innovative Solutions (HCIS)
Resolve to Save Lives
Rwanda Biomedical Center (RBC)

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I. Executive Summary

Covid-19 continues to challenge health systems. When Covid-19 was first recorded in Rwanda in March 2020, the government has instituted various response measures. Covid-19 pandemic is a threat to the invested efforts in health services. Considering malaria, for instance, estimations suggest that malaria-related deaths might double if attention continues to be strictly on Covid-19.

While there were some estimations of the impact of Covid-19 on different socio-economic development and access to important services, its impact on malaria services delivery and use in Rwanda was not effectively evidenced. Additionally, little was known about Community Health Workers (CHWs), and healthcare providers' knowledge, attitude, and practices about Covid-19, and the barriers that might have hindered the use of malaria services by the community as a result of Covid-19 mitigations measures. This study was conducted to address those gaps to inform new strategies to ensure that Rwanda keeps the momentum and preserves the achieved gains in reducing malaria morbidity and mortality while continuing to effectively manage Covid-19.

The study was conducted in three high burden malaria districts: Rwamagana, Kayonza, and Gasabo from August to September 2020. The study used mixed methods and collected both primary and secondary data. Primary data were collected through surveys among healthcare providers and CHWs, key informant interviews with health facilities managers and malaria program staff, and through focus group discussions with community members. Secondary data included data extracted in the existing platforms such as the Health Management Information System, and **"Système d'Information Sanitaire Communautaire"**

This study revealed that people continued to be treated for malaria as required during the Covid-19 pandemic in Rwanda. The study showed that the number of people treated for simple malaria in health facilities during Covid-19 was almost the same as the number of people treated before Covid-19. Interestingly, even if the overall number of people treated for malaria did not significantly change, more people used CHWs for treatment. It was found that throughout the Covid-19 period, the proportion of malaria tests performed in the community increased (3.06% per month (95%CI: 1.46 - 4.65) compared to those performed in health facilities. In addition, the findings from this study revealed that the rate of severe malaria cases also did not change throughout the Covid-19 period while the proportion of people who died from malaria among all malaria cases increased in March 2020 (6.04 deaths per 100000 malaria cases) when Covid-19 was first recorded in Rwanda but reduced significantly over time in the following months (reduction of 0.67 deaths per 100000 cases per month).

For the Covid-19 related knowledge among healthcare providers, it was found that around 73.7% have appropriate knowledge level (80% and above) about Covid-19. All know that handwashing with soap helps to prevent transmission; fever and short breath are signs of Covid-19. However, almost

half of healthcare providers consider (44%) consider antibiotics as the first-choice medicine for Covid-19. It is worth noting that the source of information is key to having an appropriate knowledge level. Those who get Covid-19 information from sources such as family, friends, and newspapers are less likely to have correct knowledge compared to those getting information from social media. For the attitude, most of the healthcare providers said their workplace provides enough information, their family is supportive to continue to work at the health facility during Covid-19 and support the government in restricting some activities to control Covid- 19. However, even if most of them continued to provide the services they were providing before Covid-19, many expressed that they were worried that they would get Covid-19 due to work as health providers.

For CHWs, only 56.51% of CHWs had an appropriate knowledge level about Covid-19. Most CHWs know that hand washing and soap help to prevent transmission, fever is a sign of Covid-19, and infected surfaces can transmit Covid-19. However, more than 70% of CHWs consider antibiotics as first-choice medicine for Covid-19. Regarding their attitude, most of CHWs supported the government in restricting some activities to control Covid-19. Moreover, they also acknowledge that their workplace provides enough information about Covid-19 and expressed that their family was supportive to continue to work as CHWs during Covid-19 restriction measures including the lockdown period. However, many expressed that they were worried that they would get Covid-19 due to the nature of their work. Furthermore, findings from this study revealed that most of the CHWs continued to provide diagnostic and treatment services, nevertheless, many stopped to provide community health promotion such as mass communication and sensitization.

On the other hand, community members as users expressed different barriers to access health services including malaria services. Transportation was the most challenging issue encountered by the community to seek diagnostic and treatment services, especially during the lockdown. Along with transportation, they also expressed that Covid-19 had swallowed access to other health-related information. Hence, they suggested that the government should integrate other health-related information with Covid-19 information and employ various available communication channels, especially media to ensure that all residents access comprehensive health information. Nevertheless, community members were knowledgeable about Covid-19 because they had access to information through different communication channels. Moreover, people were still puzzled by Rwanda's high recovery rates in light of the lack of treatment for Covid-19. Besides that, Covid -19 also impacted the implementation of malaria control interventions such as Indoor Residual Spray that was delayed as well as procurement and distribution of mosquito nets in the community.

This study demonstrated that most of the malaria services were duly delivered during the Covid-19 pandemic in Rwanda despite that some others were negatively impacted, especially those related to prevention. It highlighted the need for enhancing preventative measures, and to speed up and revert the interrupted activities to reverse Covid-19 impact on service delivery.

Besides that, the study used available data reported at health facilities to assess malaria-related deaths and it could not ascertain if there were no community deaths. Thus, findings provided a portion of information related to all malaria-related deaths and highlight a need to enhance community death surveillance and reporting. Additionally, this study also underlined again the critical role of CHWs in ensuring continuous access to primary healthcare in Rwanda by community members especially during pandemics such as Covid-19, a role that might be hindered by their limited knowledge on Covid-19 and likely on other emergencies. As health systems continue fighting the pandemic and mitigating its consequences, the findings highlight enhancing CHWs' access to information about Covid-19 and other comprehensive health topics through continuous training. Last but not least, further studies in other geographical locations and on the long-term impact of Covid-19 on malaria programs following interrupted or delayed interventions are also needed.

BACKGROUND

Covid-19 continues to be a global public health problem. Rwanda confirmed its first case on March 12, 2020. Immediately, the government instituted Covid-19 response measures including testing, contact tracing, quarantine, and countrywide lockdown (from March 21, 2020 to May 04, 2020). Only essential services were allowed to operate such as markets and health facilities(1–7). Evidence shows that the outbreaks constitute a threat to the invested efforts in health services. Unless targeted efforts are put in place, services may not recover sometimes to pre-outbreak levels (8).. The malaria services do not make an exception. The WHO estimates that the number of deaths from malaria could double if the world's attention continues to be strictly on Covid-19(9).

The impact of Covid-19 on malaria services delivery and use in Rwanda was still unknown. Additionally, although some assessments of the knowledge, attitude, and practices about Covid-19 have been conducted among health care providers in Rwanda(10), most of the assessments conducted did not use qualitative approaches to better understand other factors not quantitatively captured. Moreover, little was known about Community Health Workers' (CHWs) knowledge, attitude, and practices about Covid-19, and the barriers faced by the community to use malaria services during the lockdown period. This study was conducted to address those gaps to inform new strategies to ensure that Rwanda keeps the momentum and preserves the achieved gains in reducing malaria morbidity and mortality while continuing to effectively manage COVID-19 .

AIM OF STUDY

The aim of the study was to determine the health care providers' (HCP) and CHWs' knowledge, attitude and perspectives on readiness about Covid- 19 in general and about continuum of malaria services provision during the period of Covid-19 mitigation measures.

METHODS

I.I Study Setting and Design

The study used a mixed method and WAS implemented in public health facilities from three of the top 10 high burden malaria districts of Rwanda: Rwamagana, Kayonza and Gasabo.

I.2 Sampling and Data Collection Procedures

The study included healthcare providers (HCP), Community Health Workers (CHWs), and Community members living in the study districts. For the survey, we included all hospitals located in the study sites and randomly selected health centers weighted to the total number per district (12 in Kayonza, 11 in Rwamagana and 13 in Gasabo). At each health facility we surveyed all HCPs that were available, fulfilling the criteria and 13 CHWs selected randomly. For the interviews and focus groups, the participants were selected purposively and conveniently. We collected primary data through surveys using questionnaires, focus group discussions, and in-depth interviews. We also used the secondary data extracted from the Health Management Information System (HMIS), and **"Systèmed'Information Sanitaire Communautaire (SISCOM)".**

1.3 Measures, Data Management and Analysis

For survey data, the outcomes were knowledge level (categorized as low knowledge if <80% appropriate knowledge if 80% and above), and supportive and non-supportive attitude. Descriptive statistics (n and %) were used. We also conducted bivariate analysis using Chi-square ($\chi 2$) and logistic regression (when applicable). The significance level was set at <0.05. We also calculated utilization rates by dividing the monthly cases by estimated annual population per district and conducted

interrupted time series analysis to compare trends and level between pre-Covid-19 period (from January 2019 to February 2020) and Covid-19 period (from March 2020 to October 2020). For qualitative data, we conducted thematic analysis, memos and data displays were used in the data reduction process and finally, key themes were reported.

MAIN RESULTS

1.4 Results from the HMIS/SISCOM Analysis

When comparing the trends and the level for simple malaria rate, all districts combined, there was no significant change in presentation rate for simple malaria (p:>0.05). However, a detailed analysis per district showed that in Gasabo district, there was a significant reduction of simple malaria presentation rate (14 cases per 1000, p:>0.05) immediately once COVID-19 arrived in Rwanda, with a monthly reduction of 2.72 cases per 1000 people. However, there was a monthly increase of 5.34 cases per 1000 in Rwamagana district (Figure 1 – Figure 6).

Figure 7 shows that there was no significant change in suspected cases or patients presenting fever symptoms (both tested positive and negative) when health facilities and community are combined. However, when analyzed health facility and community separately, there was no significant change in the rate of suspected malaria cases at the health facility level immediately when Covid-19 was first reported in Rwanda, but there has been a monthly significant reduction in the suspected case rate of around 5.09 per 1000 people (95%CI: -7.46, -2.72, p: <0.001). For community malaria suspected cases rate, although there has been a constant reduction over time, that trend change is not statistically significant (p:0.102), and there was also no change in level of suspected cases rate immediately after the first case of COVID-19 was reported.

Interestingly, while the rate of suspected cases did not significantly change, more tests were performed in the community compared to health facility. Detailed analysis showed that the proportion of malaria tests performed in the community increased significantly throughout Covid-19 period. The increase was around 3.06% per month (95%CI: 1.46 - 4.65, p: <0.001) (Figure 10). Further analysis also showed that significant monthly increase in Kayonza district (3.02%, p:0.005) and in Rwamagana district (3.82%, p:0.001). However, there was no change in Gasabo district (Figure 11).

For severe cases, there was no significant change in overall presentation rate for severe malaria cases (all p:>0.05 for trends and level). When disaggregated per age group, there was no significant change for under five years old (all p:>0.05 for trends and level) while, for those of 5 years old and above, there was a significant reduction of around 42 severe cases per 100000 immediately when Covid case was reported in Rwanda (p: 0.019) but no significant change in trend over time (p: 0.153). (Figure 15 - 16).

Moreover, the results in figures 17 and 18 show that there were significant changes in malaria fatality rate. All ages combined, there was an increase of around 6.04 deaths per 100000 malaria cases immediately when Covid case was reported in Rwanda. However there was a significant reduction in trend of around 0.67 deaths per 100000 cases per month (p:0.001). When age groups were analyzed separately, we observed an increase of 14.80 deaths per 100000 malaria cases among under 5 years old (p: <0.001) and an increase of 5.08 deaths per 100000 malaria cases among the 5 years and above (p: <0.001) immediately when Covid case was reported in Rwanda. For the trend overtime, there was a significant reduction of 0.91 death per 100000 cases among those of 5 years and above (p:<0.001) but the reduction of 0.32 per 100000 cases among less than 5 years old was not statistically significant (p: 0320).

1.5 Results from the Health Care Providers Survey

The survey included 331 HCPs. More than 60% (210) were female and 121 (36.6%) males. More than 90% (309) were nurses/Allied Health Professionals. Of the total HCPs, 83 (25%) and 130 (39.3%) had 5years and 10 years and above of experience respectively.

Regarding the knowledge level on Covid-19 , 244 (73.7%) of HCPs had appropriate knowledge levels. The proportion of the HCP with appropriate knowledge varied by district where it was high in Rwamagana (n: 77, 82.8%) and low in Gasabo (n: 76, 67.9%). Moreover, a high proportion of appropriate knowledge was also observed among HCPs who use television/Radio as the main source of information about Covid-19 (n: 151, 77%) while it was 73.4% (n: 80) and 50% (n: 13) among those who use social media and other sources (Family, friends. newspapers, etc.) respectively. Table 1 in the appendix shows HCP knowledge level per background characteristics.

Moreover, a detailed analysis showed the questions that scored high with correct answers were hand washing and soap help to prevent transmission (100%), fever and short breath as a sign of Covid-19, scoring 99% each.

Multivariate analysis showed HCPs working in Rwamagana were more likely to have correct knowledge compared to those working in Gasabo (OR: 2.09, 95%CI: 1.06 - 4.12, p value: 0.034). Moreover, there is also association between the knowledge level and source of information. Those who get Covid-19 information from sources such as family, friends, and newspapers are less likely

to have correct knowledge compared to those getting information from the social media (OR: 0.39, 95%CI: 0.16 - 0.95, p value: 0.038).

For the attitude, 89% of HCP said their workplace provides enough information, 93% said their family is supportive to continue to work at the health facility during Covid-19, and 98% supported the government in restricting some activities to control Covid- 19. However, only 7% were not worried that they would get Covid-19 due to work as health providers and only 10% were not worried that their family members may get Covid-19 due to their work. (Figure 22).
The results showed that most of the HCP continued to provide the services they were providing before Covid-19. More than 97% (n: 301) continued to provide malaria diagnostic and treatment, while only 38.59% (n: 71) continued to provide community education during Covid-19 period. Further analysis showed that most of the reasons of services delivery changes were non-Covid-19 related reasons except for community education where 88.5% (n: 93) of those who stopped providing education reported it was due to Covid-related reasons. The table 3 - 4 provides the details.

1.6 Results from the Community Health Workers Survey

The survey included 384 CHWs. of them, 226 (58.9%) were female and 158 (41.1%) were male. More than 77% (n: 297) had completed primary education, 92.1% (n: 354) were married, 15.6% (n: 60) had less than 5 years of experience as CHWs, while 27.1% (n:104) and 57.3% (n: 220) had 5 to 10 years and above 10 years of experience as CHWs respectively. The majority of CHWs were using television/radio as the main source of information (n: 376, 97.9%)

Regarding the knowledge level, 56.51% of CHWs had appropriate knowledge levels. There was no statistically significant variable at bivariate analysis. Table 2 shows the CHWs background characteristics and their knowledge level. A detailed analysis showed that the questions that scored high for correct answers were hand washing and soap help to prevent transmission, fever as sign of Covid-19, and infected surfaces for transmission of Covid-19 (scoring 98% each).

For the attitude, 99% of CHWs supported the government in restricting some activities to control Covid-19, 93% said their workplace provides enough information about COVID-19, 96% said their family was supportive to continue to work as CHWs during COVID. However, only 9% were not worried that they would get Covid-19 due to work, 9% were not frustrated about how Covid-19 was affecting their daily life, and 13% were not worried that their family members may get Covid-19 due to their work (Figure 26).

Regarding the changes in malaria services delivery, the study showed that most of the CHWs continued to provide diagnostic and treatment services even during the lockdown (n: 357, 93.46%). However, the community education related activities were only provided by 94 (25.34%) during the lockdown. Almost all CHWs (n: 276, 99.64%) who did not provide education reported that it was due

to Covid-19-related reasons. However, more than 50% (n: 138) of those who stopped to distribute mosquito nets and 54.17% (n: 26) of those who stopped to supply commodities reported that the reasons for not providing those services were non-Covid-19 related reasons. Actually, 61 (22.26%) of those who stopped to distribute mosquito nets reported that it was due to stock out. The table 5- 6 provides the details.

1.7 Results from the Qualitative Analysis

The qualitative analysis included 6 focus groups discussions with CHWs, 6 FGD with community members and 20 interviews from healthcare providers of health centers and 2 staff from central level. The thematic analysis identified different prominent themes common to all participant groups. Detailed report is in Appendix with specific quotes supporting the findings.

Overall, respondents expressed that Covid-19 lockdown measures impacted the access to malaria services, especially for community members who were unable to find transportation means to seek diagnostic and treatment services. Regarding the health services delivery, HCPs continued to receive and treat malaria patients during lockdown. However, many of them expressed to be fearful that this would expose them and their families to Covid-19 and requested that the health sector works to increase their protection as a way to improve service delivery. Moreover, some other respondents reiterated that factors such as access to transportation, family support, and provision of personal protective equipment among others, contributed to facilitating access to and delivery of malaria services during lockdown.

Regarding the integration of information, respondents expressed that Covid-19 had swallowed access to other health-related information and that the government needs to employ various mediums of communication to ensure that all residents access information on Covid-19 and other diseases. Nevertheless, community members were knowledgeable about Covid-19 because they had access to information through different communication channels. Moreover, the general public is still puzzled by Rwanda's high recovery rates in light of the lack of treatment to COVID-19.

1.8 Results from the Central Level: Malaria Control Interventions Implementation

The central level malaria program implementation analysis showed that most of the planning activities continued as usual though most of the meetings were organized virtually as COVID-19 prevention measure. These activities include Global Fund (GF) Proposal Writing, the Presidential Malaria Initiative (PMI)-Malaria Operational Plan writing, etc.
However, some routine field activities such as Supervisions and surveys were put on hold during the total Lockdown period.

Further analysis showed that some field activities related to malaria prevention were impacted

due to COVID-19. Indoor Residual Spray was planned in 13 districts from July 2019 to June 2020. Of those, 10 districts were successfully sprayed on time from July 2019 to March 2020 while the remaining three districts which include the study districts (Rwamagana, Kayonza and Gatsibo) were sprayed with a delay of 2 months compared to the initial plan. Moreover, there was also a delay in Long-Lasting Insecticidal Nets (LLINs) procurement and Distribution. Only 13 out of 30 districts were covered with LLINs from July 2019 to March 2020 while the remaining17were covered with delay extending to October November 2020 due to COVID-19. Furthermore, the program reported to adapt LLINs distribution strategies and used house to house distribution by CHWs instead of mass distribution to for Covid-19 prevention. Additionally, while there was no delay in IRS products procurement due to Covid-19, there was delay in LLINs procurement, in inspection and inspection and distribution of LLINs.

Additionally, regarding the reporting rate in HMIS and SISCOM, it was noted that no change in reporting rate during COVID-19 Period (99%) compared to before COVID-19 (99%) in public health facilities.

DETAILED FINDINGS FROM THE ANALYSIS QUALITATIVE ANALYSIS

The qualitative analysis included 6 focus groups discussions with CHWs, 6 FGD with community members and 20 interviews healthcare providers from health centers. The thematic analysis identified different prominent themes common to all participant groups that describe experiences during lockdown and explore barriers and facilitators to accessing and providing malaria services during the COVID-19 mitigation measures.

1.9 Malaria Service Utilization

All participants expressed that nation-wide lockdown measures related to COVID-19 had an impact on the utilization of Malaria services. Although a few of the participants mentioned that there was no change in Malaria service utilization during lockdown, many of the respondents stated that the number of patients seeking Malaria services decreased. Reasons given for this decrease included lack of transportation, shortage of malaria commodities, fear of contracting COVID, and financial

barriers. On the other hand, other respondents also appreciated that COVID -19 lockdown measures were implemented after houses had been sprayed with insecticides and the communities had received mosquito nets, which might have contributed to low numbers malaria patients.

> ***"The problem [to accessing Malaria services] happened during lockdown. You would have a sick family member but had no way of taking them to the health facility, so their illness would become severe. There were no cars working, we had no other help." [Community member, Rubungo]***

> ***"The number of patients during lockdown decreased. But the reason for this was because we sprayed mosquito repellents [insecticide] in 2019. That's why we had fewer cases of Malaria; we did not have many cases!" [Community health worker, Rubona]***

Many respondents recommended that in order to increase access to malaria services during lockdown, there should be efforts to avail transportation for patients, to ensure no stockouts of Malaria commodities in the community, and to involve local government representatives in campaigns to encourage community members to seek health services when feeling unwell. For many respondents, improving and strengthening the capacity of CHWs to receive patients during lockdown was believed to be the best solution to make malaria services accessible in various communities.

> ***"If it were ever necessary for lockdown to be reinstated, it would be good to strengthen the capacity of CHWs [to receive Malaria patients] because they are closer to community members. They have the medication, the test kits, the treatment registers... undeniably, they would be able to deliver good services. If we were to be put into lockdown again, CHWs would still continue to work. We have to increase the capacity of CHWs." [Nurse, Karama]***

> ***"I think there should be a way for people to get to the health facility; maybe there should be vehicles to transport them. Let's say, if it is a health center, it should provide an ambulance and say people who are sick in this sector can use this car to get to the hospital when other vehicles have stopped working." [Community member, Kinyinya]***

Overall, respondents expressed COVID-19 lockdown measures impacted access to malaria services, especially for community members who were unable to find transportation means to seek treatment.

1.10 Malaria Service Delivery

Health service providers (CHWs and HCPs) expressed that they continued to work and provide malaria services during COVID -19 lockdown. The majority of respondents expressed that although they chose to continue working, they feared that they might contract COVID-19 from one of their patients. Moreover, other respondents mentioned that they worried about how their choice to continue working exposed their families to increased risks of contracting COVID -19 . A few of

the participants even admitted that at the beginning of pandemic when the government had just implemented lockdown measures, they refused to receive patients and would claim that they ran out of medication to discourage patients from coming to them for malaria services. A prominent factor that caused fear among providers was that the symptoms of malaria (fever, fatigue, body aches) were similar to COVID-19 symptoms. Among nurses and health center staff, challenges finding transportation means to work caused delays in service delivery as some HCPs would show up late for work or would simply fail show up.

> ***"Yes, we were worried, and were scared. As some of us said, in the first 2 weeks [of lockdown], we stopped working because we had no protection. We stopped receiving patients. They [patients] would come… there would be a time when they would call asking if we had medication, and we would tell them that we had none. Because you can't tell someone who came that you can't treat them, we would be smart about it by telling them that we have no medication and that they should find a way to go to the health center. Because I would think 'if I receive them, I have no way of knowing if they are not sick [with corona].' They could leave the whole house on lockdown because of Corona, so I would tell them that I have no medication. I spent two weeks without receiving any patient." [Community health worker, Rubungo]***

> ***"For us in Bumbogo, we live far from the main road. That means that our workers [nurses] had no way of getting here and during that time [lockdown], no motorbikes or vehicles were working. It became necessary that most of them take their leave days … Later, the health center had to use their motorbike to bring them to work. [Because of that], some of them used to get to work at 10, 11 am. Even, some would not come to work because they had no transport." [Nurse, Bumbogo]***

All respondents mentioned that it was crucial to provide health service providers with personal protective equipments and transportation to work, as a way to improve Malaria service delivery during lockdowns and pandemics.

> ***"Personally, what I think the government can do, my wish… they should help healthcare providers who live far get transportation to the hospital [during lockdown] so that they can treat Malaria cases quickly [on time] because Malaria is also an epidemic!" [Community member, Rubungo]***

> ***"Our first worry was due to the fact that we, community health workers, come in contact with many people. Our wish… if they could also give us personal protective clothing, the protective equipment would help us… our worries would reduce because we would also have access to protection." [Community health worker, Rwamanyoni]***

Overall, health service providers continued to receive and treat malaria patients during lockdown. However, many of them were fearful that this would expose them and their families to COVID-19 and requested that the health sector works to increase their protection as a way to improve service delivery.

1.11 Malaria Services Facilitators

Respondents mentioned that there were factors that facilitated access to and delivery of Malaria services during the COVID-19 lockdown. From community members, these factors were identified to be family members and friends helping patients access care and obtaining a pass from local authorities that allows patients to move around during lockdown.

> ***"Because vehicles like motorbikes, cars that people use to move were not working [it was hard to get services]. But, because the police [station] is close… we live in a small rural community, exchanging information to ask them to give someone permission to let them move was easy. Even the village leader would provide them [patients] with a note and the cell office would sign it, making it easier [for them to move]. The community worker would also call [asking leaders for permission], and this would make it easy [to go seek services]." [Community member, Rubona]***

From CHWs accounts, facilitators were named to be access to personal protective equipment and designating a team leader who would be in charge of going to the health center to bring re-stocking commodities.

> ***"In March when this [pandemic] had just started, it disturbed us a lot, even in April. We even felt like giving up treating [patients]. But, our supervisor and the head of the health center continued to reassure us, saying that we should continue to work. Then we got lucky… at that time people hadn't yet heard about hand washing and wearing face masks. But they [health center] called us and gave us face masks and we were able to protect ourselves. We even got the step and wash [portable hand washing stations], and that's how we continued to work without any problems. We continued to receive patients." [Community health worker, Karenge]***

HCPs described facilitators to be access to transportation to and from work and designating a transportation vehicle or motorbike that would help sick patients reach the health center.

> ***"[Getting patients] was difficult for us until we worked with the health center [to find transportation for them], and we would go get patients from their homes. Or, for patients who needed to go back home, we would put them in an ambulance that was going in or near the area they live in." [Nurse, Rwinkwavu]***

All in all, respondents reiterated that factors such as access to transportation, family support, and provision of personal protective equipment among others, contributed to facilitate access to and delivery of Malaria services during lockdown.

1.12 Integration of Health Information

While all CHWs and community members claimed that the COVID -19 pandemic reduced the amount of information they received on other diseases (Malaria, HIV, etc.), nurses stated that there was no change in the amount of information they received on other illnesses. All participants, however,

agreed that COVID-19 was the most concerning disease that had taken over public health discourse and that could have contributed to why other diseases seemed to have taken a back seat.

> ***"The information we get on other diseases has decreased because people have been more focused on COVID, that's all they think about." [Community member, Rwamanyoni]***

> ***"COVID is at the forefront but even [information] on other diseases is still provided. First, like the news I hear in the morning, they start with a talk on nutrition, followed by a talk for pregnant women, and they discuss how children are getting vaccinated. It is information we can access, even anyone can access it." [Nurse, Kayanga]***

Participants recommended that the government should disseminate health-related information to communities through CHWs and local government representatives, as they are closer to the communities and are trustworthy. Other participants suggested that government entities should continue to use existing communication means (radio, television, social media, sms messages, etc.) to communicate with the general public.

> ***"As things stand now, radios and televisions only focus on COVID messages … I think the government should put efforts into giving [people] more messages on malaria prevention. They should disseminate these messages on radio and television, so that it's not just COVID [information] because it has distracted people." [Community member, Rubungo]***

> ***"Community health workers live with the communities and we can reach people who don't have radios. Therefore, I think that's where it [information] could pass. I don't know how the government can increase the capacity or power of community health workers so that we are able to share information with the general public… because community health workers live with the communities, we know how they are, and so we can get information to them as soon as possible." [Community health worker, Rwamanyoni]***

Overall, respondents expressed that COVID-19 had taken swallowed access to other health-related information and that the government needs to employ various mediums of communication to ensure that all residents access information on COVID-19 and other diseases.

1.13 Community Knowledge on COVID-19

General consensus among all respondents was that the general public was knowledgeable about COVID-19 and that they understood well its transmissions, signs and symptoms, and how to prevent its spread. This knowledge was attributed to access to information on COVID-19 through the ministry of health announcements, local government officials, and community health workers. Many community members explained that they were able to get information on COVID-19 from the radio, television, social media, and other sources.

"We first heard about COVID in the media, they were saying that it came from or first appeared in Wuhan, China. We continued to hear about it in the media, I think on 14 March that the first case had been confirmed in Rwanda, and that's how it continued to spread in the country. Even today, we continue to hear about it [COVID]. What we know is that it is a pandemic disease caused by a virus and that it can be transmitted through two mechanisms: there is direct contact with an infected person or touching [surfaces] the infected person has touched. We also heard about how to prevent it, including the measures of washing our hands with clean water and soap, leaving one-meter distance between one person and another, and wearing a face mask properly." [Community member, Rubungo]

Although community members possessed knowledge on COVID-19 , majority expressed that they were still confused as to what treatment is provided to COVID-19 patients. While some sought to know how the government was able to have high recovery rates given that COVID-19 has no cure or vaccine, some respondents wondered if Rwanda had a secret remedy to COVID-19 that they weren't sharing with the rest of the world.

"They [government] tells us that COVID has no vaccine or cure. And [I] wonder 'there is no cure… what medication do they give to the people who get infected to cure them or reduce its severity, if there is no vaccine or cure?" [Community member, Kinyinya]

"Some say that Rwanda, even though they [government] don't say it, probably has a secret cure, that they found it but kept quiet about it because we Rwandans are secretive. They wonder why there hasn't been many deaths, saying 'why is it that our people get sick but many of them recover?' They [communities] think that there is a secret cure." [Community health worker, Rubungo]

Overall, community members were knowledgeable about COVID-19 because they had access to information through different communication medias. However, the general public is still puzzled by Rwanda's high recovery rates in light of the lack of treatment to COVID-1

DISCUSSION AND CONCLUSION

This study aimed to determine the HCP and CHWs' knowledge levels, attitude, and perspectives about COVID-19 and assess the impact of Covid-19 on malaria services in 3 districts of Rwanda. Overall, the study showed HCPs have an appropriate knowledge level about Covid-19 and CHWs' knowledge level is still relatively low. Moreover, the study showed there was an association between the likelihood of having appropriate knowledge and the district where an HCP was working as well as and the source of information about Covid-19 . Additionally, both HCP, CHWs, and community members had a positive attitude regarding the government mitigations measures and appreciated the information they received about Covid-19 . Furthermore, there are variations in how Covid-19 impacted different malaria services including geographical variations.

HCPs had a high level of knowledge about Covid-19. Many similar studies have found high knowledge levels among HCP in many settings (10–12).However, CHWs were found to have a relatively low knowledge level about Covid-19. Such high knowledge level among HCP despite the fact that Covid-19 is a new disease may have different explanations. Even before the lockdown, the government of Rwanda had started to put in place mitigation measures including HCP training as the frontline to manage cases. CHWs were more expected to provide community sensitizations. When the lockdown was put in place, all gatherings were prohibited including meetings, supervision, and face-to-face trainings. Those have been the traditional capacity-building strategies for CHWs. Thus, while the HCPs had had training but also could be able to adapt their learning strategies such as online learning, facilitated by their access to the internet, the CHWs could only get general Covid-19 related information from other sources such as family, friends, newspapers, and media. In fact, this study found HCP who were getting Covid-19 related information from sources such as family, friends, and newspapers were less likely to have the appropriate knowledge, which may suggest low quality of information from those sources. This CHWs low knowledge may impact service delivery. In FGDs, some CHWs mentioned that at the beginning, they stopped treating patients and referred them to HF due to fear of contracting the disease. Although the government has started to train and involve CHWs in care when the lockdown was eased, CHWs play an important role in service delivery. Covid-19 showed new capacity-building strategies need to be put in place such as online learning especially for CHWs to ensure continuous support even in disasters and epidemic situations. Evidence showsthat the online training of CHWs is possible and cost-effective(13,14)

The study found HCP, CHWs, and community members highly appreciate the Covid-19response by the government. The Positiveattitude may be explained by how during the response, the government has communicated the Covid-19 situation ondaily basis using different channels such as social media and radio. Moreover, studies have shown community members in Rwanda have high trust in their government even in other sectors other than the health sector (15). As the response engaged all

sectors from high-level leadership, security institutions such as police, up to local level, that existing trust by the community members may have helped in managing the Covid-19pandemic in Rwanda, a response that was also admired by many other countries and organizations(16). This exemplified that to be effective in managing emergencies, governments should build community trust beforehand and communicate clearly and on a regularbasis. Mistrust, low leadership engagement, and poor communication has been the source of ineffective epidemic management such as the recent Ebola epidemic in West Africa (17,18).

This study found a significant decrease in suspected malaria cases in health facilities and a significant increase in proportions of people receiving care in the community. Due to the nature of this study (being cross-sectional and analyzing existing aggregated data), we could not ascertain if the decrease in presentations at health facilities was due to a general decrease in malaria cases that has been observed over time or because community members could not get malaria services either due to lack of transports because of lockdown or fear to come to the health facilities. However, in FGDs, participants expressed that access to malaria services was impacted by the Covid-19 lockdown due to limited transportation. While further explorations will be needed to better understand the root causes of the decrease of presentations in health facilities, the increase in the proportion of community cases reiterates the importance of bringing care closer to the community especially in an emergency that may require lockdown. Besides, as more people have started to use community services, the malaria program should make sure the program of home-based management of malaria is equipped enough to receive patients who may continue to receive care from the community due to their proximity while they have been being treated in health facilities.

Moreover, there have been varying effects on malaria indicators after Covid-19 was reported in Rwanda such as an increase in case fatality rate, reduction of simple malaria presentation rate in some districts and increase in others. Those variations may be explained by the variations in implementing malaria control strategies in districts, some of which have also been impacted by Covid-19. For example, in the interview with the staff working in the malaria program, a respondentmentioned that coverage of Long-Lasting treated nets (LLTNs) has been impacted by delays in shipping due to COVID-19mitigation measures in countries producing and shipping LLINssuch as China. Moreover, there were also delays in conducting LLINs physical inspections and in distributions from the central warehouse to beneficiaries due to lockdown.

Additionally, there have been variations while malaria cases are normally expected to increase in April and May 2020. Those variations observed such as reduction of simple malaria in Gasabo district may be attributed to the distribution of PBO Nets (a new type of LLINs recently introduced in Rwanda in response to mosquito resistance) that was conducted in February 2020 (before the lockdown),. The increase in Kayonza and Rwamagana districts may be attributed to the fact that the last annual Indoor Residual Spray (IRS) campaign was conducted in March 2019 and the following round of IRS

was planned in March 2020 but was done in May 2020 due to COVID-19 lockdown measures. That delay of two months may explain the increase in cases in those two districts.

For the case fatality rate, although further explorations are needed, one possible explanation is in how this indicator is calculated as the change in the denominator may influence the overall rate. For this case, there has been a constant decrease in malaria cases due to high coverage of sustained IRS in high malaria burden districts even before COVID-19 and thus explaining the increase in the fatality rate. Further analysis in absolute values showed there were 24 deaths from March to October 2019 while there were 16 deaths during the same period in 2020, fewer than the cases of deaths during the same period before COVID-19. Moreover, the analysis also showed a reduction in trend overtime in the fatality rate. Nevertheless, considering the reduction in health facility presentations after March 2020, in case the observed reduction is due to not seeking malaria care in health facilities to receiving proper care, deaths may happen in the community and left undocumented. Considering that the only source of data for confirmed malaria related deaths in Rwanda is HMIS and data on community malaria related deaths are not available, further studies are needed to ascertain there were no patients that died in the community due to malaria.

This study also intended to assess other indicators such as malaria commodities stock status at different levels.The assessment of the stock status at health facilities and community levels was not possible due to various challenges encountered during data collection. In fact, accessing to the electronic Logistics Management Information System (eLMIS) to extract data on malaria commodities stock status was not possible due to ongoing changes in the system. On the side of stock level at community level, the attempts to extract data from the stock forms from CHWs during the data collection faced many challenges including unreadable paper-based files, unavailability of old reports, and files. While further analyses of stock status at community and health facility are recommended, in the qualitative study, participants did not report major challenges in having malaria commodities. Moreover, the increase in the proportion of people tested in community during Covid-19 period can indirectly suggest that the was no major issue with stock out at community level. Considering these challenges observed, it worth noting that the program should speed up the process of optimizing and scaling up the system and possibly consider using digital forms in managing commodities and other community health services to tackle archiving challenges.

The results of this study should be interpreted considering the study limitations. The time-series analysis did not have a control group and used retrospective data. Thus, the study could not control all possible confounding factors other than time effect. Moreover, being a cross-sectional study within a limited period, it could not assess the long-term impact of delayed services on malaria cases. Furthermore, this study was only limited to 3 districts while there are 12 malaria endemic districts. Thus, the results may not reflect the full picture of Covid-19 impact on malaria services delivery. Further studies are needed to assess the situation in other geographical locations.

This study demonstrated most of malaria services were delivered during the Covid-19outbreak in Rwanda but also others were impacted. It highlighted the need for preventative measures to ensure a continuum in malaria service delivery. To reverse Covid-19 impact on service delivery, there is a need to speed up and sustain the interrupted interventions. Moreover, training CHWs needs to be prioritized and access to information about Covid-19should be enhanced. Further studies in other geographical locations and on the long-term impact of interrupted or delayed interventions are needed.

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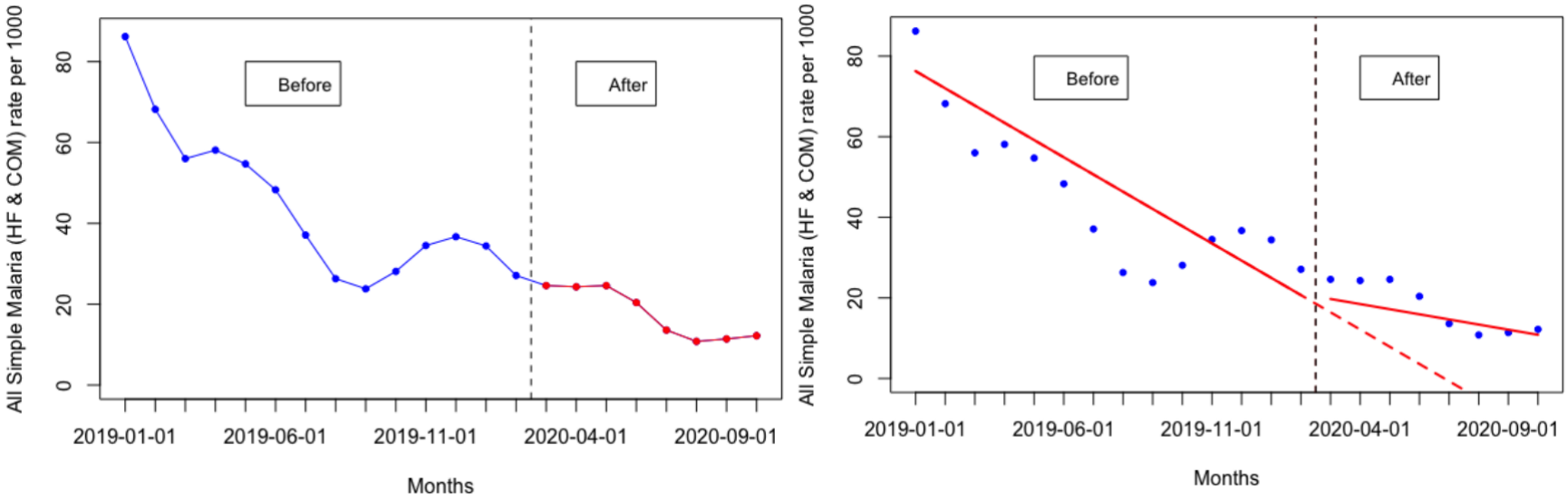
I.1 FIGURES AND TABLES FROM HMIS AND SISCOM

I.1.1 SIMPLE MARALIA

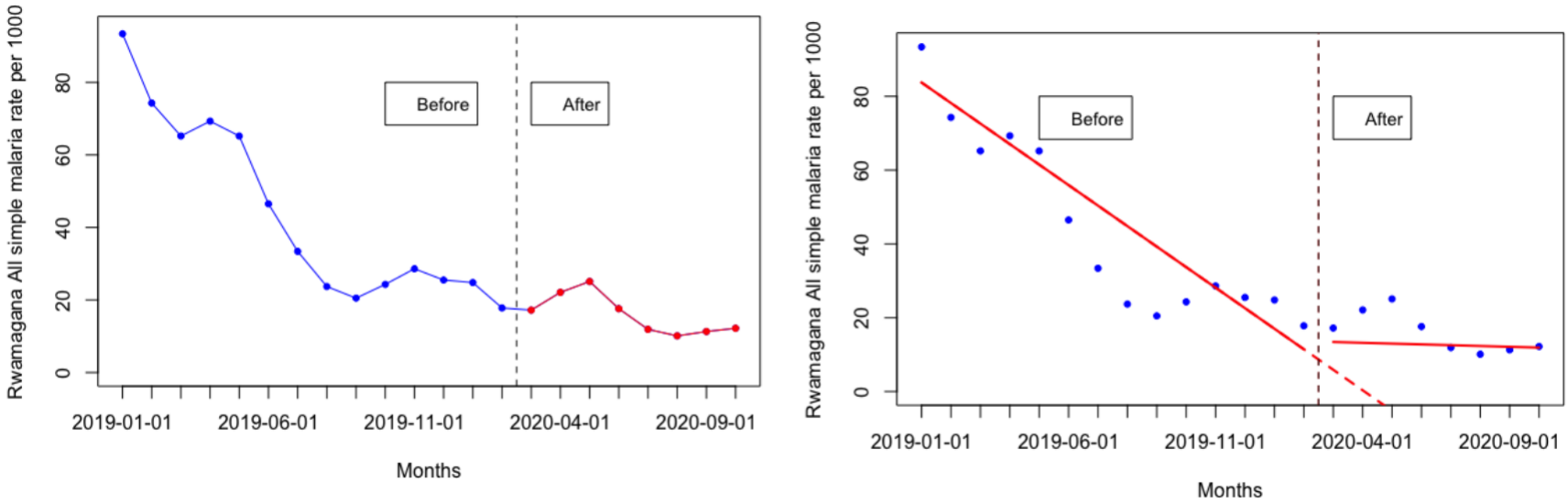
I.1.1.1 *Figure 1: Simple malaria rate per 1000 (health facilities and the community)*



Coefficients (All simple malaria combined)

	Estimate	95% CI		P- value
Change in level	0.30	-14.07	14.69	0.964
Change in trend	3.00	-1.71	7.72	0.197

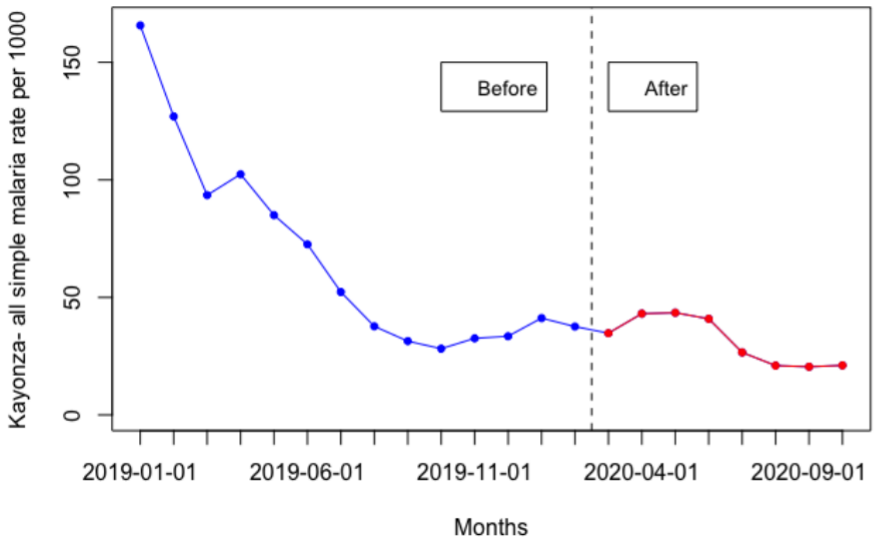
I.1.1.2 *Figure 2: Rwamagana simple malaria rate per 1000 (health facilities and the community)*

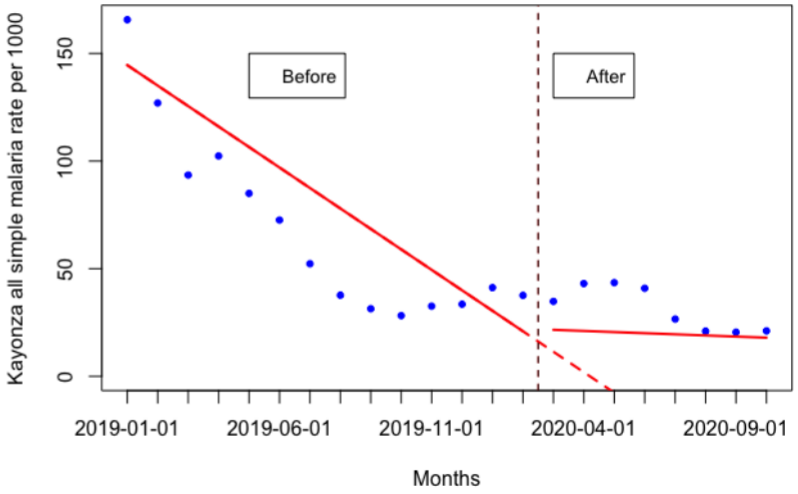


Coefficients (Rwamagana - all simple malaria combined)

	Estimate	95% CI		P- value
Change in level	2.18	-14.08	18.45	0.781
Change in trend	5.34	0.36	10.32	0.037*

I.1.1.3 *Figure 3: Kayonza- simple malaria rate per 1000 (health facilities and the community)*

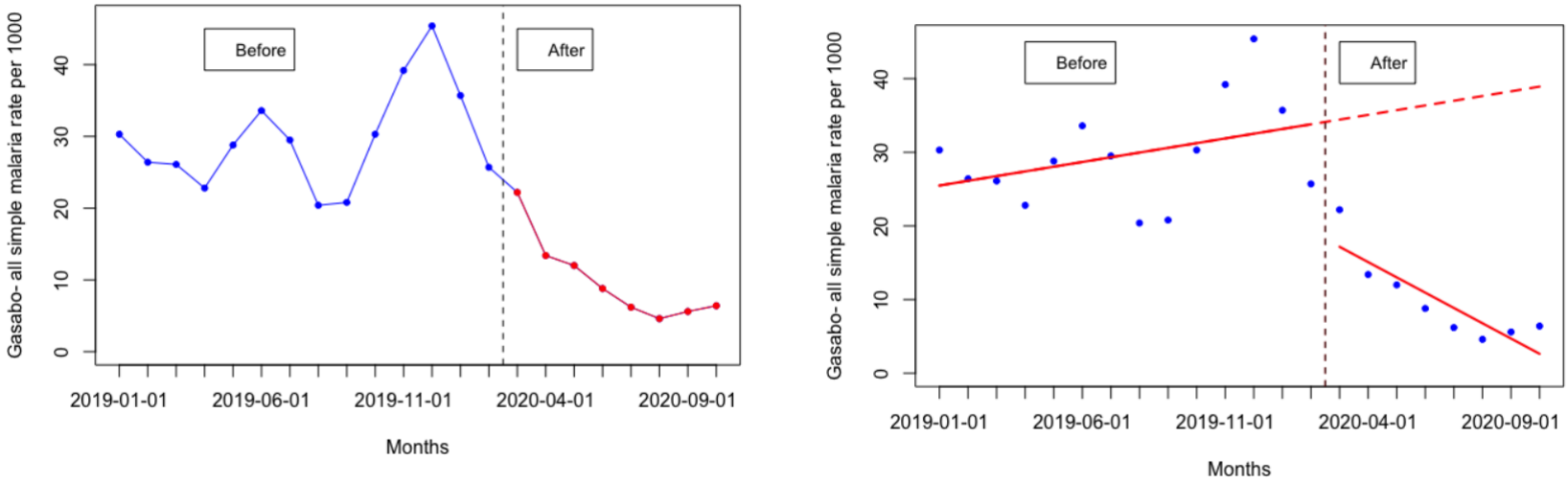




Coefficients (Kayonza - all simple malaria combined)

	Estimate	95% CI		P- value
Change in level	1.19	-28.72	31.12	0.933
Change in trend	8.98	-1.81	19.79	0.097

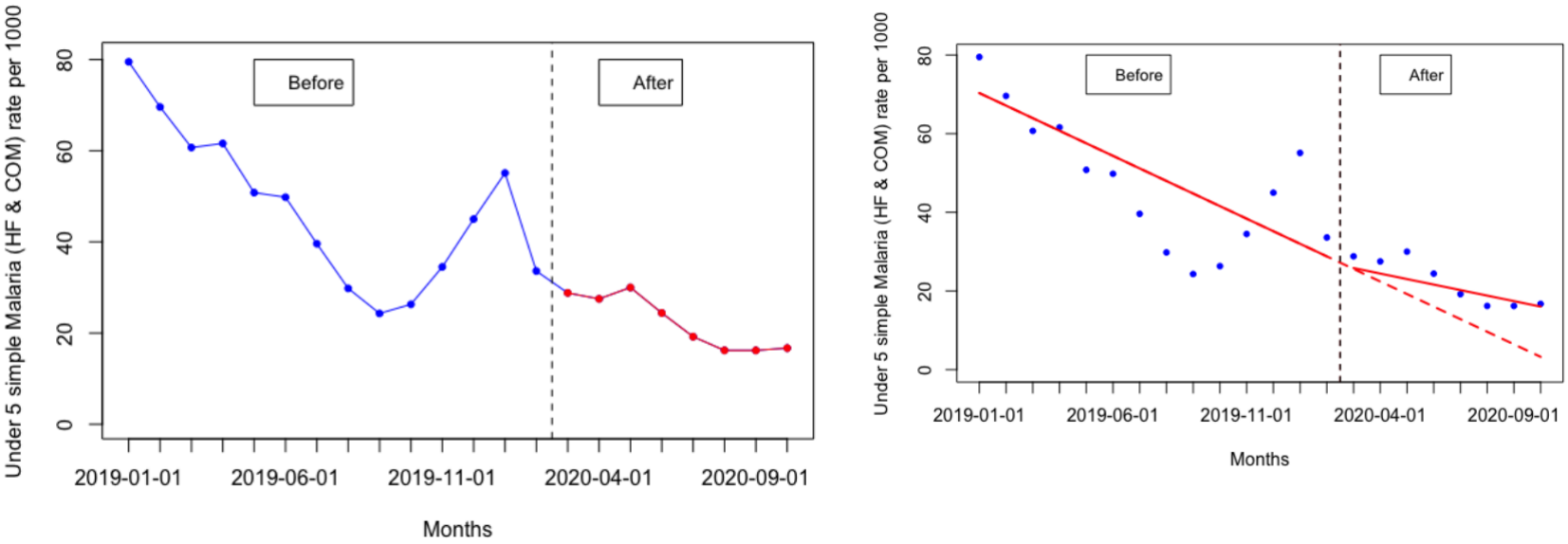
I.1.1.4 *Figure 4: Gasabo - simple malaria rate per 1000 (health facilities and the community)*



Coefficients (Gasabo - all simple malaria combined)

	Estimate	95% CI		P- value
Change in level	-14.55	-25.92	-3.18	0.015
Change in trend	-2.71	-4.77	-0.66	0.012

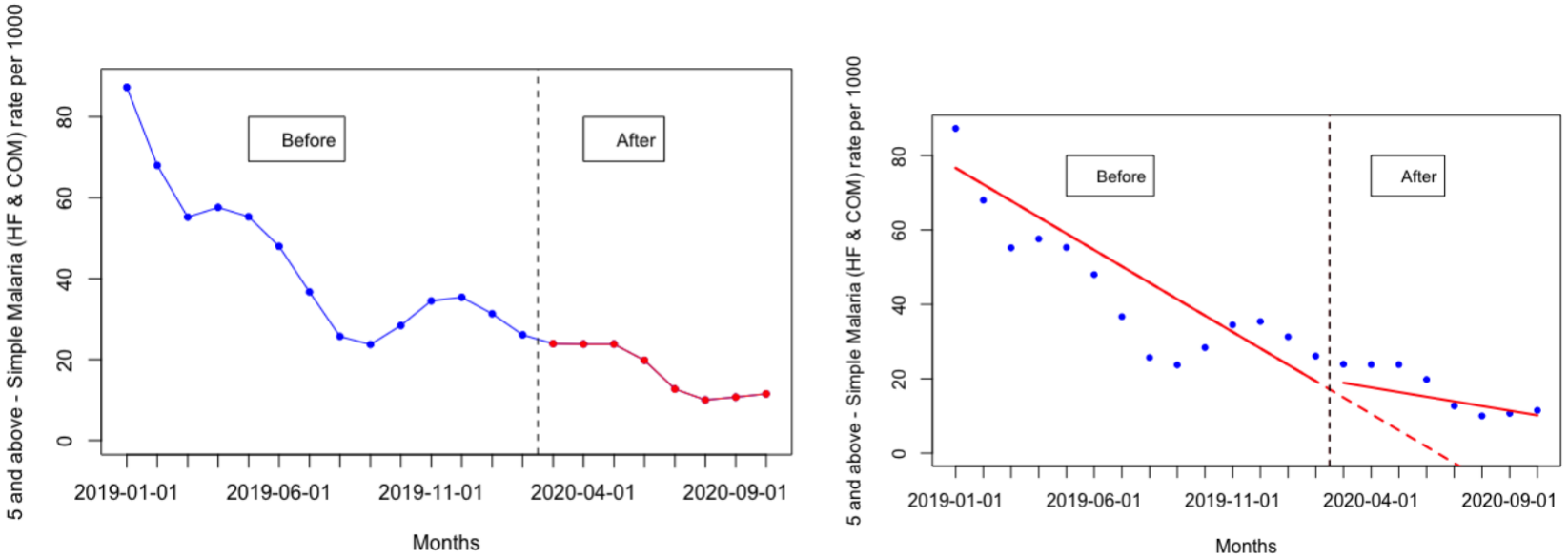
I.1.1.5 *Figure 5: Simple malaria rate per 1000 for under 5 years old (health facilities and the community)*



Coefficients (under 5 - All simple malaria combined)

	Estimate	95% CI		P- value
Change in level	-1.57	-20.01	16.87	0.860
Change in trend	1.79	-3.48	7.07	0.484

I.1.1.6 *Figure 6: Simple malaria rate per 1000 for 5 years old and above (health facilities and the community)*

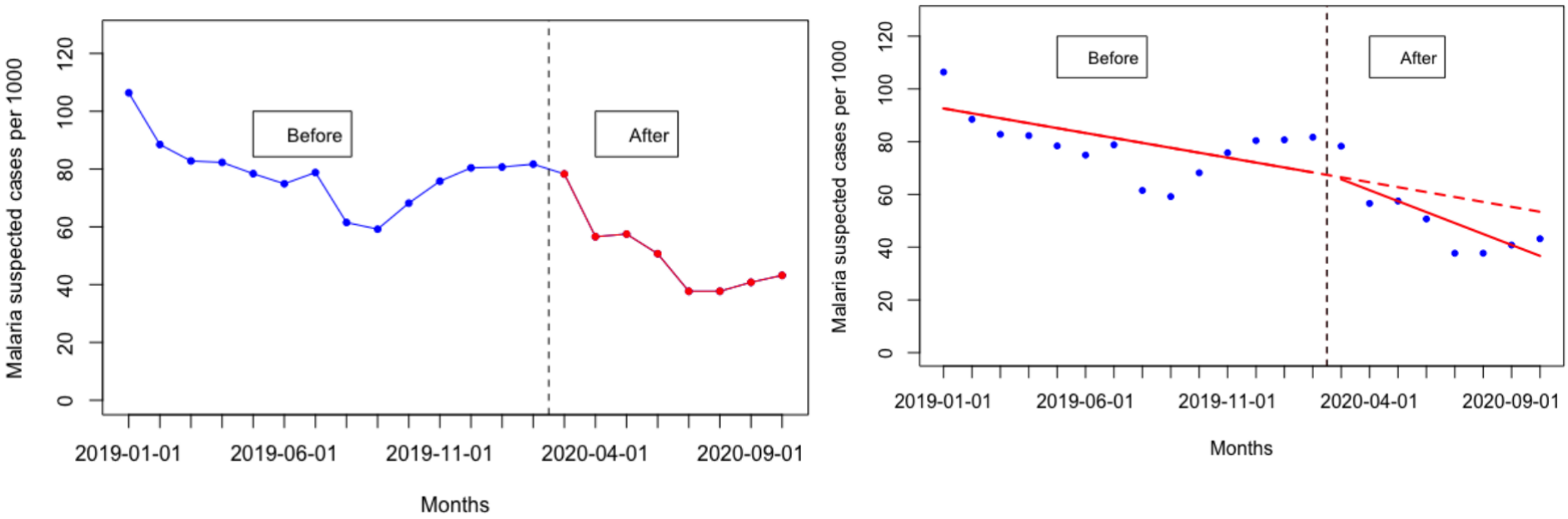


Coefficients (5 and above - All simple malaria combined)

	Estimate	95% CI		P- value
Change in level	0.77	-14.02	15.57	0.913
Change in trend	3.16	-1.59	7.91	0.179

I.1.2 I.1.2 TESTING – SUSPECTED MALARIA CASES

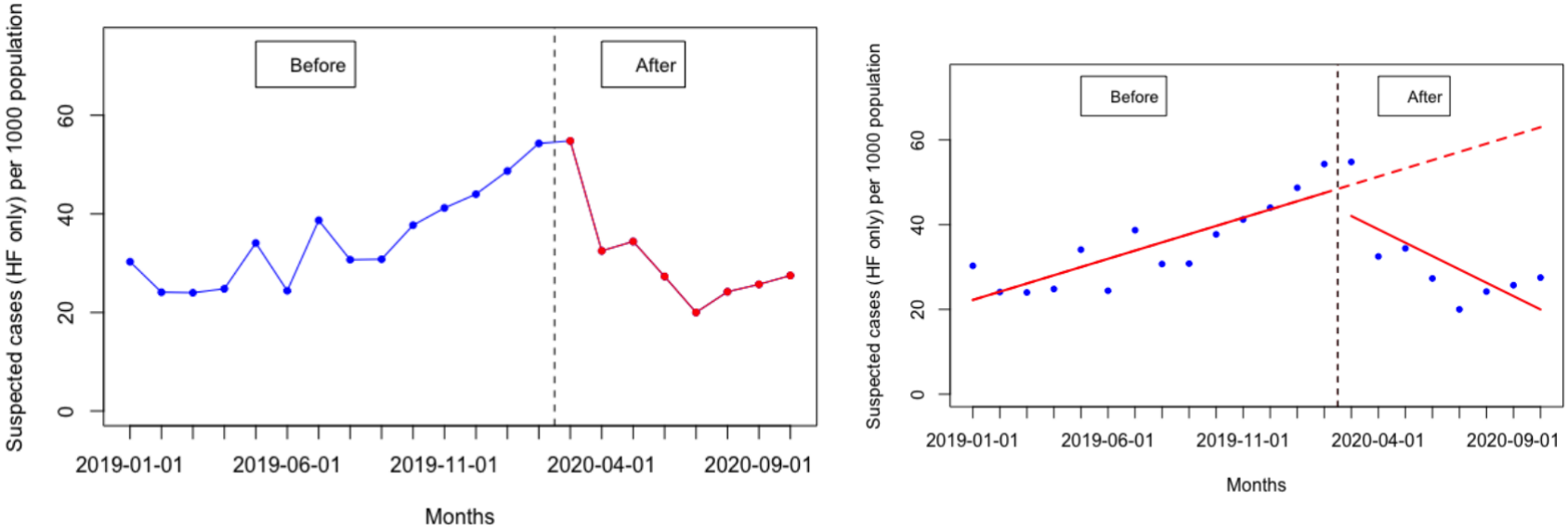
I.1.2.1 *Figure 7: All suspected cases (HF & Community) per 1000 population*



Coefficients (All suspected cases (HF & Community) per 1000 population)

	Estimate	95% CI		P- value
Change in level	1.56	-4.37	21.27	0.869
Change in trend	-7.46	-18.13	2.88	0.365

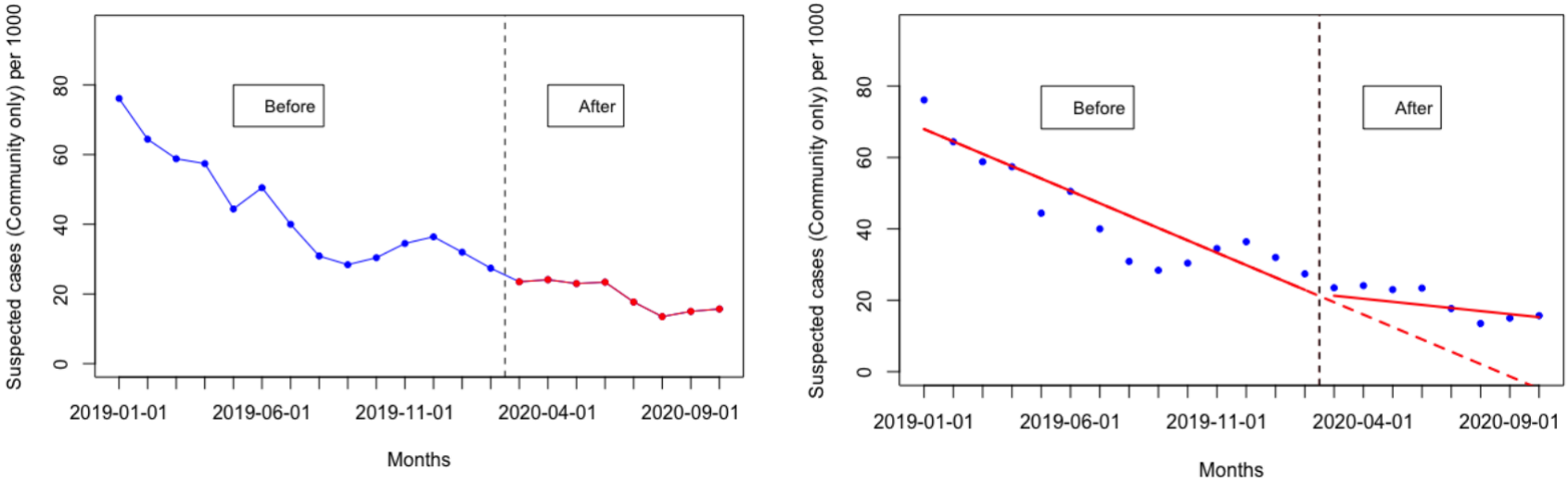
I.1.2.2 *Figure 8: All suspected cases (HF only) per 1000 population*



Coefficients (all suspected cases (HF only) per 1000 population)

	Estimate	**95% CI**		**P- value**
Change in level	-2.26	-15.13	10.59	0.715
Change in trend	-5.09	-7.46	-2.72	< 0.001

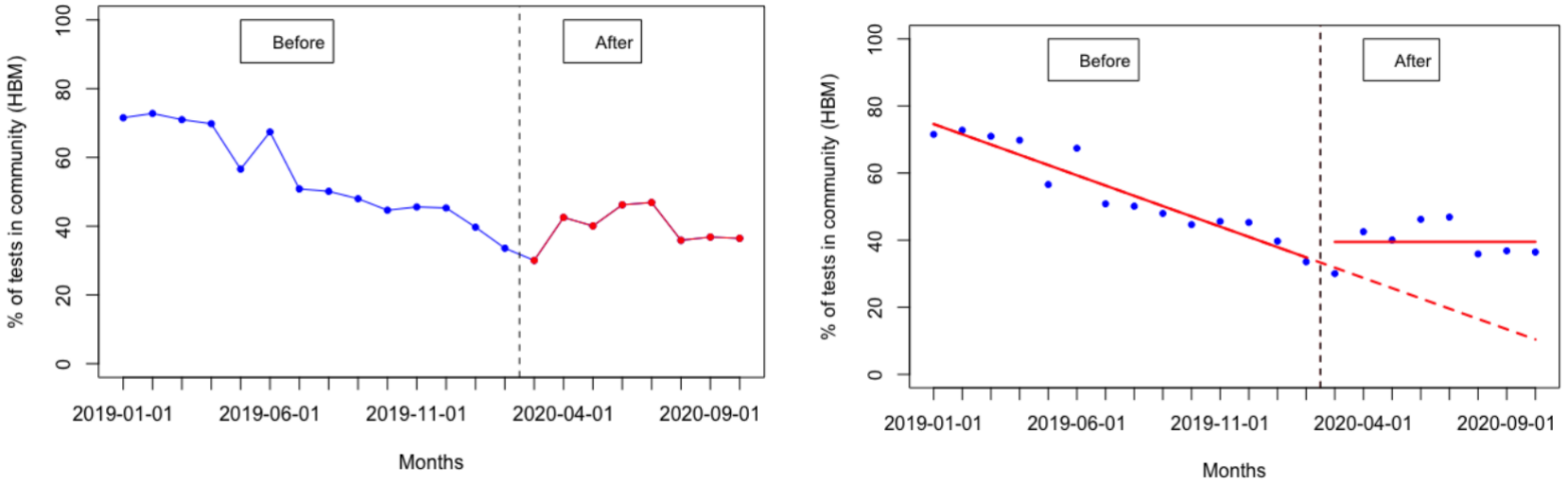
I.1.2.3 *Figure 9: All suspected cases (Community only) per 1000 population*



Coefficients (all suspected cases (HF only) per 1000 population)

	Estimate	95% CI		P- value
Change in level	-0.76	-12.85	11.31	0.895
Change in trend	2.60	-0.57	5.78	0.102

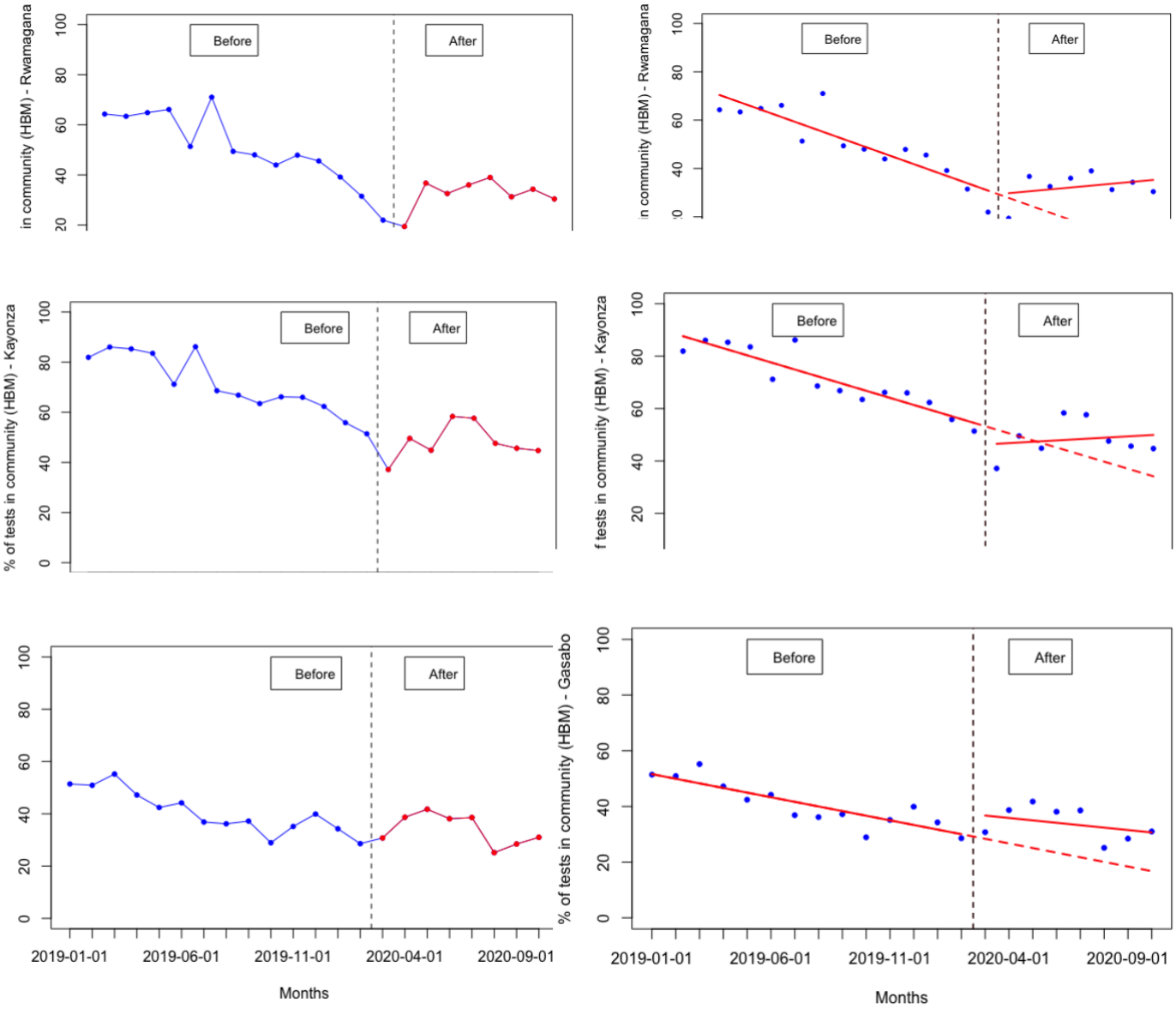
I.1.2.4 *Figure 10: Proportion of community tests (suspected cases) among all tests*



Coefficients (proportion of community tests(suspected cases) among all tests)

	Estimate	95% CI		P- value
Change in level	4.61	-4.37	13.60	0.295
Change in trend	3.06	1.46	4.65	<0.001

I.1.2.5 *Figure 11: Proportion of community test among all tests per district*



Rwamagana

	Estimate	P- value
Change in level	-1.86	0.748
Change in trend	3.82	0.001

Kayonza

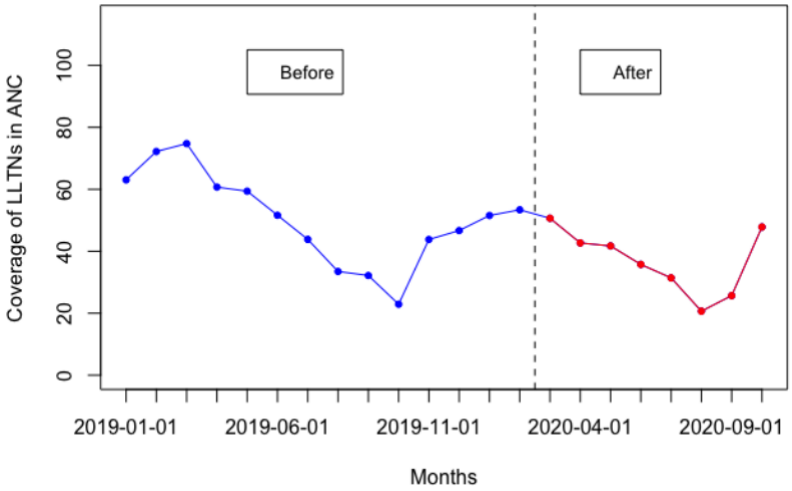
	Estimate	P- value
Change in level	-8.43	0.134
Change in trend	3.02	0.005

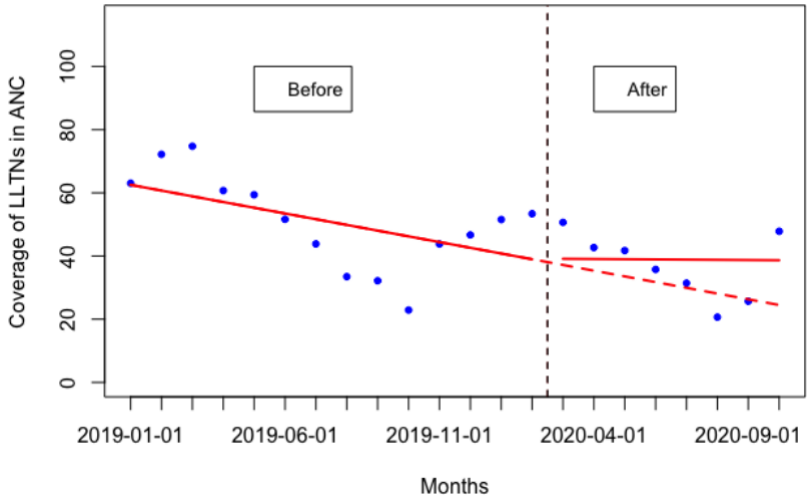
Gasabo

	Estimate	P- value
Change in level	7.56	0.144
Change in trend	0.79	0.428

I.1.3 I.1.3 LLTNS COVERAGE

I.1.3.1 *Figure 12: Coverage of LLTNs in ANC*

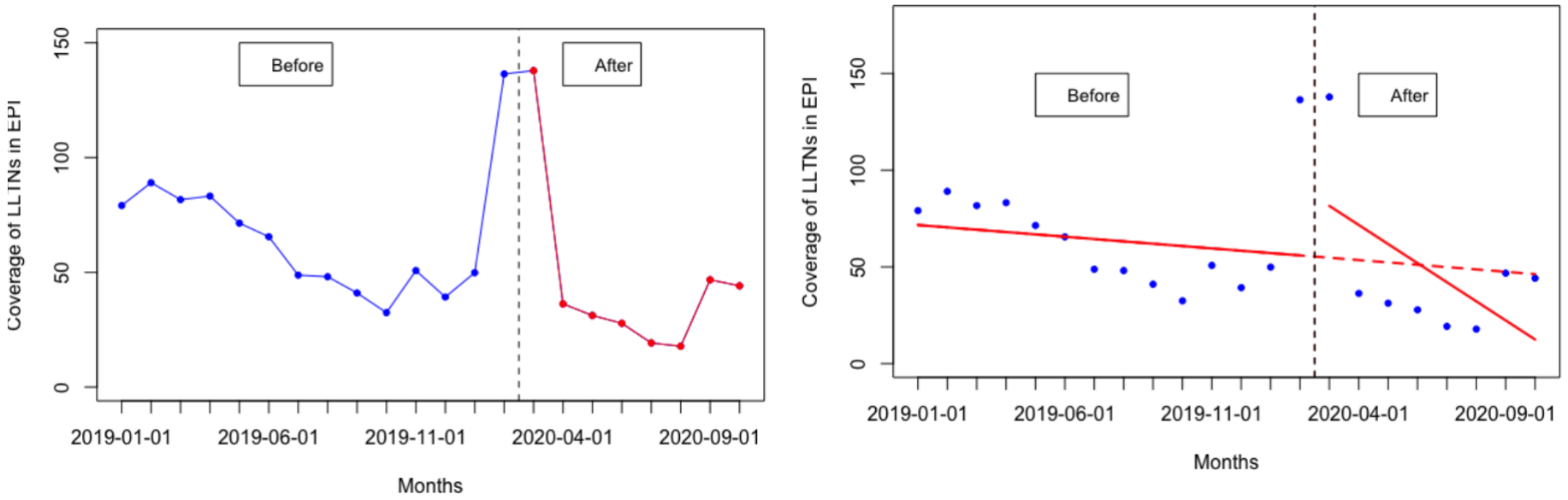




Coefficients (Coverage of LLTNs in ANC)

	Estimate	95% CI		P- value
Change in level	0.20	-21.92	22.33	0.984
Change in trend	1.74	-4.31	7.80	0.552

I.1.3.2 *Figure 13: Coverage of LLTNs in EPI*

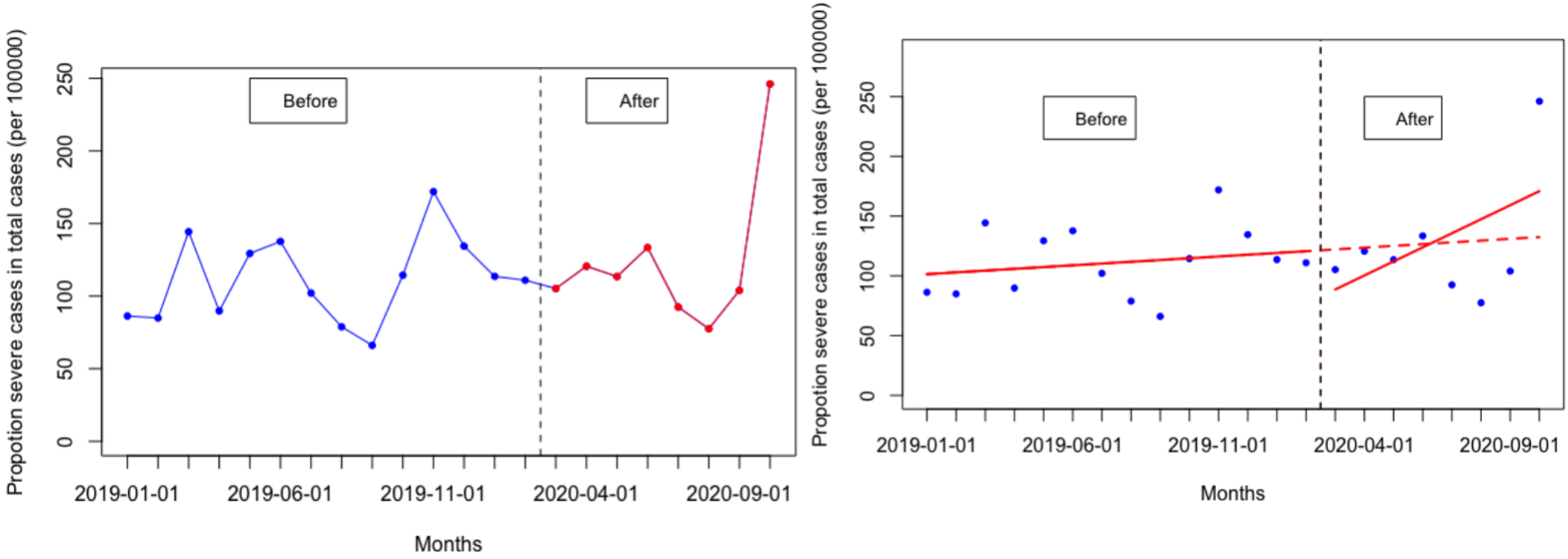


Coefficients (Coverage of LLTNs in EPI)

	Estimate	95% CI		P- value
Change in level	35.4	-1.18	72.12	0.057
Change in trend	-8.66	-21.68	4.36	0.179

I.1.4 SEVERE MARALIA CASES

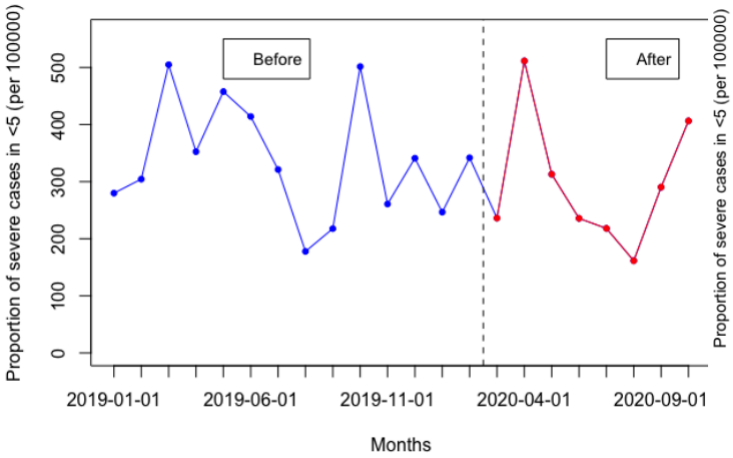
I.1.3.3 *Figure 14: Propotion of severe cases in total cases (per 100000)*

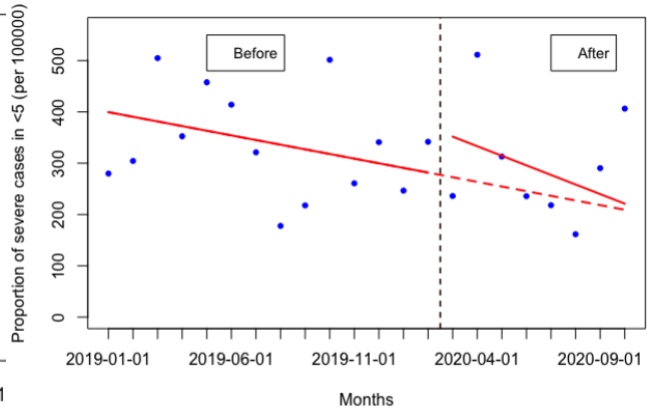


Coefficients (severe cases in total cases)

	Estimate	95% CI		P- value
Change in level	-43.8	-129.3	41.69	0.295
Change in trend	10.28	-6.58	27.15	0.216

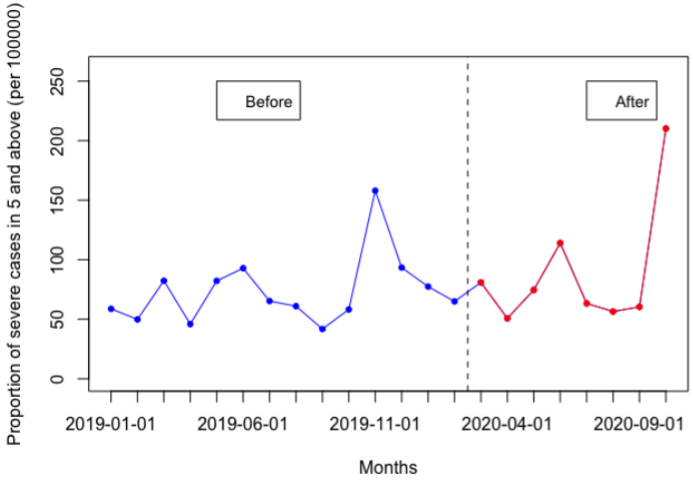
I.1.3.4 *Figure 15: Proportion of severe cases in <5, and 5 years and above (per 100000)*

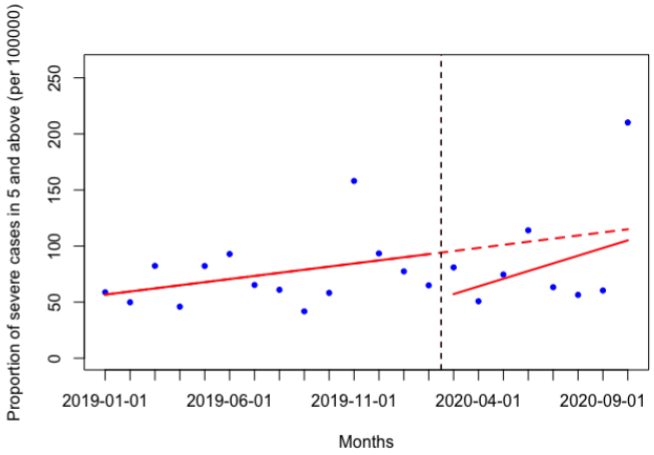




Proportion severe cases < 5 years

	Estimate	P- value
Change in level	88.72	0.113
Change in trend	-9.59	0.288



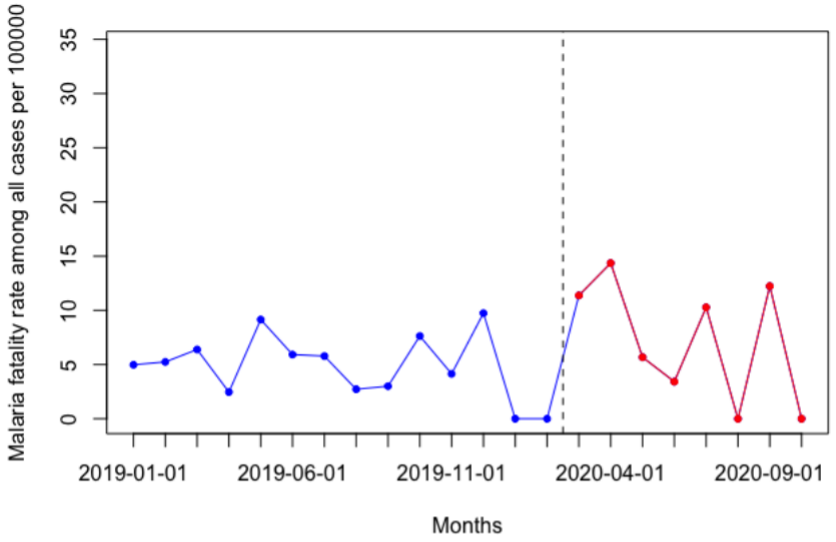


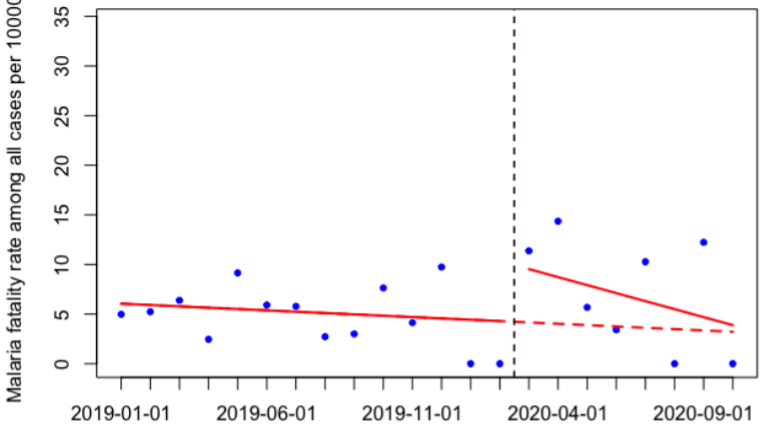
Proportion severe cases 5 and above

	Estimate	P- value
Change in level	-42.45	0.019*
Change in trend	4.074	0.153

I.1.4 I.1.5 CASE FATALITY RATE

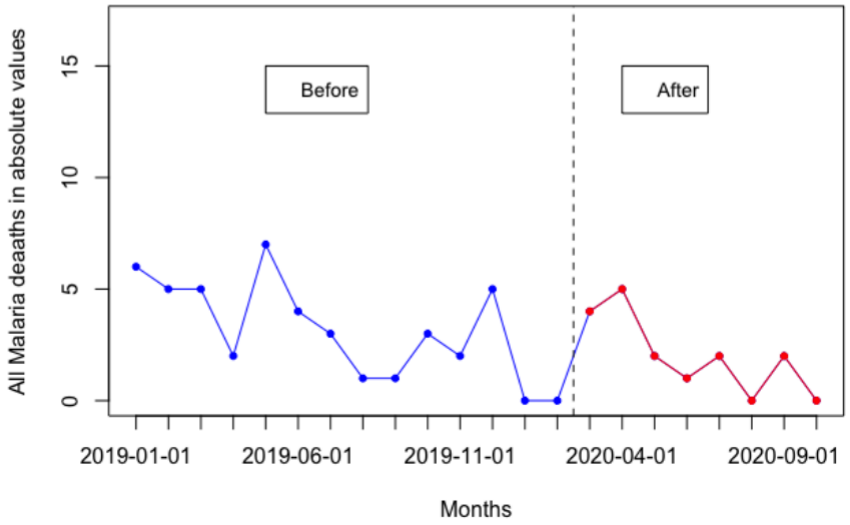
I.1.4.1 ***Figure 16: Malaria fatality rate among all cases per 100000***



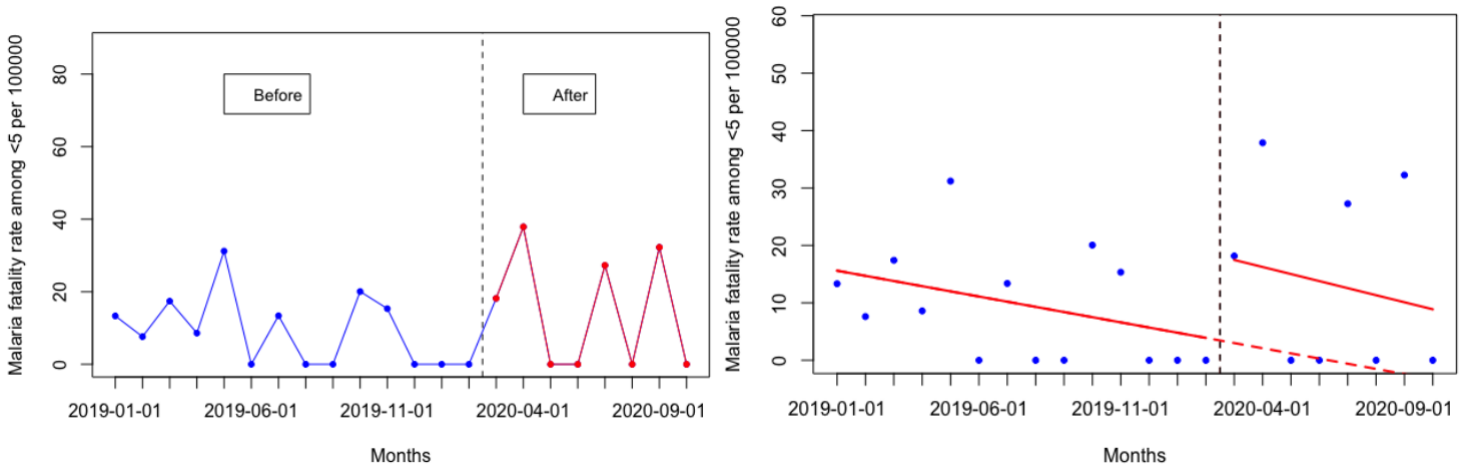


Coefficients (Malaria fatality rate among all cases)

	Estimate	95% CI		P- value
Change in level	6.04	3.80	8.28	<0.001*
Change in trend	-0.67	-1.05	-0.29	0.001*

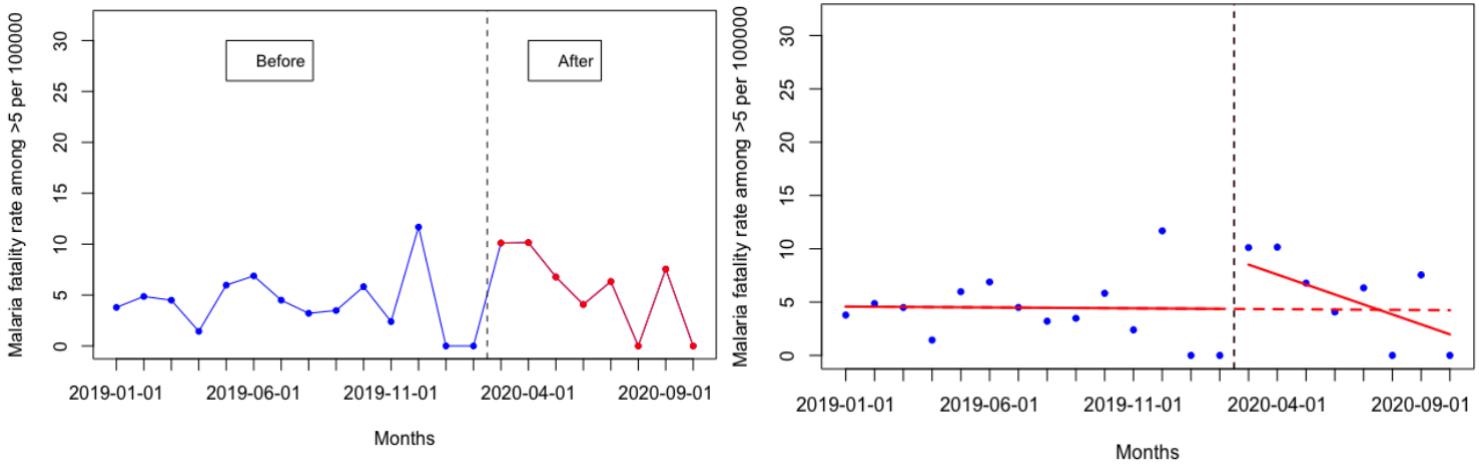


I.1.4.2 *Figure 17: Malaria fatality rate per 100000 (among under 5, and 5 years and above)*



Fatality rate among under 5

	Estimate	P- value
Change in level	14.80	< 0.001*
Change in trend	-0.32	0.320

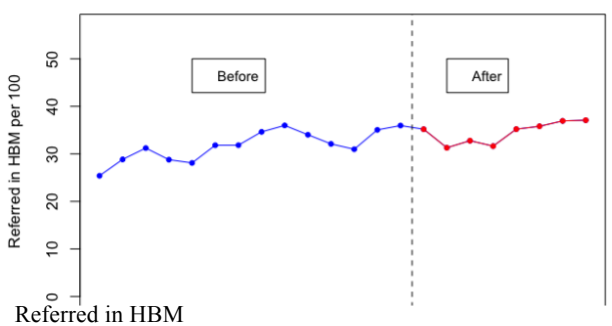


Fatality rate among 5 and above

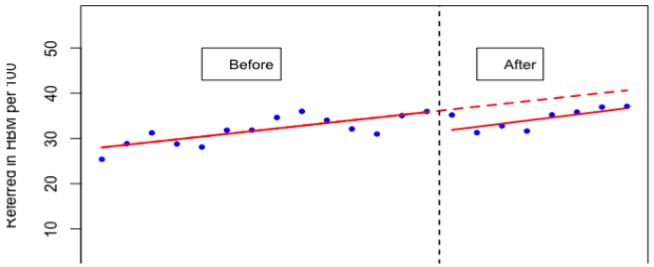
	Estimate	P- value
Change in level	5.08	< 0.001
Change in trend	-0.91	< 0.001

I.1.5 I.1.6 OTHER MALARIA INDICATORS

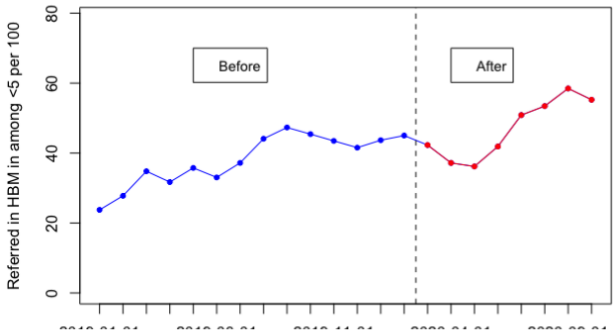
I.1.5.1 *Figure 18: Referred cases in HBM (all, <5, and 5 years and above) per 1000*

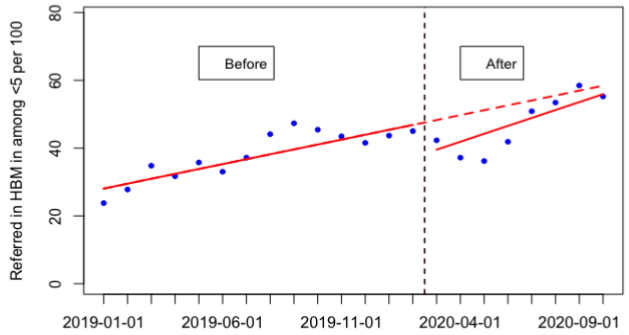


Referred in HBM

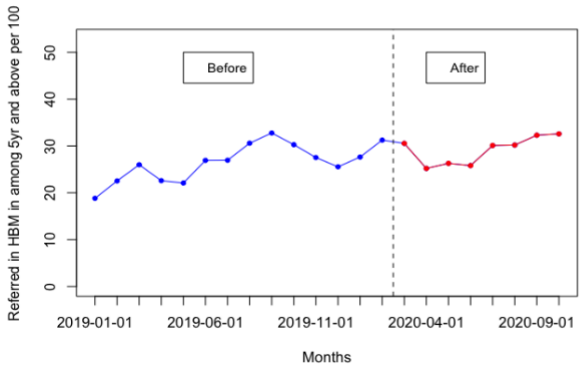


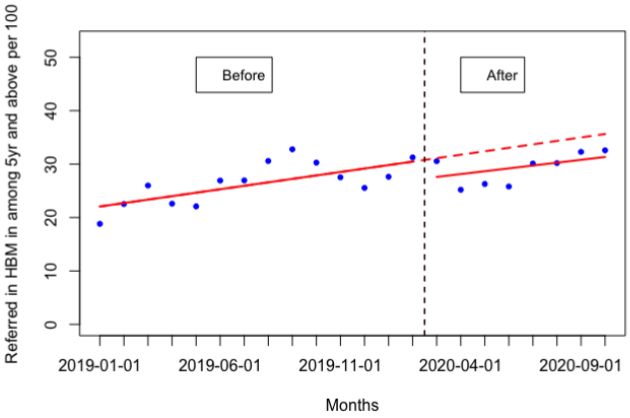
Referred case in HBM per 100		
	Estimate	**P- value**
Change in level	-4.62	0.009*
Change in trend	0.08	0.762





Referred case in HBM among < 5 year per 100		
	Estimate	**P- value**
Change in level	-9.63	0.037
Change in trend	0.89	0.352





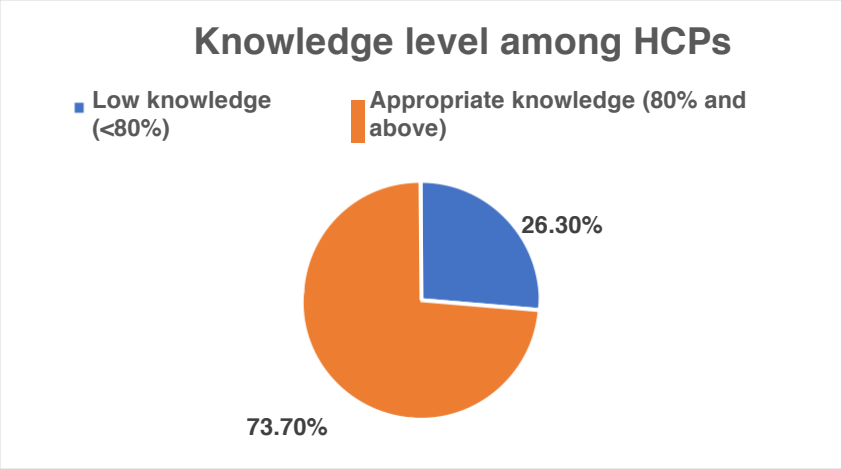
Referred case in HBM among 5 years and above per 1000		
	Estimate	**P- value**
Change in level	-3.40	0.234
Change in trend	-0.11	0.843

I.2 I.2 II. RESULTS FROM THE SURVEY

I.2.1 I.2.1 1. Knowledge, attitude, and practice among healthcare providers

I.2.2 I.2.1.1 HCPs - Knowledge

I.2.2.1 ***Figure 20: Overall knowledge level among HCPs***



I.2.2.2 ***Figure 21: Correct answers per knowledge question - HCPs***

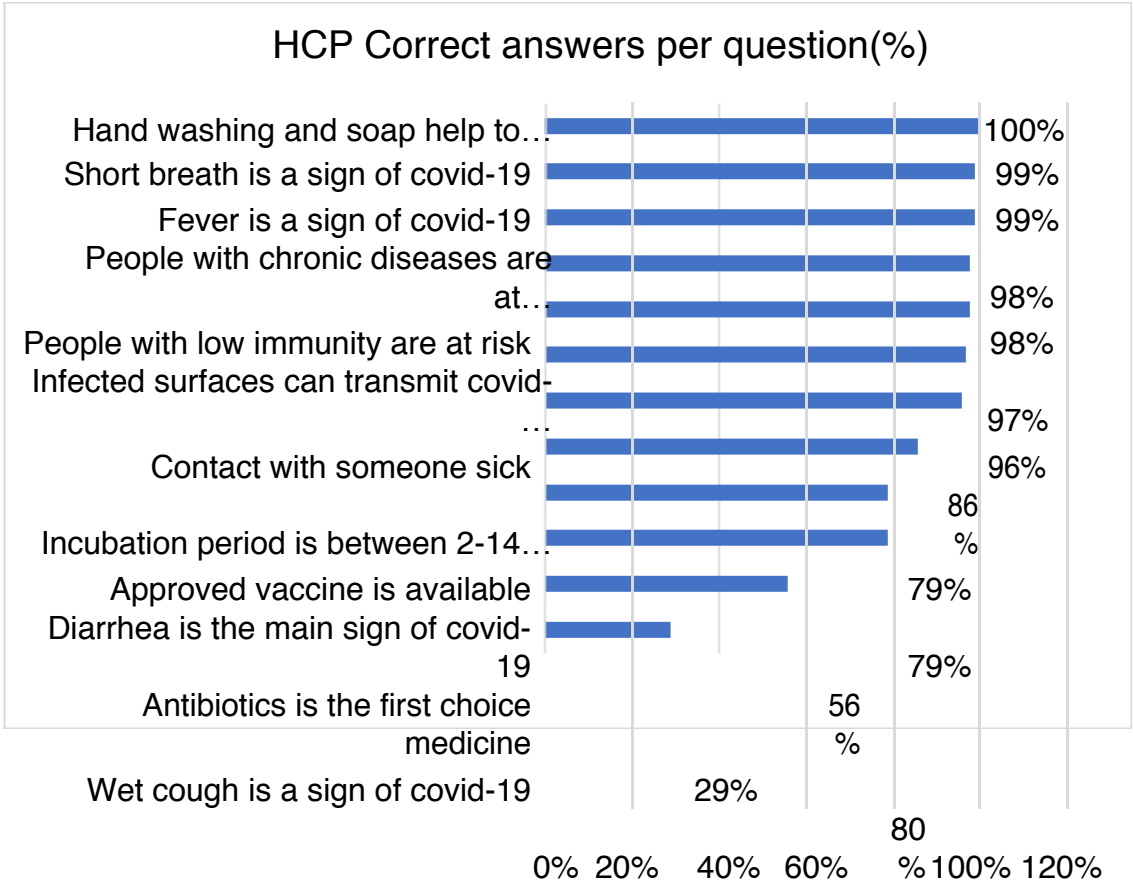


Table 1: Knowledge level among healthcare providers per background characteristics

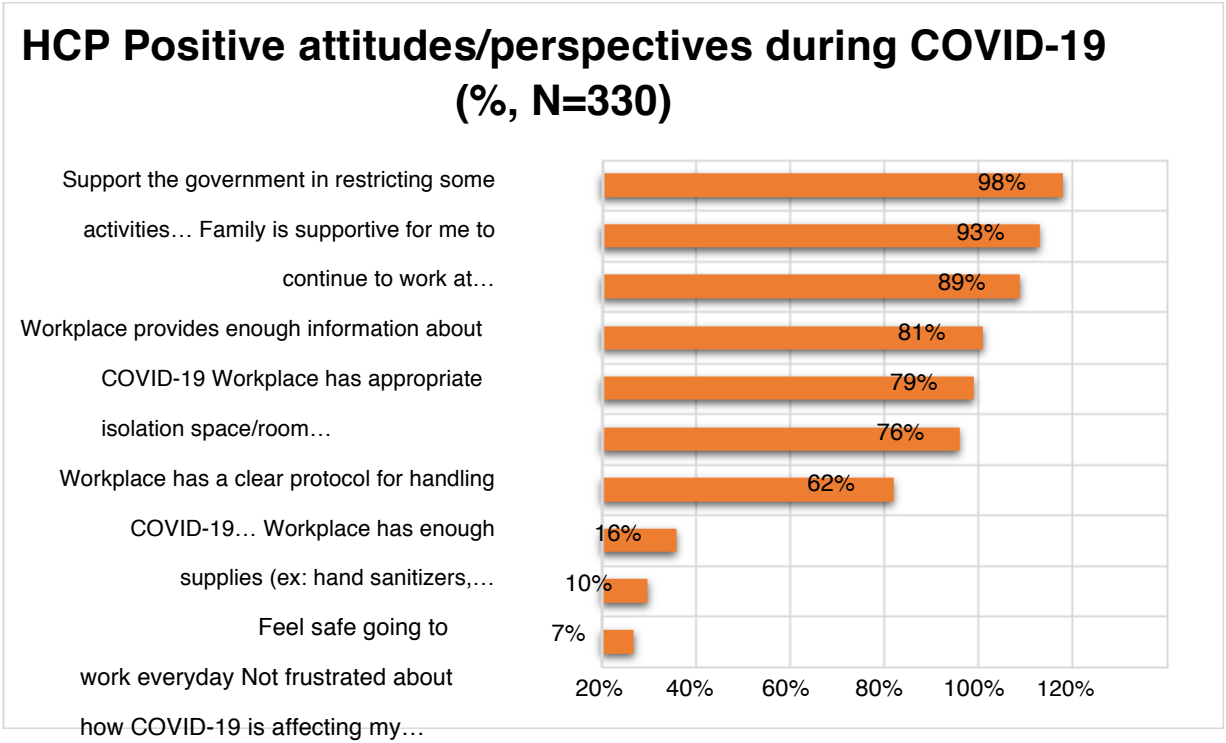
Variables	Categories	Knowledge level				N	P value
		Low knowledge (<80%)		Appropriate knowledge (80% and above)			
		n	%	n	%		
District	Gasabo	36	32.1	76	67.9	112	0.049*
	Kayonza	35	27.8	91	72.2	126	
	Rwamagana	16	17.2	77	82.8	93	
	Total	87	26.3	244	73.7	331	
Sex	Female	59	28.1	151	71.9	210	0.325
	Male	28	23.1	93	76.9	121	
	Total	87	26.3	244	73.7	331	
Health facility category	District Hospital	17	30.4	39	69.6	56	0.449
	Health center	70	25.5	205	74.5	275	
	Total	87	26.3	244	73.7	331	
Age categories	<30 years	15	26.3	42	73.7	57	0.956
	30 to 40 years	46	26.9	125	73.1	171	
	Above 40 years	26	25.2	77	74.8	103	
	Total	87	26.3	244	73.7	331	
The highest educational level attained	Advanced Diploma (A1)	45	26.9	122	73.1	167	0.962
	Bachelor's degree/Medical doctor	18	25.7	52	74.3	70	
	Secondary level (A2)	24	25.5	70	74.5	94	

	Total	87	26.3	244	73.7	331	
Profession	Nurses/Allied Health Professionals	83	26.9	226	73.1	309	0.373
	Physician	4	18.2	18	81.8	22	
	Total	87	26.3	244	73.7	331	
Years of experience as CHWs	< 5 years	36	30.5	82	69.5	118	0.431
	5 to 10 years	20	24.1	63	75.9	83	
	Above 10 years	31	23.8	99	76.2	130	
	Total	87	26.3	244	73.7	331	
Marital status	Married/cohabited	61	25	183	75	244	0.376
	Single. Divorced/widowed	26	29.9	61	70.1	87	
	Total	87	26.3	244	73.7	331	
Main source of information on COVID-19	Social media	29	26.6	80	73.4	109	0.014*
	Television/Radio	45	23	151	77	196	
	Others (Family. friends. Newspapers)	13	50	13	50	26	
	Total	87	26.3	244	73.7	331	
Screened for COVID-19	No	62	25.2	184	74.8	246	0.449
	Yes	25	29.4	60	70.6	85	
	Total	87	26.3	244	73.7	331	
Received COVID-19 patient/suspected	No	69	26.8	188	73.2	257	0.665
	Yes	18	24.3	56	75.7	74	
	Total	87	26.3	244	73.7	331	

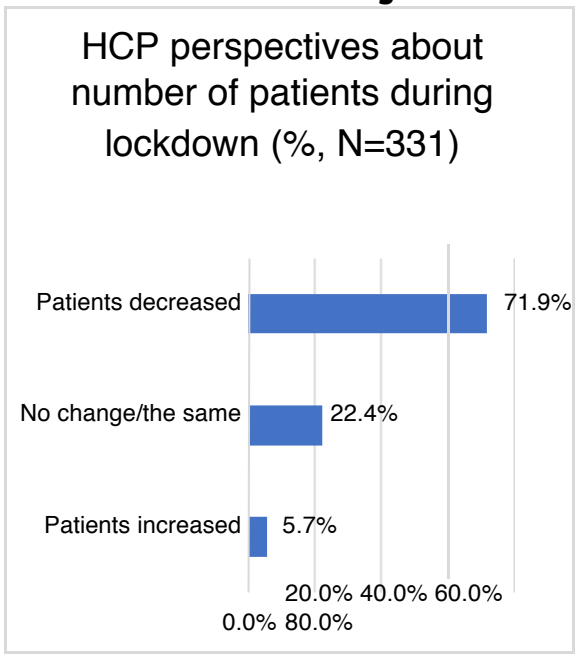
* Statistically significant ($p<0.05$)

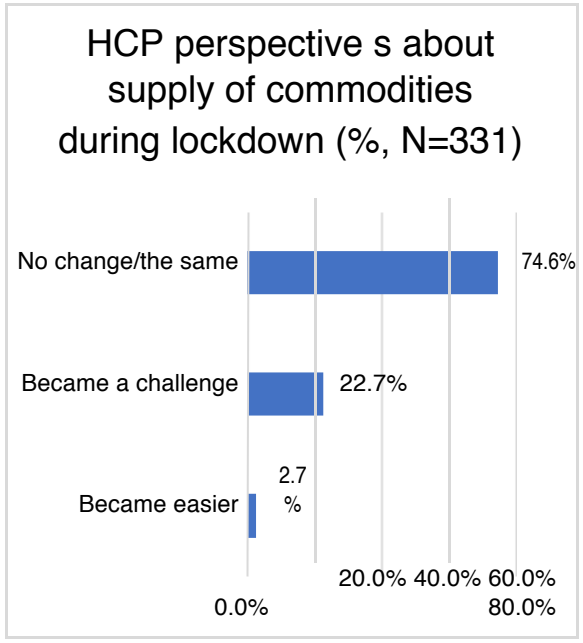
I.2.3 I.2.1.2 HCPs Attitude/perspectives

I.2.3.1 ***Figure 22: HCP Positive attitudes/perspectives during COVID-19***



I.2.3.2 *Figure 23: HCPs perspectives about number of patients and supply of commodities during lockdown*

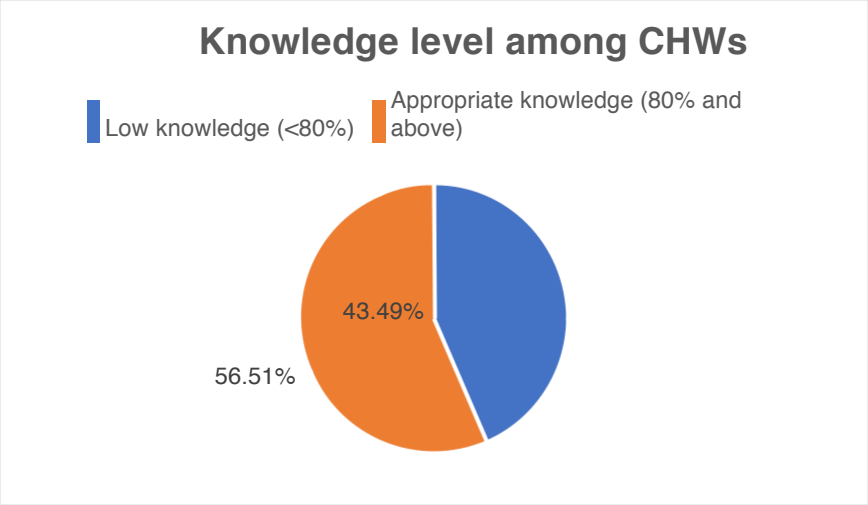




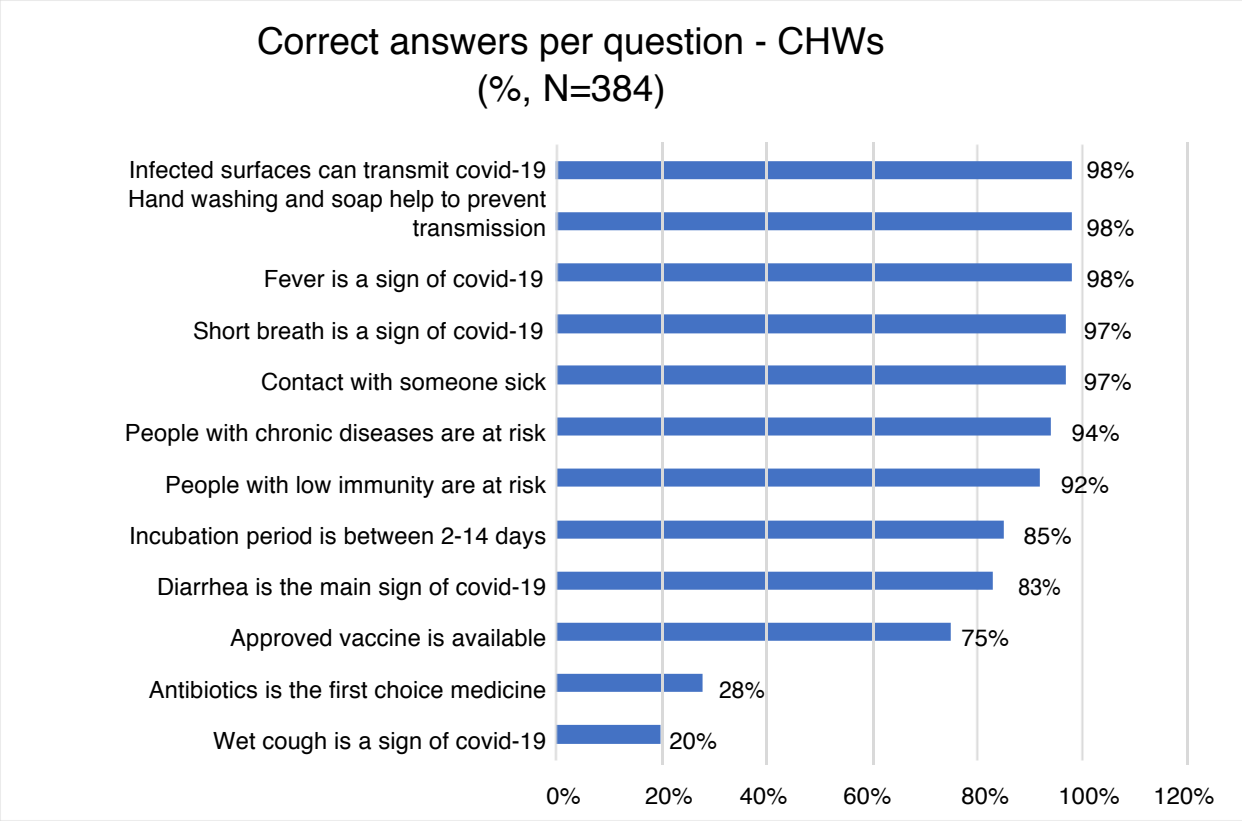
I.3 I.2.2 Knowledge, attitude, and practice among Community Health Workers (CHWs)

I.3.1 I.2.2.1 CWHs - Knowledge

I.3.1.1 ***Figure 24: Overall knowledge level among CHWs***



I.3.1.2 *Figure 25: Correct answers per knowledge question- CHWs*



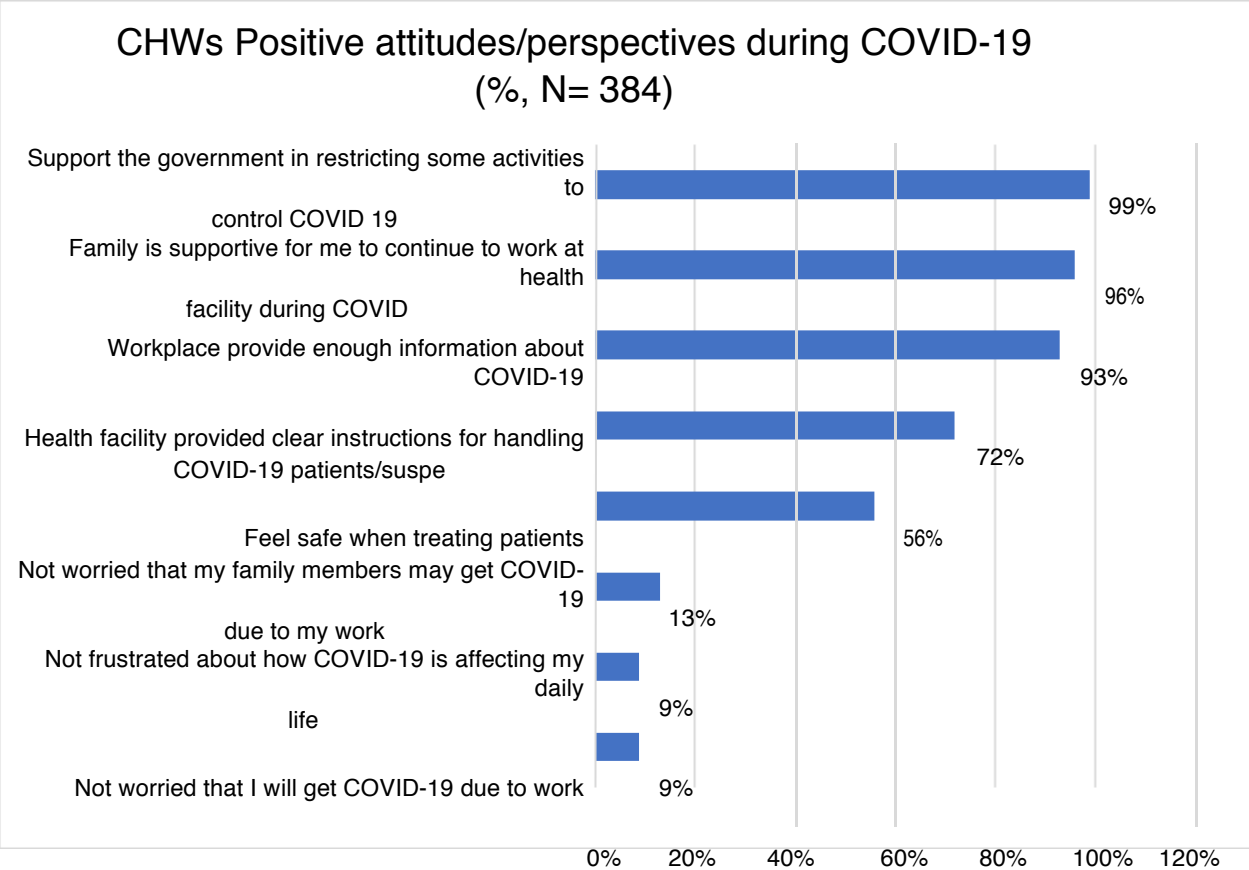
I.3.1.3 *Table 2: Knowledge level among CHWs per background characteristics*

Variables	Categories	Knowledge level (CHWs)				N	P value
		Low knowledge (<80%)		Appropriate knowledge (80% and above)			
		n	%	n	%		
District	Gasabo	56	42.4	76	57.6	132	0.28
	Kayonza	48	39	75	61	123	
	Rwamagana	63	48.8	66	51.2	129	
	Total	167	43.5	217	56.5	384	
Sex	Female	107	47.3	119	52.7	226	0.069
	Male	60	38	98	62	158	
	Total	167	43.5	217	56.5	384	
Age categories	<40 years	40	46.5	46	53.5	86	0.792
	40 to 50 years	77	42.1	106	57.9	183	
	Above 50 years	50	43.5	65	56.5	115	
	Total	167	43.5	217	56.5	384	
Educational level	Primary	135	45.5	162	54.5	297	0.153
	Secondary and above	32	36.8	55	63.2	87	
	Total	167	43.5	217	56.5	384	
Marital status	Married/cohabited	152	42.9	202	57.1	354	0.455
	Single. Divorced/widowed	15	50	15	50	30	
		167	43.5	217	56.5	384	

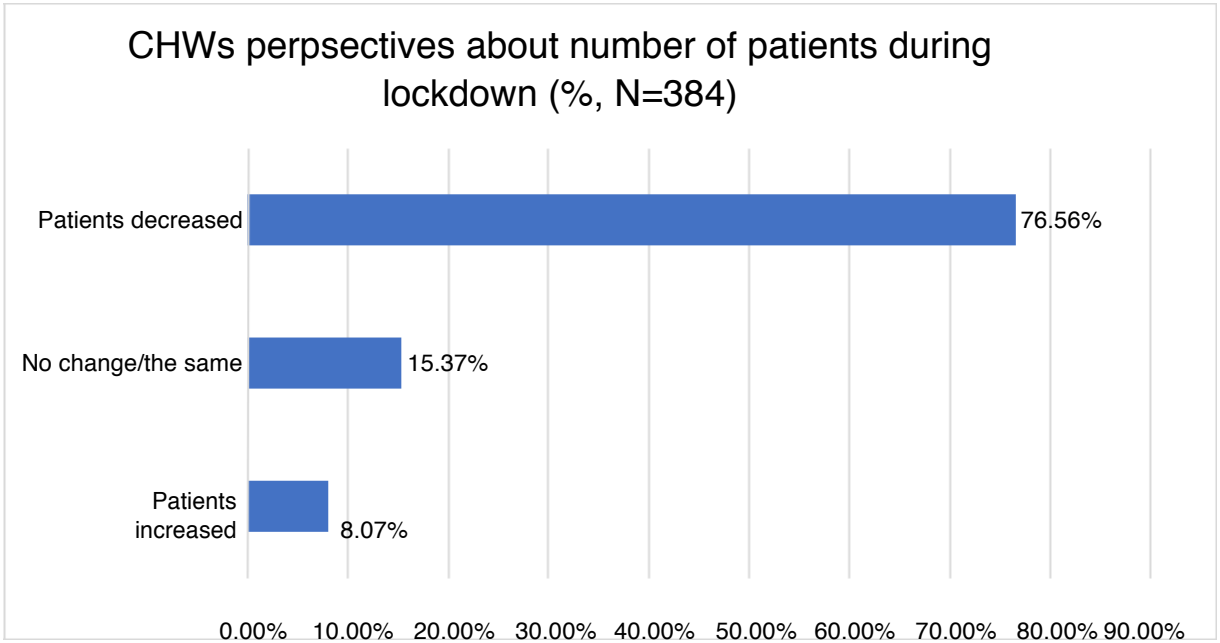
	Total						
Years of experience as CHWs	< 5 years	28	46.7	32	53.3	60	0.376
	5 to 10 years	50	48.1	54	51.9	104	
	Above 10 years	89	40.5	131	59.5	220	
	Total	167	43.5	217	56.5	384	
Main source of information on COVID-19	Television /Radio	163	43.4	213	56.6	376	0.708
	Others (Social media. family. friends. etc.)	4	50	4	50	8	
	Total	167	43.5	217	56.5	384	
Ever been screened for COVID-19	No	163	43	216	57	379	0.099
	Yes	4	80	1	20	5	
	Total	167	43.5	217	56.5	384	
Ever received. screened or treated any known or suspected COVID-19 patient?	No	165	43.3	216	56.7	381	0.417
	Yes	2	66.7	1	33.3	3	
	Total	167	43.5	217	56.5	384	

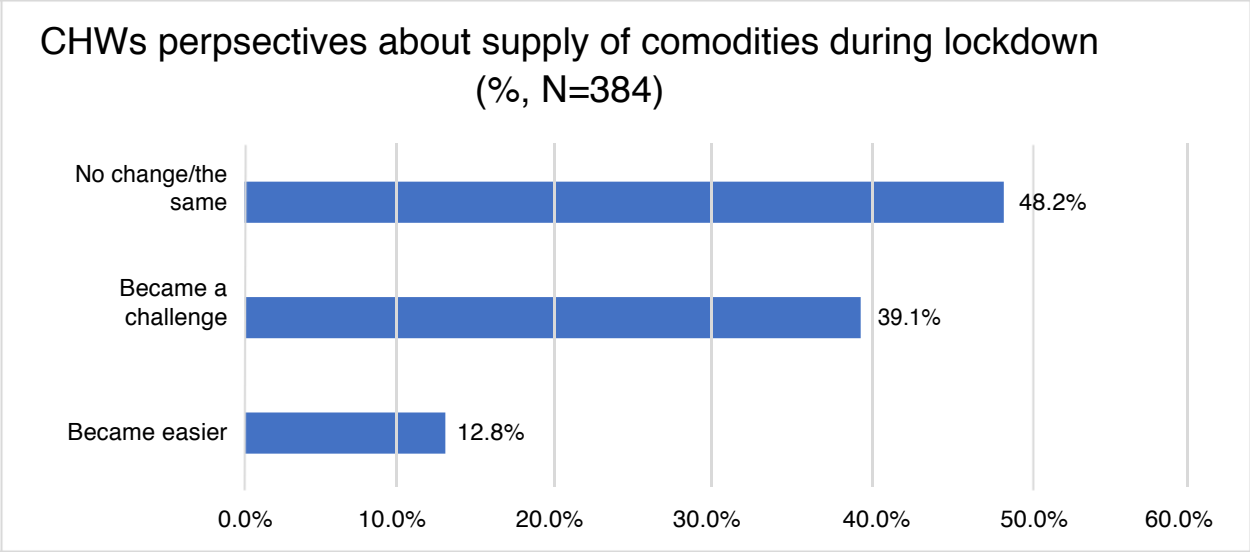
I.3.2 I.2.2.2 CHWs Attitudes/perspectives

I.3.2.1 *Figure 26: CHWs Positive attitudes/perspectives during COVID-19*



I.3.2.2 *Figure 27: CHWs perspectives about number of patients and supply of commodities during lockdown*




CHWs perpsectives about supply of comodities during lockdown
(%, N=384)
No change/the same
48.2%
Became a challenge
39.1%
Became easier
12.8%
0.0%
10.0%
20.0%
30.0%
40.0%
50.0%
60.0%

I.3.2.3 *Table 3: Change in services delivery after COVID-19 arrives in Rwanda in health facilities*

Service	Delivered the service						
	Total	Both before and after		Before only		After only	
		n	%	n	%	n	%
Malaria Diagnosis and Treatment	310	301	97.10	3	0.97	6	1.94
Mosquito nets distribution	125	63	50.40	61	48.80	1	0.80
IRS in the community	27	17	62.96	7	25.93	3	11.11
Community education	184	71	38.59	105	57.07	8	4.35
Radio Talk Shows	3	0	-	3	100.00	0	-

I.3.2.4 *Table 4: Reasons for change in services delivery after COVID-19 arrives in Rwanda in health facilities*

COVID/Lockdown related reasons for not delivering the services after					
Service	**COVID/Lockdown related**		**Non COVID/Lockdown related**		**Total (N)**
	n	**%**	**n**	**%**	
Malaria Diagnosis and Treatment	1	33.33	2	66.67	3
Mosquito nets distribution	12	19.67	49*	80.33	61
IRS in the community	2	28.57	5	71.43	7
Community education	93	88.57	12	11.43	105
Radio Talk Shows	1	33.33	2	66.67	3
** Of the 49 non COVID/lockdown related, 34 (55.74%) were stock out the products*					

I.3.2.5 Table 5: Change in services delivery after COVID arrives in Rwanda among CHWs

Service	TOTAL	Both before and after		Before only	
		n	%	n	%
Malaria Diagnosis and Treatment	382	357	93.46	25	6.54
Mosquito nets distribution	280	6	2.14	274	97.86
IRS in the community	174	78	44.83	96	55.17
Community education	371	94	25.34	277	74.66
Supply of commodities	369	321	86.99	48	13.01

I.3.2.6 *Table 6: Reasons for change in services delivery after COVID arrives in Rwanda among CHWs*

COVID/Lockdown related reasons for not delivering the services after							
Service	COVID/Lockdown related		Non COVID/ Lockdown related		Stock out of the products		Total (N)
	n	%	n	%	n	%	
Malaria Diagnosis and Treatment	11	44	9	36	5	20	25
Mosquito nets distribution	75	27.37	138	50.36	61	22.26	274
IRS in the community	24	25	72	75	-		96
Community education	276	99.64	1	0.36	-		277
Supply of commodities	22	45.83	26	54.17	-		48

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