

Impact of COVID-19 on Rwanda's Health Sector

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Working Paper - COVID-19_013

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By

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Contents

List of tables

List of figures

List of abbreviations and acronyms

Acknowledgments

Executive summary

1.	Introduction	1
2.	Country context	5
3.	Methodology	9
4.	Research findings	11
5.	Discussion	25
6.	Conclusion and policy implications	27
	Notes	29
	References	30
	Appendix: Key Informant Interview	32

List of tables

1.	Top 10 causes of mortality in health centres, district/provincial hospitals, and referral hospitals (all age groups)	7
2.	Top causes of morbidity in health facilities (all age groups)	8
3.	Factors associated with positivity among Rwandan population	15

List of figures

1.	Trend of COVID-19 confirmed cases in Rwanda (as of 8 May 2021)	3
2.	Structure of the healthcare system of Rwanda	6
3.	Sequence of events in the COVID-19 response	14
4.	Distribution of case fatality rate by age categories (as of 8 May 2021)	16
5.	National COVID-19 response coordination structure	17
6.	Contact tracing structure	18
7.	Results of community survey	19
8.	Routine and preventive services (antenatal care, vaccination, and family planning) trends before and during COVID-19	21
9.	Trend of hospital consultations for NCDs and CDs before and during COVID-19	22
10.	Trend of deaths by month (January 2018-June 2020)	23

List of abbreviations and acronyms

AERC	Africa Economic Research Consortium
ANC	Antenatal Care
CBOs	Community-Based Organizations
CDs	Communicable Diseases
CHWs	Community Health Workers
COVID-19	Coronavirus Disease 2019
CSOs	Civil Society Organizations
DDMC	District Disaster Management Committees
DHIS-2	District Health Information System-2
EAC	East African Community
ECDs	Early Childhood Development
eIDSR	Integrated Diseases Surveillance and Response System
EPR	Emergency Preparedness and Response
ESR	Epidemic Surveillance and Response Division
DALYs	Disability-Adjusted Life Year
DHMT	District Health Management Team
DHU	District Health Unit
DRC	Republic Democratic of Congo
GDP	Gross Domestic Product
GoR	Government of Rwanda
GIS	Geographic Information System
HBC	Home-Based Care
HMIS	Health Management Information System
HRH	Health Human Resources
HSSP	Health Sector Strategic Plan
IHR	International Health Regulations
UNECA	United Nations Economic Commission for Africa
IPC	Infection Prevention and Control
ISO	International Standards Organization
KAP	Knowledge, Attitudes and Practices
MIDIMAR	Ministry of Disaster Management and Refugee Affairs
MOH	Ministry of Health
NCDs	Non-Communicable Diseases

NDMEC	National Disaster Management Executive Committee
NDMTC	National Disaster Management Technical Committee
NRL	National Reference Laboratory
PHEIC	Public Health Emergency of International Concern
PMTCT	Prevention of Mother-To-Child Transmission
POE	Points of Entry
PPE	Personal Protective Equipment
QALYs	Quality-Adjusted Life Year
RBC	Rwanda Biomedical Centre
RDTs	Rapid Diagnostic Tests
RHCC	Rwanda Health Communication Centre
RT-PCR	Reverse Transcription Polymerase Chain Reaction
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
SDGs	Sustainable Development Goals
SMEs	Small and Medium-sized Enterprises
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
VAT	Value-Added Tax
WHO	World Health Organization

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Executive summary

On 30 January 2020, the World Health Organization (WHO) declared the new coronavirus COVID-19 outbreak as a Public Health Emergency of International Concern (PHEIC) with a strong recommendation for countries to take appropriate measures to interrupt virus spread. By 11 March 2020, the WHO had declared COVID-19 as a global pandemic with the number of cases estimated at 118,319, and the virus had expanded to 114 countries with ripple effects on every aspect of human life.

The COVID-19 burden has been asymmetrically distributed. Although the infection and death rates in Africa did not reach the inflection points that had been predicted, there was unprecedented pressure on the public health systems in many African countries and far-reaching socioeconomic implications which may trigger major setbacks for years to come. Many African countries deployed the national budget to support in mitigating the health and economic crisis.

Rwanda is the focus in the current report and evaluated as an illustrative example of a country which stemmed the spread of COVID-19 with early measures, while leveraging previous investments in the healthcare system and outbreak preparedness. This report seeks to: document the interventions put in place to mitigate COVID-19 transmission, including ongoing vaccination; examine the impact of COVID-19 on health outcomes; and describe interventions to mitigate socioeconomic impact.

The report uses historical data, primary data, review of government and international reports, as well as published papers. The historical data covered two years before the onset of COVID-19 pandemic until December 2020 to reflect on any potential change in the use of key health services. Global reports are used to provide context for the outbreak preparedness. Key informant interviews were used to triangulate information collected with perspectives from policy makers, health implementers, academics, members of the National COVID-19 Task Force, and the general population as the consumers of services.

The national information health systems were used to collate data prior to the COVID-19 pandemic. This involved the extraction of key routine services data (vaccination, ANC, and outpatients' records), from June 2018 to December 2020 to understand any disruption of the use of health services. Secondary data analysis was conducted to determine positivity rate, demographic characteristics and case fatality rate. Disease-specific HMIS countrywide data was analysed to determine trend of hospital consultation of major chronic diseases and mortality between June 2018 to

December 2020 and compare two critical periods (before and after COVID-19 onset) to assess any existence of disruption of services and increase in number of mortalities as a result of COVID-19 pandemic.

In Rwanda, the first case was confirmed on 14 March 2020, and was detected through preparedness and response measures that had been deployed in late January. The National Steering Committee, chaired by the Prime Minister, is in charge of overall management, leadership, mobilizing, and coordinating resources to fight COVID-19 and its socioeconomic consequences. A National COVID-19 Task Force was activated to run daily activities and report to the National Steering Committee. The establishment of the command post was coordinated by the Government of Rwanda (GoR), in collaboration with bilateral and multilateral partners in the country, which guided the timely implementation and monitoring of public health and policy measures.

A total of 11,032 cases were reported between 14 March 2020 and 17 January 2021. During this period, the epidemic in Rwanda progressed through four phases which comprise of: first phase which was characterized by a stable period with case either imported or linked to imported cases; it was followed by phase two characterized by the occurrence of the first clusters of community transmission identified on 31 May 2020 in the district bordering the Republic Democratic of Congo (DRC) with peaks of 200 cases daily, with positivity rate reaching 1.1%. The third phase was characterized by drop of cases with decreased number of daily confirmed cases and low case fatality rate; while in the last and fourth phase, started in December 2020, the number of cases and case fatality rate increased compared to the previous phases, the percentage positivity of tests tripled (3.4% vs ~1.0%), and the average number of daily cases reported has more than quintupled (124 vs 24). The majority of positive cases were male (64%) compared to 36% female. Among the 142 deaths recorded as of 17 January 2021, there were 102 (72%) male compared to 40 (28%) female.

As implementation strategies, Rwanda sought to limit the spread of the virus through non-pharmaceutical public health to prevent community spread including a six-week lockdown across the country in March 2020, in addition to maintaining physical distancing and hygiene measures. The restrictions also included closure of non-essential businesses, school and church closures, limitations on intra- and inter-regional transport, which aimed to contain the pandemic and protect the healthcare systems from being overwhelmed with demand from COVID-19 and other essential services. The national response focused on community surveillance, increased testing and developed targeted containment measures with intermittent lockdowns during sharp increases of cases and deaths. The country rolled out the first COVID-19 vaccination campaign on 5 March 2021 with Pfizer-BioNTech and AstraZeneca vaccines received through the international vaccine cooperative, COVAX Facility. This report provides recommendations for policy makers in the context of COVID-19 response in Rwanda. These recommendations aim at strengthening epidemic preparedness and response, based on lessons from the COVID-19 crisis in the country and region. Such discussions are particularly important given the risk of a second wave of infections, and the constant threat of other outbreaks.

1. Introduction

On 11 March 2020, the World Health Organization (WHO) declared the COVID-19 outbreak as a global pandemic with recommendations for countries to take appropriate measures to mitigate its spread. As of 8 May 2021, an estimated 156,496,592 confirmed cases and 3,264,143 deaths had been reported in more than 220 countries and territories.

The COVID-19 disease caused by SARS-CoV-2 virus is highly transmissible from person to person, with a reproduction number, R_0 , (number of additional cases resulting from initial case) estimated between 1.6 and 2.4 (Aylward & Liang, 2020). The virus particularly affected older individuals, and individuals with underlying conditions who were evaluated to have higher fatality rates compared to other age groups (WHO, 2020).

The African continent was predicted to have the highest burden of COVID-19 based on severe limitations in healthcare systems, critical infrastructure, and other vulnerabilities. These predictions have not reached the inflection points anticipated. Some factors put forth are the younger population structure compared to other continents and stringent measures put in place. Other factors are the limited testing capacity, which may lead to underestimated epidemiological situation. The effects of COVID-19 extend beyond the health sector, with significant socioeconomic implications that threaten to reverse development gains.

Rwanda is an East African Community (EAC) member state with an estimated population of 13 million. The country has recorded significant progress in social and economic development over the past two decades. For example, poverty levels reduced from 60% to 38%, while its human development score doubled between 1990 and 2019. In 2019, the economic growth was estimated to average 8% annually. This growth estimate has since been reduced.

The COVID-19 pandemic has put pressure on the healthcare system and economic growth prospects. Rwanda reported the first COVID-19 case on 14 March 2020, a day after the first recorded case in East Africa (in Kenya). This case was detected through preparedness and response measures that had been deployed in late January 2020. The country had initiated public health campaigns and screening at all points of entry (POE). This early response was built on measures put in place during the previous outbreaks in the region, including Ebola in 2018.

The COVID-19 pandemic has gone through various phases (Figure 1). As of 8 May 2021, Rwanda had recorded 25,586 total cases with 1,129 (4.4%) active cases, and 338

(1.3%) deaths. The country has recorded an estimated 10.4% of the cases and 9.1% of deaths reported among EAC member states.

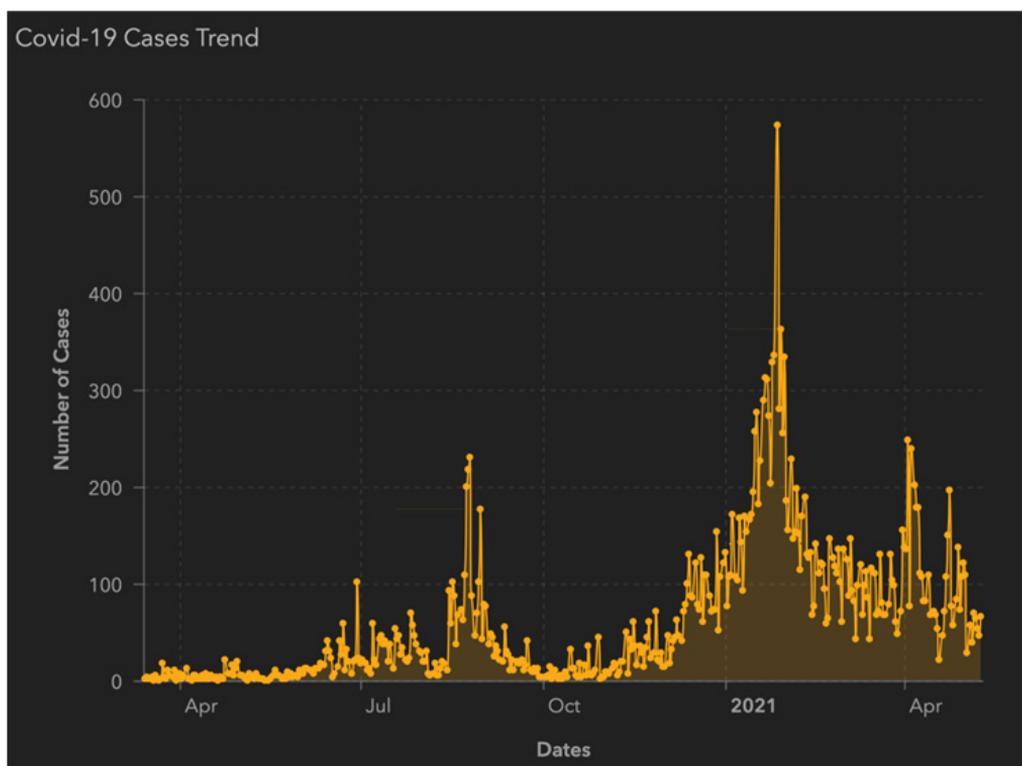
The national COVID-19 preparedness and response plan implemented involved eight key pillars: leadership and coordination, epidemiological surveillance, points of entry (POE), laboratory, infection prevention and control, case management, risk communication and community engagement, and logistics. This plan guided the national response team and ensured the decentralization of the response from central to district levels.

Rwanda's approach was to put in place enhanced measures to flatten the curve of COVID-19 transmission, including lockdown restrictions, isolation of confirmed cases, quarantining close contacts of confirmed cases, contact tracing, quarantining travellers, mandatory use of face masks, and expanding testing and treatment capacities. As the virus continued to spread, Rwanda sought to balance the increasing demands of COVID-19 pandemic response with the need to maintain the delivery of critical services like healthcare.

The public health measures to flatten the curve of COVID-19 transmission also impacted social programmes, mobility, and overall economic activities. The pandemic has exacerbated existing gaps in access to basic services and protection challenges, particularly for the most vulnerable groups.

This report seeks to document the interventions put in place to flatten the curve of COVID-19 transmission, examine the impact of COVID-19 on health outcomes in Rwanda, and describe interventions to mitigate socioeconomic impact. Recommendations from this report can strengthen epidemic preparedness and response, based on lessons from the COVID-19 crisis in the country and region. Such discussions are particularly important given the risk of recurring waves of infections, increase in SARS-CoV-2 variants, and the constant threat of other outbreaks.

The report starts with an exploration of the country context in terms of healthcare situation, and socioeconomic context. The findings section covers the epidemic preparedness, before presenting the current epidemiological and socioeconomic situation in Rwanda. The discussion and recommendations sections provide an overview of results and actionable recommendations within a broader policy context in the East African region and Africa at large.

Figure 1: Trend of COVID-19 confirmed cases in Rwanda (as of 8 May 2021)

Source: Rwanda Biomedical Centre.

Objectives

This report aims to achieve the following objectives:

- i) Describe epidemiology of COVID-19 in Rwanda, and document established interventions to flatten the curve of COVID-19 in Rwanda.
- ii) Analyse potential effect of COVID-19 on health outputs, outcomes, and continuity of health services.
- iii) Outline interventions put in place to mitigate social-economic impact while flattening the COVID-19 curve in Rwanda.
- iv) Present policy recommendations on how to strengthen outbreak preparedness and response based on COVID-19 crisis.

The report considers the extent to which the healthcare system in Rwanda was prepared for COVID-19 and the immediate impact of the disease on selected indicators. It also explores interventions used by the government to manage the outbreak, and places it in the context of East African countries.

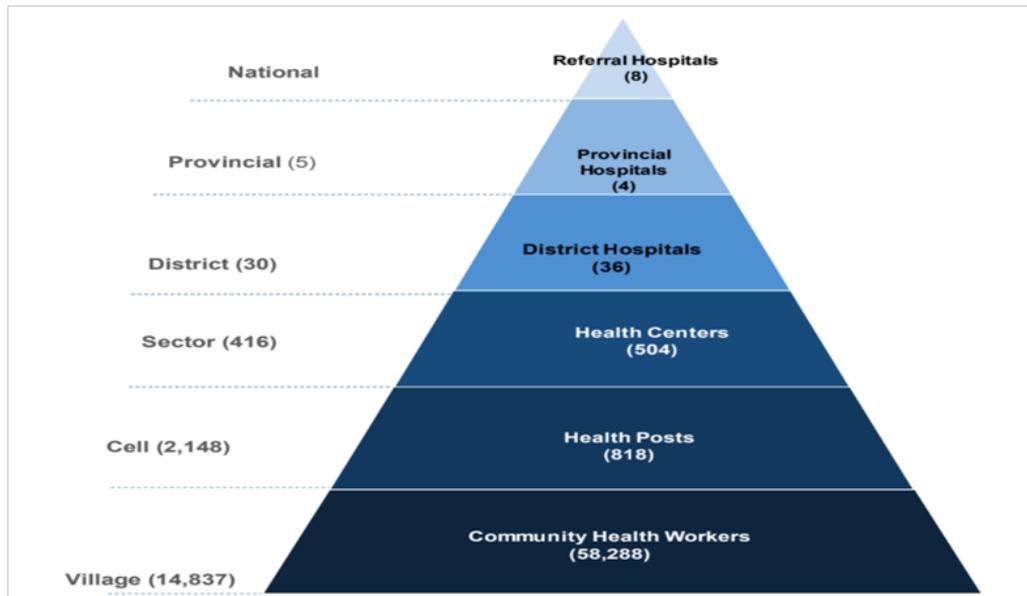
Guided by available evidence, the report explores important areas with negative secondary impact as a result of the COVID-19 crisis, including the impact on women and girls, and cross-border initiatives.

2. Country context

Rwanda has recorded significant progress in healthcare and economic development over the last 20 years. For example, the public health insurance (Mutuelle de Sante) provides coverage for nearly 84% of the population, with another 6% covered by private insurances. The country has a wide network of health facilities with significant geographical coverage, and healthcare packages defined for each level from the community level up to the referral level.

The Rwandan healthcare system is organized at five main levels based on health service provision: eight national referral hospitals, four provincial hospitals, 36 district hospitals, 504 health centres at sector level, and 818 health posts at cell level, in addition to 58,288 community health workers (CHWs) (Rwanda Ministry of Health, 2017a). The private sector also supports health service delivery, mostly through provision of specialized services (laboratory, cancer, dialysis, surgery, fertility, etc.), management of health posts, and provision of medical products using social marketing. At the central level, the Ministry of Health (MOH) sets policies, national strategies, and governs all health facilities, while the Rwanda Biomedical Centre (RBC) leads the implementation of policies, strategies and health-related programmes since 2011. At a decentralized level, there are 30 administrative districts, 416 sectors, 2,148 cells and 14,837 villages (Figure 2). At district level, a decentralization of health care services is governed by the District Health Management Team (DHMT), which is composed of all stakeholders involved in the health service delivery at the district level, including bilateral organizations and local government entities under the leadership of the Mayor of the administrative district. The DHMT is chaired by Vice-Mayor for social affairs, and it oversees planning and monitoring, supervision of health activities, coordination of development partners, and resource management in the delivery of health (Rwanda Ministry of Health, 2017b).

The district health unit (DHU) is the administrative structure responsible of the day-to-day planning, monitoring, evaluation, and coordination of health activities and partners, in collaboration with the DHMT (Rwanda Ministry of Health, 2017b).

Figure 2: Structure of the healthcare system of Rwanda

Source: Ministry of Health (MOH, District Health Systems Guidelines, 2019).

These service delivery mechanisms are critical to sustain the healthcare system at all levels and rely on financial sustainability. This is particularly important in an environment with growing budgetary pressure as expenses increase with the ongoing pandemic threat in destabilizing the existing healthcare system.

The spending on healthcare is higher than the African average, with an estimated 16% of national budget earmarked for the healthcare sector in the fiscal year 2018/19 (Rwanda Ministry of Health, 2017a). The funds are prioritized in line with the country's disease profile and healthcare priorities. This spending approach reduces vulnerabilities to public health outbreaks, including increasing skills of human resources for health and equipping health facilities. However, current indicators show constraints still remain in health financing, advanced care, and healthcare workforce, which are exacerbated during public health emergencies.

For the past two decades, Rwanda has increased human resources for health. Between 2010 and 2019, the doctor-population ratio improved from 1:16,001 to 1:8,294, while the nurse-population ratio improved from 1:1,291 to 1,040. As of 2019, Rwanda has 1,492 medical doctors (642 specialists and 850 general practitioners), 10,409 nurses, and 1,561 midwives. The health sector is continuously increasing the number of qualified health professionals (Rwanda Ministry of Health, 2017a).

In comparison, sub-Saharan Africa has an average population per doctor ratio of 5,000, and 1,000 for nurses. However, the healthcare personnel needs to be trained on emerging diseases, including management of outbreaks, and improvement of skill-mixed for specialization for specific conditions and targeted conditions such as neonatal illnesses, non-communicable diseases, and outbreaks. The involvement of civil societies and private sector is also critical to produce health workforce that can manage and prevent outbreaks from clinicians, to allied health workers and support services staff.

In terms of health outcomes, Table 1 outlines neonatal illnesses and respiratory infections which constitute almost to 50% of causes of mortality. The estimated 23% of causes of death were due to respiratory infections, making this group of population vulnerable to COVID-19.

Table 1: Top 10 causes of mortality in health centres, district/provincial hospitals, and referral hospitals (all age groups)

	Disease group	2017	2018	2019
		N (%)	N (%)	N (%)
1	Neonatal illness	3,812(50%)	3,643(48%)	3,928(58%)
2	ARI	163 (2%)	84 (1%)	47 (1%)
3	Cardiovascular disease	207 (3%)	239 (3%)	241 (4%)
4	Malaria	382 (5%)	319 (3%)	217 (3%)
5	Congenital anomalies	251 (3%)	296 (4%)	189 (3%)
6	Pneumopathies	573 (8%)	677 (9%)	696 (10%)
7	Physical trauma and fracture	505 (7%)	586 (8%)	456 (7%)
8	Gynaecological problems	68 (1%)	165 (2%)	47 (1%)
9	Asthma	984 (13%)	1,081 (14%)	622 (9%)
10	HIV-AIDS opportunistic infections	306 (4%)	296 (4%)	183 (3%)
11	Other diseases	334 (4%)	279 (4%)	89 (1%)
Total		7585	7665	6715

Source: R-HIMS.

Table 2: Top causes of morbidity in health facilities (all age groups)

	Cause of outpatient visit	2017	2018	2019
		N (%)	N (%)	N (%)
1	Acute respiratory infections	3,490,763 (23%)	2,678,952 (14%)	1,201,873 (7%)
2	Malaria	1,937,194 (13%)	1,976,283 (10%)	1,225,997 (8%)
3	Intestinal parasites	755,883 (5%)	753,141 (4%)	783,632 (5%)
4	Physical trauma	74,675 (0%)	82,111 (0%)	39,840 (0%)
5	Tooth and gum disease	731,063 (5%)	824,030 (4%)	778,605 (5%)
6	Skin infections	513,729 (3%)	492,739 (3%)	331,524 (2%)
7	Eye problems	519,393 (3%)	409,743 (2%)	425,298 (3%)
8	Urinary tract infections	330,483 (2%)	390,212 (2%)	423,179 (3%)
9	Pneumopathies	256,804 (2%)	345,158 (2%)	267,726 (2%)
10	Diarrhoea disease	349,822 (2%)	557,647 (3%)	404,241 (2%)
11	Gastro-intestinal diseases	466,271 (3%)	523,887 (3%)	481,268 (3%)
12	Gynaecological problems	203,455 (1%)	149,530 (1%)	199,675 (1%)
13	Cardiovascular diseases	59,041 (0.4%)	27,448 (0.1%)	27,128 (0.2%)
14	Obstetrical problems	58,905 (0.4%)	28,476 (0.1%)	14,318 (0.09%)
15	Hypertension	42,599 (0.3%)	21,658 (0.1%)	21,345 (0.13)
16	Neurological problems	7,157 (0.05)	8,620 (0.04%)	4,979 (0.03%)
17	Other causes of morbidity	2,639,042 (17.3%)	7,550,218 (38.7%)	8,268,540 (51.1%)
Total		15,234,027	19,494,649	16,194,995

Source: R-HIMS.

3. Methodology

Study design

The report is a descriptive cross-sectional and mixed method using historical data, primary data, and review of government and international reports, as well as published papers. The historical data covered two years before the onset of COVID-19 pandemic until December 2020 to reflect on any potential change in the use of key health services.

These documents were used to analyse the trend of disease progression before and after COVID-19, current assessment of SARS-CoV-2 since the onset of the disease in the country, review of grey literature, peer-reviewed papers, policies, and other government documents. The review of international reports related to health infrastructure and outbreak preparedness was also used. We also conducted ten key informant interviews to triangulate information collected with views from policy makers, implementers, academicians, and members of the task force, and the general population as the consumers of services.

Data collection and source of information

The national information health systems were used to collate data prior the COVID-19 pandemic. This involved the extraction of key routine services data (vaccination, ANC, and outpatients' records), from June 2018 to December 2020, to understand any disruption of the use of health services. Using HMIS, we analysed data from SARS-CoV-2 from the onset of the disease in the country up to end of November 2020. Confirmed case was defined according to the Rwanda Ministry of Health guideline as detection of SARS-CoV-2 in clinical specimen using Reverse Transcription Polymerase Chain Reaction (RT-PCR). The review of available literature used academic peer-reviewed papers, policy documents, and reports from national and international organizations. Lastly, interviews were used to triangulate the information collected and collated via different portals to understand the trend of key health services, descriptive analysis of SARS-CoV-2 and perceptions of COVID-19 socio and economic impact on the daily activities.

Data analysis

Routine data entered in the HMIS during sample collection were extracted and transferred to Microsoft Excel. Secondary data analysis was conducted to determine positivity rate, demographic characteristics and case fatality rate. Data analysis was done using STATA version 16.0 and Microsoft Excel 2010. Disease-specific HMIS countrywide data was analysed to determine trend of hospital consultation of major chronic diseases and mortality between June 2018 and December 2020, and compare two critical periods (before and after COVID-19 onset) to assess any existence of disruption of services and increase in number of mortalities as a result of COVID-19 pandemic.

4. Research findings

Epidemic preparedness

a. National legislation, policy, and financing

Adequate policies and legal framework are the foundation to support the implementation of national responses and preparedness for an adequate response plan. In Rwanda, the development and implementation of national response and public health surveillance were done through the existing national policy documents such as Health Sector Policy (2015); Health Sector Strategic Plan (HSSP [2018-2024]), and the One Health Strategic Plan (2014-2018). At the international level, these frameworks are done through the International Health Regulations (IHR [2005]). The country is a signatory of the IHR and had shown commitment to building capacities to detect and respond to major public health events and threats. To minimize and curb the impact of health threats from the region, Rwanda, as many countries in EAC, is also a signatory to a number of cross-border agreements that are highly relevant to epidemic preparedness such as the East African Community (EAC) Protocol on Health, the EAC Act of One Border Post, and the Continental Free Trade Area (UNDP, 2020). These frameworks provide a strong foundation for epidemic preparedness and response within the country and across the borders.

Based on the aspiration of vision 2050 and current challenges faced by the health sector, there is a need to accelerate the existing services implementation level of key and evidence-based interventions to the critical areas. Although maternal and child health impact indicators have improved substantially in the past two decades, maternal mortality and under-five mortality still need to be reduced by half to attain SDGs. An existing burden in health sector and a cross-cutting issue is how to accelerate the reduction of maternal and child mortality, and reduction of poverty through food security approaches and ECDs. The HSSP4 targets and WHO severity threshold are set to be below 20% of stunting rate among under-five children. Quality of life (QALYs) and years of life lost due to disability (DALYs) in Rwanda can be improved if accelerated effort and financial support are designed to respond to the current burden of non-communicable diseases through the improvement of key pillars that include HRH, medical infrastructure,

and equipment and health digitalization. Despite the budget constraint for the implementation of these frameworks and policies, Rwanda was able to develop funding mechanisms to address preparedness for previous outbreaks.

b. Coordination at national and decentralized levels

Outbreaks often test the resilience of national health systems and national coordination mechanisms in place. In Rwanda, the National Disaster Management Executive Committee (NDMEC) brings together line ministries, including MOH with the overall responsibility for responding to and managing emergencies and disasters. The committee is coordinated by the Prime Minister. The National Disaster Management Technical Committee (NDMTC), led by the Ministry of Disaster Management and Refugee Affairs (MIDIMAR), is tasked with overall responsibility for coordinating the Government of Rwanda efforts to prepare for and respond to disasters, including disease epidemics.

For public health emergencies, MOH and the Rwanda Biomedical Centre (RBC), within its Epidemic Surveillance and Response Division (ESR), coordinate the national preparedness and response within the health sector. At MOH, the Emergency Preparedness and Response (EPR) Committee reviews policies and guidelines regarding public health emergencies, coordination and mobilization of resources during outbreaks, and linking the health sector to other sectors relevant to outbreak response and mitigation. At district level, the District Disaster Management Committees (DDMC) leads the coordination of emergency response in their respective districts. There are several steering committees which include representatives from government institutions, bilateral and multilateral partners, Civil Society Organizations (CSOs), the private sector, and Community-Based Organizations (CBOs). For example, the One Health Steering Committee is in charge of overall coordination and oversight of implementing the One Health approach (UNDP, 2020).

c. Real-time surveillance and screening at points of entry

The electronic Integrated Diseases Surveillance and Response system (eIDSR) was rolled out in all health facilities in 2011. The eIDSR is built upon the District Health Information System-2 (DHIS-2) platform, for monitoring epidemic-prone diseases and probable outbreaks in real time. The platform allows syndromic surveillance through case-based reporting, outbreak alert when threshold is reached, weekly aggregated data reporting, integration of laboratory information, and other important features. Training has been provided to health facility staff at all levels to analyse surveillance data for public health actions.

Event-based surveillance is ongoing at central and decentralized levels, and community event-based surveillance systems are being linked to the eIDSR.

Further, active surveillance is also done through sentinel sites of selected conditions (influenza, Rift Valley fever, etc.). On a weekly basis, surveillance feedback is provided through epidemiological reports and surveillance bulletins are prepared and disseminated through RBC portal (UNDP, 2020). Rwanda is landlocked with 22 border points (in 2019), including 20 land borders (six with Uganda, seven with the DRC, one with Tanzania, and six with Burundi). Kigali International Airport and the border with DRC at Rubavu have emergency care services, permanent staff, basic personal protective equipment (PPE), isolation rooms, and thermal screening systems (UNDP, 2020).

d. Laboratory and diagnostics capacity

Rwanda has a 5-tier national medical laboratory system with 664 public and private laboratories, including the National Reference Laboratory (NRL) (accredited International Standards Organization (ISO) 15189 for clinical laboratories), seven referral hospital laboratories, four provincial hospital laboratories, 39 district hospital laboratories, and 478 public health care laboratories. There is a laboratory-based disease surveillance system, with these laboratories usually attached to health facilities. The NRL and provincial and referral hospital laboratories monitor supervision to ensure the quality of services. A national transportation system is in place for the nine priority diseases, with established guidelines under coordination of NRL (WHO, 2018).

e. Community engagement and risk communication

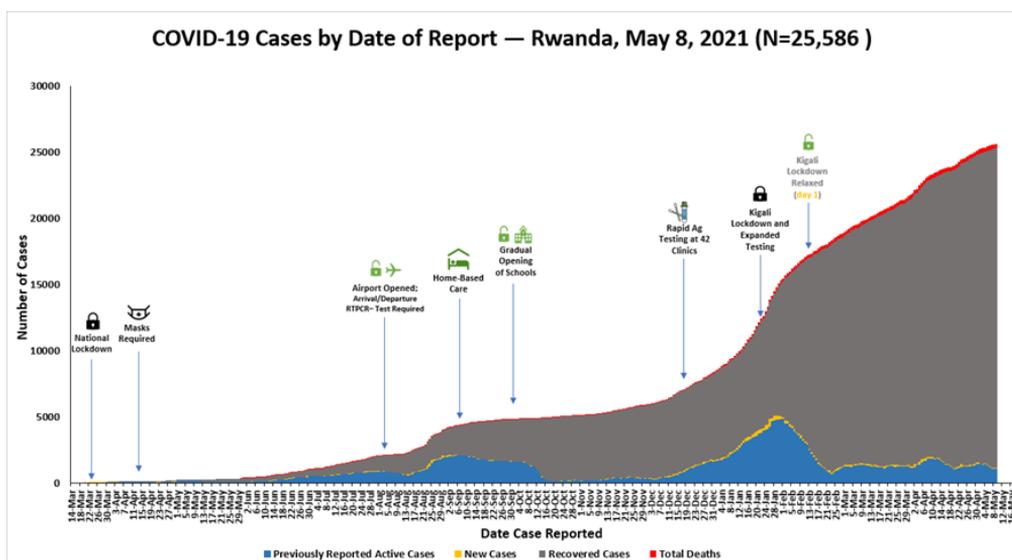
Rwanda Health Communication Centre (RHCC) within RBC leads risk communication with the public around health issues during a declaration of a health emergency. RHCC is also in charge of health promotion and routine communication. RHCC develops daily media review and monitoring, and rumours are flagged and shared with all relevant senior officials. Multiple media channels are mobilized during emergencies to disseminate relevant information. Religious leaders and community leaders are also involved in disseminating information. A toll-free emergency hotline number is activated to address community concerns and surveillance, particularly during emergency situations (WHO, 2018).

Descriptive and analytical epidemiology of COVID-19 in Rwanda

A total of 25,586 cases were reported between 14 March 2020 and 8 May 2021. During this period, the epidemic in Rwanda progressed through four phases. The first phase between 14 March 2020 and 31 May 2020 was characterized by a stable period with case either imported or linked to imported cases. Phase two had the first clusters of community transmission identified on 31 May 2020 in the district bordering the

Republic Democratic of Congo (DRC). During this phase between 31 May 2020 and August 2020, daily cases reached the peaks of 200 with positivity rate reaching 1.1%. This phase had clusters of community transmission in Rusizi district (bordering DRC); other clusters were identified among high risk occupation groups including markets in the country. Phase three was characterized by drop of cases with decreased number of daily confirmed cases and low case fatality rate. Rwanda maintained medians of daily positive cases at 11, and median daily tests conducted were 1,911, while the median tests conducted per case were 153. In the fourth phase, which started in December 2020, the number of cases and case fatality rate increased compared to the previous phases; the percentage positivity of tests tripled (3.4% vs ~1.0%), while the average number of daily cases reported more than quintupled (124 vs 24). Figure 3 shows the total number of confirmed cases (25,586) during the four phases as of 8 May 2021. The majority of positive cases were male (64%) compared to 36% female.

Figure 3: Sequence of events in the COVID-19 response



Source: Rwanda Biomedical Centre – Health Information Systems database.

A critical analysis of demographic characteristics of the COVID-19 cases is shown in Table 3.

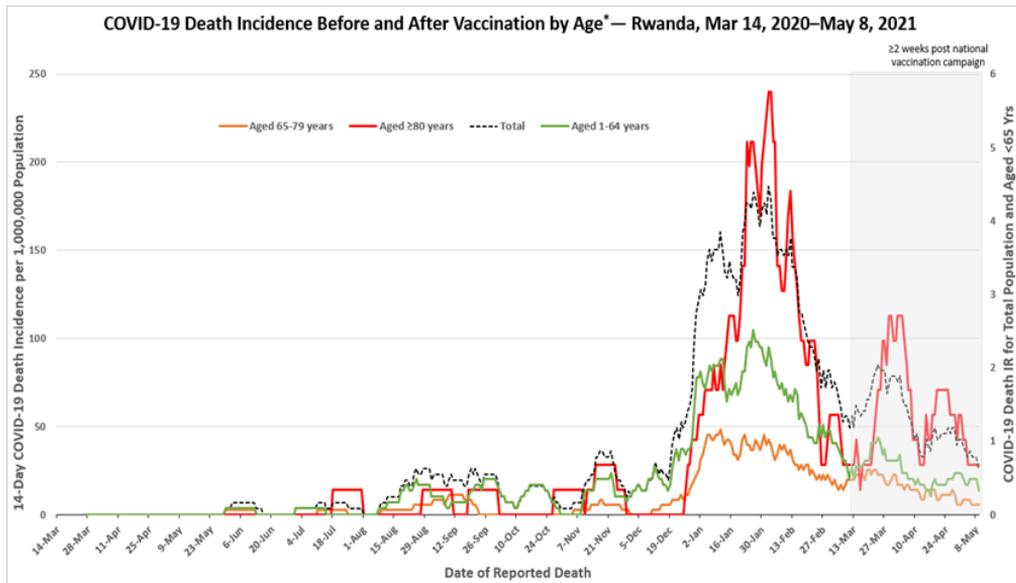
As shown in Table 3, demographic characteristics were checked for significance with COVID-19 infection by calculating logistic regression and odds ratios with the corresponding 95% confidence intervals (CI) and P-values. The variables with P-value <0.05 were considered as significant. The significant association of increased positivity rate was found among those who are aged above 20 years, with a special accent of those above 80 years of age having high odds ratio (OR) of 2.84 (1.45-5.55) compared to those aged less than 20 years old. The higher odds among those aged above 80 years is due to the fact that testing among the elderly was done among contacts and few

attended random testing. Occupation categories attained significant association with higher odds among self-employed Rwandan with OR of 4.66 (4.28-5.06) as compared to healthcare providers. There was significant association between place of residence, where Kigali City 2.38 (2.05-2.76) was exposed to high positivity rate as compared to North and other regions of Rwanda.

Table 3: Factors associated with positivity among Rwandan population

Characteristics	Multivariate analysis		
	COVID-19 Positive N (%)	AOR (95% CI)	P-values
Sex			
Female	1,612 (28.7%)		
Male	4,008 (71.3%)	1.05 (0.99-1.12)	0.135
Age Group (Years)			
0-19	731 (3.0%)	1	
20-39	3,524 (62.7%)	6.24 (5.61-6.96)	0
40-59	1,152 (20.5%)	7.72 (6.84-8.70)	0
60-79	204 (3.6%)	6.33 (5.30-7.57)	0
≥80	9 (0.2%)	10.13 (5.13-20.0)	0
Occupation			
Healthcare providers	209 (3.7%)	2.95 (2.57-3.38)	0
Salaried employees	1,394 (24.8%)	4.64 (4.16-5.17)	0
Self-employed	2,820 (50.2%)	9.84 (8.88-10.91)	0
Drivers & assistants	468 (8.3%)	2.95 (2.58-3.38)	0
Others	729 (12.9%)	1	
Province			
North	185 (3.3%)	1	
South	269 (4.8%)	2.85 (2.35-3.47)	0
East	985 (17.1%)	2.46 (2.09-2.90)	0
West	994 (17.7%)	1.75 (1.48-2.05)	0
Kigali City	3,214 (57.2%)	3.29 (2.82-3.84)	0

Figure 4 shows that the case fatality rate in Rwanda starts increasing from age 60 years and reach its maximum as the patient's age increases to >80 years from a total of 338 deaths recorded as of 8 May 2021, with case fatality rate of 13 deaths per 1,000 cases. The case fatality is high among people aged above 60 years, comprising 60% of all cases.

Figure 4: Distribution of case fatality rate by age categories (as of 8 May 2021)

Source: Rwanda Biomedical Centre – Health Information Systems database.

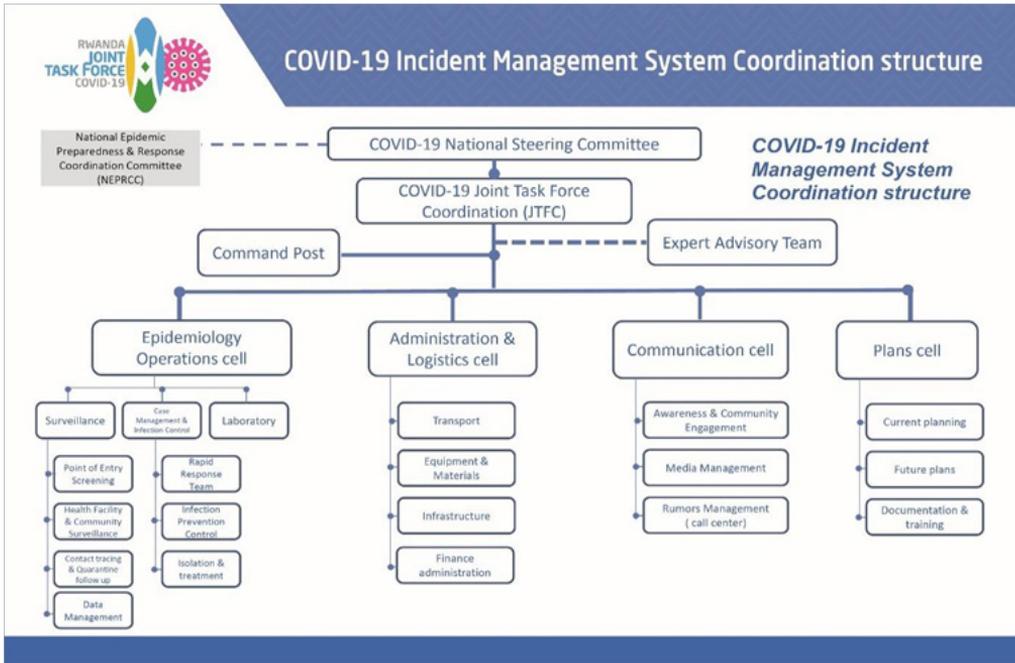
Established approaches to curb the trend of COVID-19 cases in Rwanda

a. Coordination – communication and community engagement

The initial step in responding to COVID-19 in Rwanda involved ramping up the response by enhancing coordination mechanisms and community engagement. More than 400 individuals from government and the private sector were mobilized to support the command post organized in four pillars: Epidemiology, Administration and logistics, Communication, and Planning.

Epidemiology and Operations as the main pillar coordinated surveillance and contact tracing, case management, and laboratory network in the country; with Administration and logistics overseeing supply of medical and nonmedical equipment and support operation services with logistical facilitation. This coordination was crucial, notably in ensuring adequate availability and distribution of basic personal protective equipment (PPE) (Nachega et al., 2021).

Figure 5: National COVID-19 response coordination structure

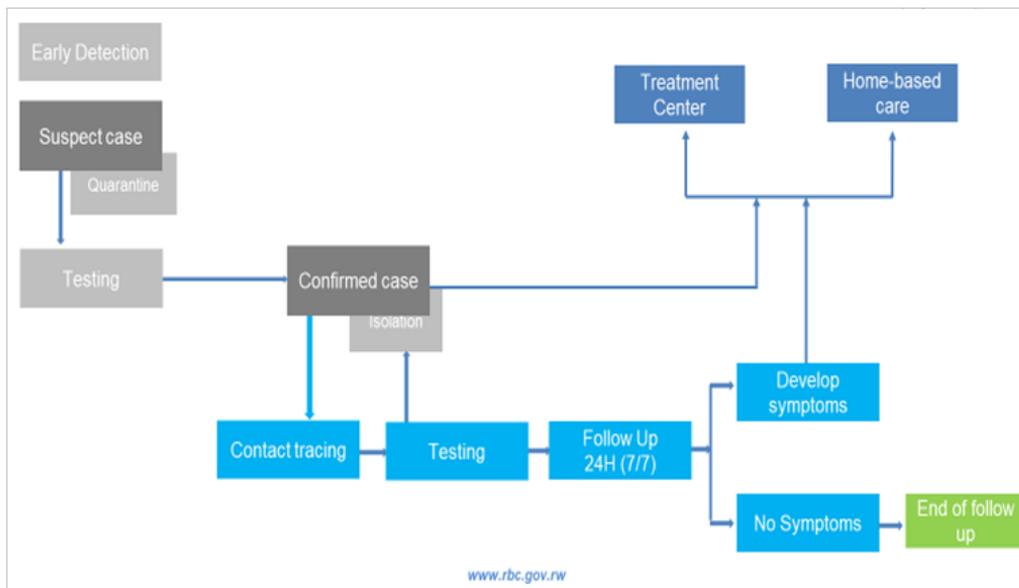


Source: Rwanda COVID-19 National response plan 2021

The communication pillar of the national response enhanced community engagement and improved awareness of the population on preventive measures. A knowledge, attitudes and practices (KAP) survey done in December 2020, shows a widespread understanding of COVID-19 measures based on respondents' responses.

b. Individual and community COVID-19 contact tracing and digitalization

Rwanda has prioritized testing, isolation, and contact tracing as key approaches to curb the number of cases, and has recognized timely and accurate COVID-19 testing as an important step of community surveillance. Once the case is suspected through contact tracing, testing is done using reverse transcription polymerase chain reaction (RT-PCR) which has the turnaround time to obtain results within six hours. After the confirmation of case, contacts with close proximity of one metre without face masks are identified and listed for close follow-up and testing, which are done between five and seven days after exposure.

Figure 6: Contact tracing structure

Source: Rwanda Biomedical Centre – Health Information Systems database.

Different technologies and innovative approaches were utilized in case investigations and contact tracing, such as use of bracelets. Findings from case investigations were used in informing decisions and still under exploration.

In addition, a Geographic Information System (GIS) is being used to visualize data and to monitor COVID-19 cases at the household level and assess the need for implementing lockdown measures, focus public health interventions where there is evidence of community transmission, and monitor at-risk populations.

c. Enhanced surveillance

As part of surveillance, in addition to continuous testing of patients consulting in health facilities for influenza like illness and severe acute respiratory illness, testing is also done in drive-through to enable early identification and initiate contact tracing before the onset of clinical signs.

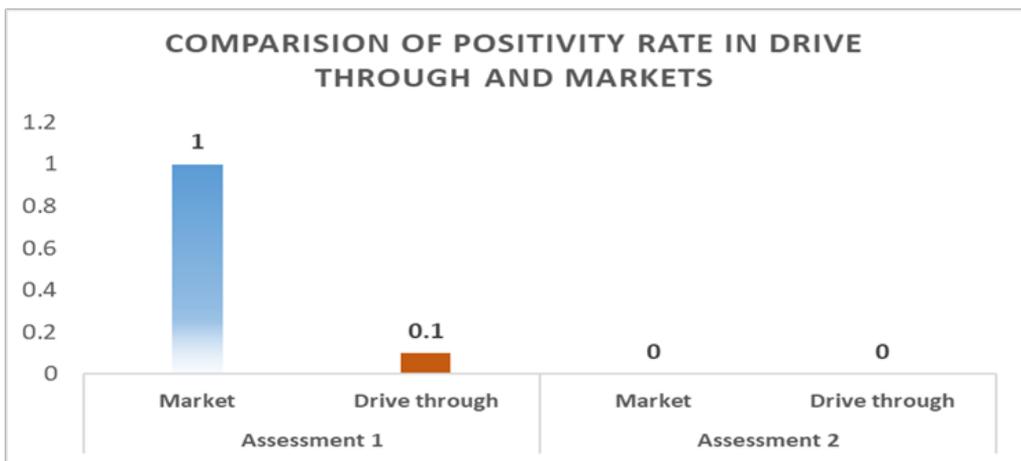
Rwanda launched a monthly drive- and walk-through approach in the epicentre of Kigali City and other districts to enable the understanding of the epidemiological change over time. The exercise involves randomly selecting and testing passing by cars, moto bikes, bicycles, and pedestrians in the city's main junctions and at the entry point from different parts of the country that led to tactical response to the pandemic.

Other hot spots, including markets, have been targeted for the national sample testing. The process involves mapping high risk groups and randomly selecting

people for testing. So far, two rounds of cross-sectional assessments have been conducted in drive-through and hot spots, where the first was conducted in October 2020 and second conducted in November 2020. The assessment has revealed decrease in positivity rate from 1% in markets and 0.1% in drive-through to zero case in both settings in the second assessment (see Figure 7).

Rwanda has enhanced testing capacity and coverage using antigen-based testing (RDTs) provided at various health facilities across the country. From the two assessments, the positivity rate has gone down, showing that implemented preventive interventions were promising in flattening the COVID-19 curve.

Figure 7: Results of community survey



d. Case management and home-based care

In June 2020, Rwanda shifted the case management approach towards decentralization and scaling-up capacities for public health and other interventions to respond to COVID-19, leveraging on the existing health systems at the decentralized level. The paradigm shift involved home-based care for asymptomatic and patients with mild symptoms to reduce patient load at the clinical level. While over 90% of COVID-19 cases will experience only mild to moderate symptoms, the approach implemented is to use existing platforms such as the use of Community Health Workers (CHWs) to manage these cases and to refer when appropriate. People with COVID-19 and who don't have co-morbidities or underlying health conditions placing them at risk for severe disease are being followed at home. The approach helps relieve the substantial burden the COVID-19 pandemic has placed on healthcare systems by maximizing available resources for managing and caring for people with more severe illness and also help maintain essential health services. The success of home-based care (HBC) relies on the strong collaboration between local governments or administrative divisions and corresponding levels of the healthcare system.

e. Border control measures

Rwanda responded by establishing measures including mandatory quarantine after arrival within designated hotels before obtaining results. The gradual opening of borders started with resuming flights with precautionary measures, including equipping the airport with protective plexiglass at check-in and immigration counters, thermal and temperature screening, social distancing markers, and increased levels of sanitization.

The government put in place a guideline, as requirement, for arrivals to be tested negative for COVID-19 within 72 hours before departure and receive a second test upon entry into the country. IPC facilities were established at points of entry (POE) including border ports and using robots for temperature screening. The gradual opening of two borders with the Democratic Republic of Congo has been done while ensuring mitigation of cross-border transmission. Measures in the two borders include testing of those crossing the borders and screening for everyone entering or exiting the country.

f. Surge capacity for the second wave of infections

During January-February 2021, after festive seasons, Rwanda experienced a second wave of infections similar to other regions. A growing theory is that, new COVID-19 variants detected in the UK, South Africa, Brazil, and other regions could be contributing to the rise in cases and case fatality rates. The National Task Force has been tasked to deploy surge capacity in terms of epidemic control, testing, contact tracing, and home-based care. More concerted testing campaigns are being implemented to gain a better understanding of the true spread of the virus. The initial findings have guided the government responses in a more targeted approach using the new laboratory method “pooled testing” for COVID-19 (Mutesa et al., 2021). For example, movement restriction measures were instated for 15 days in the capital city, while other provinces had curfew imposed.

Assessing potential impact of COVID-19 on health indicators and continuity of preventive health services

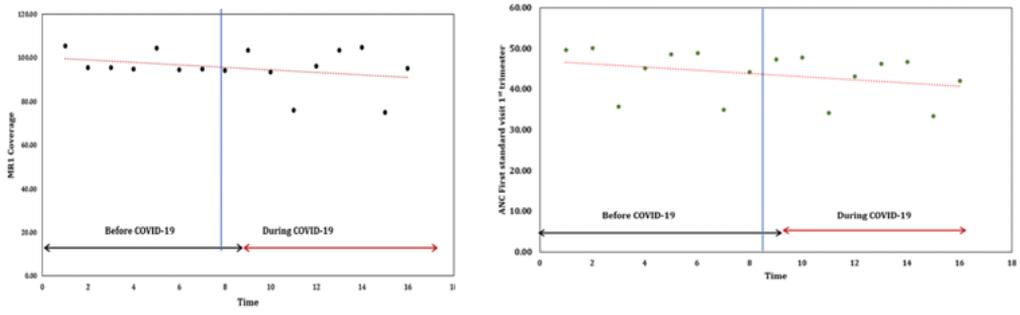
The continuity of health services during the pandemic response is crucial to avoid poor health outcomes and deaths from other conditions due to delay in seeking basic and preventive health services such as vaccination, Antenatal Care Services, etc., and also to check if there may be an increase of patients’ hospitalization rates before and after the onset of COVID-19 in Rwanda.

Antenatal care, vaccination, and family planning

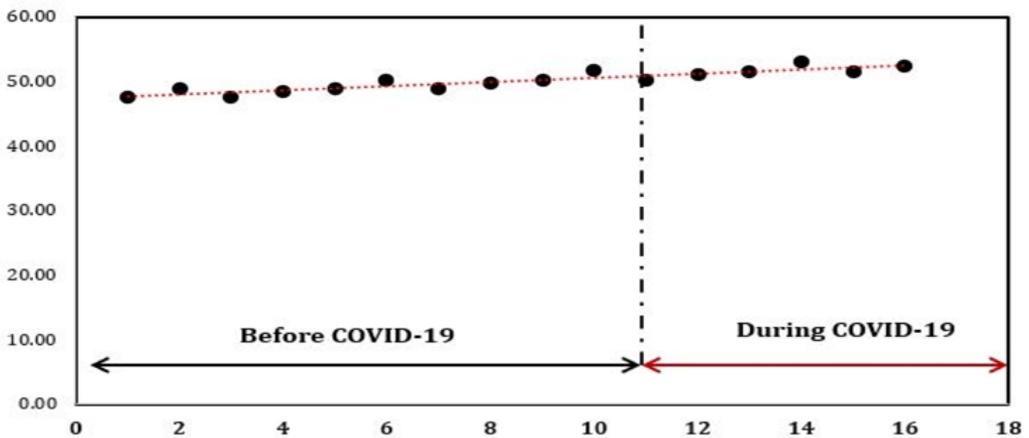
The findings below show no difference in both the Antenatal Care first standard visit and MR vaccination coverage and family planning before and during the outbreak in the country.

The findings from HMIS countrywide reports show there was no decrease in number of visits as has been expected due to stringent measures implemented during lockdown. This reflects that the inclusion of nonmedical staff, including medical students, in response avoided any disruption of healthcare services during the lockdown and most healthcare providers working in different health facilities were not assigned to support the COVID-19. Exemption to movement of people seeking medical care also facilitated the non-disruption of medical visits.

Figure 8: Routine and preventive services (antenatal care, vaccination, and family planning) trends before and during COVID-19

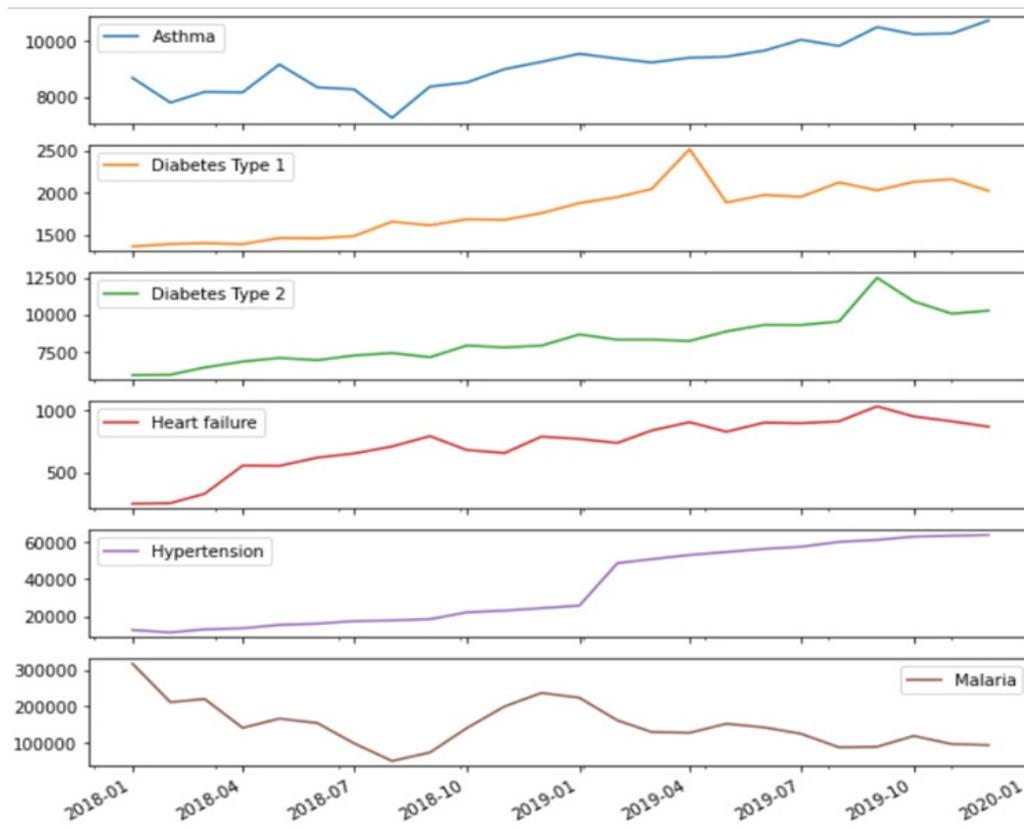


CPR (FP)



Same trend is seen for patients with Non-Communicable Diseases (NCDs) and Communicable Diseases (CDs) (e.g., malaria) as shown in Figure 9.

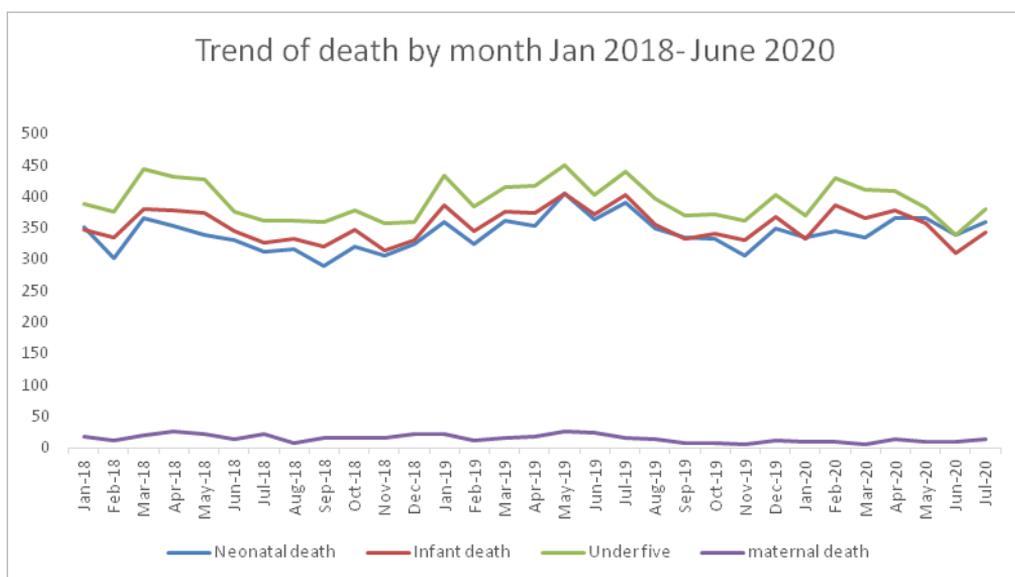
Figure 9: Trend of hospital consultations for NCDs and CDs before and during COVID-19



Trend of maternal, child, infant and neonatal deaths before and during COVID-19

The non-disruption of services during the pandemic has resulted in no increase of maternal and child mortality. During the pandemic, different schools were designated as isolation centres for COVID-19 cases and health facilities were left to continue their regular activities. This has impacted positively in ensuring continuity of services for patients.

Figure 10: Trend of deaths by month (January 2018-June 2020)



Impact on social protection programmes

Rwanda economic growth is projected to slow down to 3% in 2020 from 9.4% in 2019, as the COVID-19 pandemic has put pressure on key sectors that contribute to the economic growth (retail, tourism, services, construction, and manufacturing). The first priority was to mitigate and contain the outbreak, with a focus on keeping low case and fatalities counts.

Rwanda has developed an Economic Recovery Plan, including support to vulnerable households (food distribution, subsidized access to agricultural inputs, cash transfers, etc.) and adopted various tax deferral and relief measures (including VAT refunds and exemptions for locally produced masks) to help informal and formal sectors to overcome economic burden imposed by the lockdown. The government has also launched a private sector fund for SMEs and sectors that were highly impacted. The salaries of top civil servants were redirected to welfare programmes in April (UNECA, 2020).

Rwanda has established a framework that is focusing on accelerating economic recovery, rebuilding the most affected sectors, such as tourism, and increasing national resilience to the medium-term and long-term impact of COVID-19. In the medium term, the economy is expected to recover with economic growth reaching 6.3% in 2021, and back to its average growth of 8% in 2022.

Women and girls, who account for a significant number, and in some cases the majority, of workers in high-risk sectors with a high likelihood of disruptions, face a bleak job security threatening to push back the gains made on gender equality and exacerbate the feminization of poverty, vulnerability to violence, and women's equal

participation in the labour force. Mitigating this risk will require higher and more targeted investments as well as adequate social safety nets (UNDP, 2020). Similar to many countries, the informal economy workers have been particularly vulnerable to COVID-19 disruptions and have been included in support efforts. The social protection programmes must take into account poorer households as they are the most at risk to shocks from the pandemic. In Rwanda, the social protection programmes targeted the lowest income groups (ubudehe 1 and 2) to reduce the poverty incidence. Rwanda has also prioritized support to the private sector through economic recovery fund to make finance available for small and medium enterprises, and the agriculture sector (IMF, 2019).

5. Discussion

Most East African countries reported their first COVID-19 cases in late February/early March 2020, a few weeks after the virus was first reported in Asia. Rwanda sought to limit the spread of the virus through “lockdown” regulations, implemented within five days of the first case that significantly restricted people’s movement across the country. The restrictions also included closure of non-essential businesses, school and church closures, and limitations on intra- and inter-regional transport. The national lockdowns put in place were necessary to contain the pandemic and protect the healthcare systems from being overwhelmed with demand from COVID-19 and other essential services (Nachegea et al., 2021).

The COVID-19 outbreak expanded over a few months from a Public Health Emergency of International Concern (PHEIC) to a global pandemic with ripple effects on every aspect of human life across all continents. At the time of writing this report towards the end of 2020, Rwanda, similar to most of the African continent, was experiencing a fast evolving second wave of the COVID-19 pandemic where, as of 31 December 2020, 40 countries (73%) had experienced or were still experiencing a second wave of cases. Rwanda has been able to maintain the case fatality at 1.3%, which is below the global case fatality of 2.2%, while 18 African countries reported case fatality above 2.2% (Salyer et al., 2020).

The initial approach of containing COVID-19 was through test, isolate, trace, and quarantine strategies. In addition to RT-PCR, Rwanda has enhanced testing capacity and coverage through antigen-based testing (RDTs) provided at various health facilities across the country.

Contact tracing is a crucial strategy in outbreak response. Contact tracing was initially aggressive, conducted on every case with contacts placed in quarantine facilities. As the epidemic evolved, the contact tracing focused on high-risk contacts. Contact tracing approach was similar to contact tracing done in different countries in African region (Uganda, Nigeria, and South Africa) and attributed the low burden of COVID-19 in the region (Nachegea et al., 2021).

The isolation of all infected people and monitoring and enforcement of isolation are essential interventions for disease control, albeit, resource intensive. Rwanda initially centralized isolation at designated sites and later adopted a home-based isolation.

The identification of first case in Rwanda activated the incidence management system to respond to the outbreak similar to Uganda and Kenya, where the incident

management system was activated to coordinate public health mitigation measures such as banning of public gatherings and coordination of contact tracing (Nachega et al., 2021).

The COVID-19 burden has been asymmetrically distributed, with a large number of the cases reported in Europe, Americas, and Asia regions. Although the infection and death rates in Africa were not as predicted, the social and economic impact of the pandemic in African countries is significant and may trigger major setbacks for years to come.

These containment measures, coupled with mandatory implementation of preventive measures like mass distribution and wearing of face masks, social distancing, and frequent hand washing, led to the disease control, unfortunately with declines in economic outputs, with particularly impact on poorer households.

Results presented shows that Rwanda's social economy, which is driven by the service sector, was confronted with a large direct impact from COVID-19 pandemic with a decline of the GDP. The findings are similar to studies that were conducted in lower income countries that estimated that 256 million individuals, around 77% of the population across the four countries of Nigeria, Ethiopia, Uganda, and Malawi, have lost income since the start of the pandemic, exacerbated by an inability to access medicine and foods for an estimated 30% of households (Josephson et al., 2021).

Lockdown measures, including population movement restrictions and curfews, have been implemented in different countries, including Rwanda, in order to mitigate COVID-19 transmission, and it resulted in disruption of healthcare services continuity (Kanu, 2020). The findings of this study indicated that there was no interruption of basic and preventive health services in Rwanda, including antenatal care, vaccination, and family planning services. However, a meta-analysis study conducted across 20 countries showed a consistent reduction in the utilization of healthcare services during the pandemic period compared with previous years (Moynihan et al., 2021). A report released in May 2020 by UNICEF Uganda indicated that there was a decrease in demand and utilization of essential health services like immunization, health facility delivery, PMTCT services, and ANC4 visits between March and April 2020 attributed to COVID-19 travel restrictions which caused limited attendance to health facilities (UNICEF Uganda, 2020). The continuity of health services might be attributed to the multisectoral involvement in COVID-19 activities and utilization of nonmedical staff like medical students to support COVID-19 activities which prevented Rwanda from staffing shortage during this pandemic period, and easing movement of people seeking health services during lockdown also facilitated the non-disruption of health services in Rwanda.

The findings from this study revealed non-disruption of ANC, vaccination, and maternal and child health, which is not similar to the findings in Kenya that reported decreased antenatal attendance, immunizations, and hospital deliveries, along with an increase in stillbirths during COVID-19 (Kimani et al., 2020).

6. Conclusion and policy implications

Conclusion

The initial approach of containing COVID-19 was through test, isolate, trace, and quarantine strategies. The testing capacities are globally limited and costly and should be strategically conducted to control disease spread. Therefore, preventive measures coupled with mass testing helped curb the curve of COVID-19 spread in the country.

In Rwanda, the national response has focused on contextually embedded initiatives and innovations in responding to the health and socioeconomic impact of COVID-19.

The epidemic situation is assessed every 15 days by the Cabinet, and measures are adapted in line with evolving transmission dynamics. These assessments must be a combination of various expertizes and perspectives in order to keep an emphasis on public health considerations while considering the often-nuanced socioeconomic considerations.

The Government of Rwanda has to consider people living in informal settlements and those relying on informal work, who are significantly affected by restrictions and other policies. In Rwanda, there were some measures of social mitigation targeting the lowest-income households in particular areas.

Policy implications and recommendations

The COVID-19 pandemic underlines the need to further strengthen beyond national boundaries and support the core capacities of public health systems to detect and respond to all disease outbreaks, not only concentrating on high profile diseases with epidemic potential.

Like most countries in Africa, Rwanda put efforts in implementing and improving contingency plans at district and national levels that could be easily replicable at the regional and continental level; this should be the way to go given limited resources in the country and regionally that need to be shared. These contingency plans should, not only be platforms to understand the funding gaps, but also setting health priorities to ensure effective preparedness and response in the country and beyond. The plans should include mechanisms for quick access of funds and apply unconventional methods to train capable human resources for health (clinicians and laboratory technicians) to reduce the burden of health providers at health facility

levels. Furthermore, a logistical contingency plan should be in place with deployment mechanisms for emergency logistics (e.g., PPEs, test kits). A stock of back-up materials should be established at the national level.

The use of technology and digital solutions should be leveraged in the epidemic response. In Rwanda, the deployment of digital solutions enhanced the national response and continuity of services. For example, smart phones used by CHWs helped setting an extended system to track COVID-19 patients and their contacts across the country. The use of robots to check temperatures at the airport or the use digitalized data collection, analysis, and reporting for prompt feedback by policy makers are all different recommendations to be improved at country level with possible extension in the region.

Beyond the health sector, there is an imperative to avoid the compounding effect on pre-existing vulnerabilities across income and gender, through specific social safety nets programmes. The government has to consider people living in informal settlements and those relying on informal work, who are significantly affected by restrictions and other policies. In Rwanda, there were some measures of social mitigation targeting the lowest-income households in particular areas.

Strict movement restrictions were effective at decreasing case numbers but came at an economic and societal cost. These lockdowns should be tailored to maximize public health protection and minimize economic and societal hardship. Usually, short-strict lockdown of 14 days minimum captures one full incubation period, which can be extended if needed.

Notes

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Appendix

KEY INFORMANT INTERVIEW

Each interview could take about 30-45 minutes, and it would focus on the questions below. In order to optimize participation of selected key informants, both in-person interviews and calls have been organized.

CATEGORY 1: KEY INFORMANT INTERVIEW IN HEALTH SECTOR

Questions

1. Please describe your role or organization's role in the COVID-19 preparedness and response in Rwanda.
2. What impact have you observed in the community related to COVID-19?
3. What broader impact have you observed across the health sector and in terms of healthcare service delivery?
4. a) What impact, positive or negative, have you observed related to public health measures against COVID-19 (stay at home measures, physical distancing, non-essential workplace closures, access to community/social services, etc.)?
b) From your perspective, which population (or subpopulation) was most impacted?
5. What mitigation strategies have you observed that address the negative effects of COVID-19, particularly in most affected populations? How are/were they implemented?
6. What best practices have you observed in terms of mitigation strategies?
7. What barriers have you observed to the mitigation strategies?
8. Are there mitigation strategies not in place that would help impacted populations? What were the drivers of the mitigation strategies put in place?
9. Might you have any additional comments to add?

CATEGORY 2: KEY INFORMANT INTERVIEW IN OTHER SECTORS**Questions**

1. Please describe your role or organization's role in the COVID-19 preparedness and response in Rwanda.
2. What impact have you observed in the community related to COVID-19?
3. What broader impact have you observed across sectors?
4. a) What impact, positive or negative, have you observed related to public health measures against COVID-19 (stay at home measures, physical distancing, non-essential workplace closures, access to community/social services, etc.)?
b) From your perspective, which population (or subpopulation) was most impacted?
5. What mitigation strategies have you observed that address the negative effects of COVID-19, particularly in most affected populations? How are/were they implemented?
6. What best practices have you observed in terms of mitigation strategies?
7. What barriers have you observed to the mitigation strategies?
8. Are there mitigation strategies not in place that would help impacted populations?
9. Might you have any additional comments to add?

CATEGORY 3: KEY INFORMANT INTERVIEW IN COMMUNITY**Questions**

1. What impact have you observed in your community related to COVID-19?
2. a) What impact, positive or negative, have you observed related to public health measures against COVID-19 (stay at home, physical distancing, non-essential workplace closures, access to community/social services, etc.)?
b) From your perspective, which population (or sub-population) in your community are most impacted?
3. What mitigation strategies have you observed that address the negative effects of COVID-19, particularly in most affected populations? How are/were they implemented?
4. What barriers have you observed to the mitigation strategies?
5. Are there mitigation strategies not in place that would help impacted populations in your community?
6. Might you have any additional comments to add?



Mission

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