



Rapid assessment on the utilization of maternal and child health services during COVID-19 in Rwanda

D. Wanyana,¹ R. Wong,^{1,2} D. Hakizimana¹

<http://dx.doi.org/10.5588/pha.20.0057>

SETTING: All public health facilities in Rwanda, East Africa.

OBJECTIVE: To assess the change in the utilization of maternal and child health (MCH) services during the COVID-19 outbreak.

DESIGN: This was a cross-sectional quantitative study.

RESULTS: During the COVID-19 outbreak in Rwanda, the utilization of 15 MCH services in all four categories—antenatal care (ANC), deliveries, postnatal care (PNC) and vaccinations—significantly declined. The Northern and Western Provinces were affected the most, with significant decrease in respectively nine and 12 services. The Eastern Province showed no statistically significant utilization changes. Kigali was the only province with significant increase in the fourth PNC visits for babies and mothers, while the Southern Province showed significant increase in utilization of measles + rubella (MR) 1 vaccination.

CONCLUSION: Access and utilization of basic MCH services were considerably affected during the COVID-19 outbreak in Rwanda. This study highlighted the need for pre-emptive measures to avoid disruptions in MCH service delivery and routine health services during outbreaks. In order for the reductions in MCH service utilization to be reversed, targeted resources and active promotion of ANC, institutional deliveries and vaccinations need to be prioritized. Further studies on long-term impact and geographical variations are needed.

Since the first case of COVID-19 was discovered in Wuhan, China, in December 2019, the novel strain of coronavirus has quickly spread worldwide and become a pandemic.¹ As of today, over 41 million people have been infected, and over one million deaths have been recorded globally.² Several countries have instituted COVID-19 prevention measures, including testing, contact tracing, quarantine and countrywide lockdown.

COVID-19 is highly contagious, with an average of 2.2 additional cases generated by each sick person.^{3,4} The transmission of COVID-19 from humans to humans is mainly through droplets via sneezing or coughing and contact with surfaces touched by an infected person.⁵

Studies have shown that in times of epidemic crisis, the health system is compromised. The health of women and children is usually the most affected and they face the highest rate of death.^{6–8} The 2014–2015 Ebola outbreak in West Africa severely compromised

the health systems in the affected countries. The fear of healthcare providers, as well as patients substantially reduced the utilization of antenatal care (ANC), skilled and facility-based deliveries, cesarean sections, vaccination, and other maternal health care services by about 35% to 80%.⁶ Evidence has shown that the decline in the utilization of MCH services after the disease outbreak did not recover to pre-outbreak levels until targeted strategies were put in place.⁷

Rwanda is not free from the disruption caused by the COVID-19 pandemic. Since the first case was confirmed on March 14, 2020, Rwanda has reported over 4,000 total cases of COVID-19 as of September 2, 2020.⁹ The country has implemented several measures to minimize the spread of the disease^{10,11} while essential services, such as health facilities, remain open. To the best of our knowledge, the impact of COVID-19 on the utilization of health care services related to MCH has not been assessed. This study, therefore, aimed to assess the utilization of MCH services during COVID-19 in Rwanda. The findings from this study contributed to the existing knowledge on the impact of coronavirus disease in Rwanda and will support the Ministry of Health (Kigali, Rwanda) and Rwanda Biomedical Center (Kigali, Rwanda) in implementing targeted interventions to reverse the decline in MCH services utilization.

METHODS

Study design

We analyzed data from the Rwanda Health Management Information System (HMIS).

Setting

Rwanda (estimated 2020 population: 12,663,117; 51.8% female, of whom 23.4% are of reproductive age)¹² is made up of 30 districts in five provinces—Eastern, Northern, Western, Southern and Kigali City. In 2015, 99% of pregnant women attended at least one ANC session, 91% of deliveries took place at a health facility, a 93% immunization coverage was recorded among children aged 12–23 months, and 87% of children received all their basic vaccinations before their first birthday.¹³

Study period

MCH data from March and April 2019 (before the COVID-19 outbreak) were compared with those from March and April 2020 in order to account for any seasonal differences.

AFFILIATIONS

- 1 Institute of Global Health, University of Global Health Equity, Kigali, Rwanda
- 2 School of Public Health, Yale University, New Haven, CT, USA

CORRESPONDENCE

Correspondence to: Denise Wanyana, University of Global Health Equity, Kigali Heights, 5th Floor, KG 7 Ave, PO Box 6955, Kigali, Rwanda. email: denise.wanyana@gmail.com

ACKNOWLEDGMENTS

The authors wish to thank the University of Global Health Equity (Kigali, Rwanda), and the Health Management Information System (HMIS) team, E Ntawuyirusha and A Muhire, at the Rwanda Ministry of Health (Kigali, Rwanda) for their support. Conflicts of interest: none declared. Disclaimer: The views expressed in this document are those of the authors and may not necessarily reflect those of their affiliated institutions.

KEY WORDS

MCH; disease outbreak; sub-Saharan Africa; Health Management Information System; HMIS; secondary analysis

Received 15 September 2020
Accepted 22 December 2020

PHA 2021; 11(1): 12–21
e-ISSN 2220-8372

Sample and data collection method

MCH indicators from each of the 30 districts were extracted from the HMIS by the HMIS data manager at the Ministry of Health. The data received were aggregated at the district level from all public health facilities in Rwanda.

Data variables

The 30 MCH indicators were categorized into four groups: ANC (7 indicators), facility delivery (3 indicators), postnatal care (PNC) (4 indicators), and immunization (16 indicators). The individual indicators were listed in Tables 1–6.

TABLE 1 Changes in use of MCH services, national level

Variables	March and April 2019		March and April 2020		Change	P value
	Observed*/expected† (Expected number = 59,810)	Utilization rate‡ ± SD	Observed/expected (Expected number = 61,205)	Utilization rate ± SD		
ANC-related indicators						
ANC new registrations	64,711	1.06 ± 0.23	62,453	1.01 ± 0.19	-0.057	0.138
ANC first standard visit	29,213	00.49 ± 0.12	27,361	00.45 ± 0.09	-0.041	0.042§
ANC fourth standard visit	24,034	00.40 ± 0.14	22,042	00.36 ± 0.10	-0.039	0.083
ANC TT 1 given	21,721	00.36 ± 0.25	20,600	00.33 ± 0.07	-0.026	0.439
ANC TT 2 to 5 given	45,571	00.76 ± 0.21	44,264	00.72 ± 0.15	-0.035	0.284
ANC new registrations full course of iron and folic acid supplements	59,269	00.99 ± 0.19	58,365	00.95 ± 0.15	-0.040	0.204
ANC new registrations tested for anemia	43,273	00.73 ± 0.20	42,940	00.71 ± 0.20	-0.017	0.639
Indicators related to deliveries at health facility						
Deliveries at health facility						
Mothers in labor referred to higher level for delivery	59,734	00.99 ± 0.19	54,658	00.89 ± 0.19	-0.103	0.004§
Live births	11,996	00.20 ± 0.06	12,094	00.20 ± 0.06	-0.003	0.793
	59,461	00.98 ± 0.19	54,332	00.88 ± 0.19	-0.103	0.004§
PNC-related indicators						
PNC 1 visit: baby	50,627	00.84 ± 0.16	50,402	00.81 ± 0.13	-0.027	0.302
PNC 1 visit: mother	51,577	00.86 ± 0.15	50,543	00.82 ± 0.11	-0.038	0.122
PNC 4 visit: baby	25,393	00.43 ± 0.14	30,597	00.50 ± 0.13	0.071¶	0.005§
PNC 4 visit: mother	26,279	00.44 ± 0.14	31,090	00.51 ± 0.13	0.064¶	0.011§
Indicators related to childhood vaccinations						
BCG	64,079	1.06 ± 0.19	59,057	00.95 ± 0.17	-0.104	0.002§
Polio Zero_P0	58,412	00.97 ± 0.18	53,161	00.86 ± 0.15	-0.106	0.001§
Polio 1	58,913	00.97 ± 0.17	55,303	00.89 ± 0.16	-0.080	0.008§
Polio 2	57,615	00.95 ± 0.16	54,242	00.88 ± 0.14	-0.075	0.008§
Polio 3	57,372	00.95 ± 0.16	55,587	00.90 ± 0.15	-0.050	0.081
IPV	57,195	00.95 ± 0.16	55,578	00.90 ± 0.15	-0.047	0.101
DTP_HepB_Hib1	58,901	00.97 ± 0.17	55,236	00.89 ± 0.15	-0.080	0.007§
DTP_HepB_Hib2	57,624	00.95 ± 0.16	54,188	00.88 ± 0.14	-0.076	0.007§
DTP_HepB_Hib3	57,335	00.95 ± 0.16	55,527	00.90 ± 0.15	-0.050	0.078
Pneumococcus 1	58,925	00.97 ± 0.17	55,236	00.89 ± 0.15	-0.081	0.007§
Pneumococcus 2	57,638	00.95 ± 0.16	54,188	00.88 ± 0.14	-0.076	0.007§
Pneumococcus 3	57,341	00.95 ± 0.16	55,527	00.90 ± 0.15	-0.050	0.079
Rotavirus 1	59,025	00.98 ± 0.17	55,242	00.89 ± 0.15	-0.083	0.006§
Rotavirus 2	57,551	00.95 ± 0.17	54,180	00.88 ± 0.14	-0.075	-0.009§
Measles + rubella 1	59,240	00.98 ± 0.17	61,235	00.99 ± 0.15	0.014	0.642
Measles + rubella 2	53,840	00.89 ± 0.12	54,396	00.88 ± 0.13	-0.011	-0.625

*The number of women or children who actually attended the service.

†The number of women or children who were expected to attend the service in March and April 2019–2020, calculated by multiplying the projected population of 2019/2020 by 2.9%, which is the proportion of the total population aged 0–11 months representing the proportion of women who were expected to give birth divided by 12, then multiplied by 2 for both March and April.

‡The reported utilization rate is the average utilization of each service across all 30 districts in Rwanda.

§Significant at $P = 0.05$.

¶MCH services that experienced an increase in average utilization rate.

MCH = maternal and child health; SD = standard deviation; ANC = antenatal care; TT = tetanus toxoid; PNC = postnatal care; BCG = bacille Calmette-Guérin; IPV = inactivated polio vaccine; DTP = diphtheria; HepB = hepatitis B; Hib = hemophilus influenza.

TABLE 2 Summary of MCH service utilization changes across all five provinces

Variables	Eastern	Northern	Western	Southern	Kigali
ANC new registrations		-0.123			
ANC first standard visit					-0.195
ANC TT 2 to 5 given					-0.244
Deliveries at health facility		-0.125	-0.119		
Live births		-0.123	-0.128		
PNC 4 visit: baby					+0.086
PNC 4 visit: mother					+0.079
BCG*		-0.110	-0.118	-0.097	
Polio Zero_P0*		-0.108	-0.119	-0.094	
Polio 1		-0.116	-0.121		
Polio 2			-0.132		
DTP_HepB_Hib1		-0.115	-0.122		
DTP_HepB_Hib2			-0.131		
Pneumococcus 1		-0.115	-0.121		
Pneumococcus 2			-0.132		
Rotavirus 1		-0.115	-0.120		
Rotavirus 2			-0.130		-0.143
Measles + rubella 1				+0.066	
Number of services with decreased utilization		9	12	2	3
Number of services with increased utilization				1	2

*Decreased utilization in at least three provinces.

MCH = maternal and child health; ANC = antenatal care; TT = tetanus toxoid; PNC = postnatal care; BCG = bacille Calmette-Guérin; DTP = diphtheria; HepB = hepatitis B; Hib = hemophilus influenza.

Data management and analysis

The raw data were converted into rates by calculating the projected populations based on the growth rate of each district in 2019 and 2020 from the country's population projection records provided in the Rwanda Population size, structure and distribution report.¹² The number of women expected to use MCH services was calculated for each district by multiplying each district projected population by 2.9%, the proportion of the total population aged 0–11 months representing the proportion of women who were expected to give birth.¹² Finally, the utilization rate for each MCH service was calculated by dividing the raw data (i.e., the number of women or children who actually attended the service) by the number of women or children who were expected to attend the service. The utilization rates for each of the 30 MCH indicators were calculated at each district for 2019 and 2020. *t*-tests were used to analyze the difference in utilization of each indicator between March and April 2019 and March and April 2020 at the national level and at the provincial level. All statistical analyses were conducted using SPSS v.23 (IBM, Armonk, NY, USA); *P* value was set at 0.05.

Ethical consideration

This study was approved by the University of Global Health Equity Institutional Review Board (Kigali, Rwanda) and the Rwanda Ministry of Health, Kigali, Rwanda. As this was a secondary data analysis study with aggregated data, no identifiable data were used; informed consent was thus waived for the study.

RESULTS

Nationally, there was significant decrease in the utilization of 13 indicators: ANC first standard visits from 0.49 to 0.45 ($P = 0.042$), deliveries at health facility from 0.99 to 0.89 ($P = 0.004$), live births from 0.98 to 0.88 ($P = 0.004$), vaccinations: bacille Calmette-Guérin (BCG) from 1.06 to 0.95 ($P = 0.002$), polio zero

from 0.97 to 0.86 ($P = 0.001$), polio 1 from 0.97 to 0.89 ($P = 0.008$), polio 2 from 0.95 to 0.88 ($P = 0.008$), diphtheria, tetanus, pertussis, hepatitis B and hemophilus influenza (DTP_HepB_Hib) 1 from 0.97 to 0.89 ($P = 0.007$), DTP_HepB_Hib 2 from 0.95 to 0.88 ($P = 0.007$), pneumococcus 1 from 0.97 to 0.89 ($P = 0.007$), pneumococcus 2 from 0.95 to 0.88 ($P = 0.007$), rotavirus 1 from 0.98 to 0.89 ($P = 0.006$) and rotavirus 2 from 0.95 to 0.88 ($P = 0.009$). Two indicators showed increase in utilization: postnatal care (PNC) 4 visit for baby from 0.43 to 0.50 ($P = 0.005$) and PNC 4 visit for mother from 0.44 to 0.51 ($P = 0.011$) (Table I).

Table 2 gives the change in utilization across all five provinces in Rwanda. Of the 30 indicators, 15 significantly decreased (–) and three significantly increased (+) in utilization. The Northern and Western Provinces had the greatest number of MCH services with respectively nine and 12 services experiencing a significant decrease in utilization compared to the other provinces. The South experienced a significant decrease in two services and an increase in one, while Kigali had a significant decrease in three services and an increase in two services. The East showed no statistical differences across all 30 indicators. BCG and polio zero vaccination services showed decreases in utilization in at least three out of five provinces.

DISCUSSION

The analyses showed that there was a decrease in utilization of 13 MCH services across Rwanda since the COVID-19 outbreak, particularly in utilizations related to health facility deliveries and child vaccinations services.

Countrywide, the utilization of 13 MCH services significantly decreased. However, PNC 4 visits for both the baby and mother showed a significant increase. The Northern and Western Provinces were affected most, with significant decrease in respectively nine and 12 services. Kigali had significant changes in five services, while the Southern Province had changes in three services.

TABLE 3 Changes in utilization of MCH services, Eastern Province

Variables	March and April 2019		March and April 2020		Change	P value
	Utilization rate*	SD	Utilization rate	SD		
ANC-related indicators						
ANC new registrations	1.14	0.16	1.11	0.11	-0.039	0.454
ANC first standard visit	0.53	0.12	0.49	0.12	-0.040	0.380
ANC fourth standard visit	0.44	0.11	0.41	0.12	-0.031	0.482
ANC TT 1 given	0.35	0.04	0.35	0.03	0.002	0.901
ANC TT 2 to 5 given	0.72	0.13	0.72	0.12	0.001	0.978
ANC new registrations full course of iron and folic acid supplements	1.07	0.20	1.04	0.13	-0.038	0.564
ANC new registrations tested for anemia	0.80	0.10	0.82	0.18	0.024	0.671
Indicators related to deliveries at health facility						
Deliveries at health facility	1.07	0.19	0.97	0.08	-0.097	0.092
Mothers in labor referred to higher level for delivery	0.23	0.05	0.23	0.03	-0.007	0.68
Live births	1.06	0.19	0.97	0.08	-0.095	0.098
PNC-related indicators						
PNC 1 visit: baby	0.92	0.23	0.90	0.07	-0.022	0.731
PNC 1 visit: mother	0.96	0.19	0.91	0.07	-0.049	0.368
PNC 4 visit: baby	0.47	0.19	0.54	0.10	0.076	0.205
PNC 4 visit: mother	0.50	0.20	0.56	0.10	0.059	0.324
Indicators related to childhood vaccinations						
BCG	1.14	00.22	1.06	00.11	-0.080	0.225
Polio Zero_PO	0.99	00.22	00.90	00.14	-0.088	0.219
Polio 1	1.05	00.18	00.99	00.12	-0.054	0.360
Polio 2	1.00	00.12	00.96	00.12	-0.039	0.412
Polio 3	1.00	00.14	1.00	00.15	0.001	0.988
IPV	1.00	00.13	1.00	00.15	0.003	0.962
DTP_HepB_Hib1	1.04	00.18	00.99	00.12	-0.050	0.392
DTP_HepB_Hib2	1.00	00.12	00.96	00.12	-0.039	0.411
DTP_HepB_Hib3	1.00	00.14	1.00	00.15	0.001	0.987
Pneumococcus 1	1.04	00.18	00.99	00.12	-0.051	0.381
Pneumococcus 2	1.00	00.12	00.96	00.12	-0.039	0.411
Pneumococcus 3	1.00	00.14	1.00	00.15	-0.002	0.976
Rotavirus 1	1.04	00.18	00.99	00.12	-0.051	0.384
Rotavirus 2	1.00	00.12	00.96	00.12	-0.038	0.417
Measles + rubella 1	1.07	00.12	1.13	00.15	0.063	0.242
Measles + rubella 2	0.94	00.12	00.94	00.17	0.004	0.940

*The reported utilization rate is the average utilization of each service across the seven districts in the Eastern Province.

MCH = maternal and child health; SD = standard deviation; ANC = antenatal care; TT = tetanus toxoid; PNC = postnatal care; BCG = bacille Calmette-Guérin; IPV = inactivated polio vaccine; DTP = diphtheria; HepB = hepatitis B; Hib = hemophilus influenzae.

The Eastern Province had no statistically significant utilization changes in any of the 30 MCH indicators. Kigali was the only province with significant increase in utilization of two services, while the Southern Province showed significant increase in utilization of one service. Our study results only captured the initial impact of the COVID-19 in Rwanda. As the pandemic continues, the utilization might be further impacted.

Since COVID-19 is a novel strain, there have not been any similar studies. However, changes in MCH service utilization during previous outbreaks have been well documented in other countries. Similar declines in MCH services observed in our study were reported in West Africa during the 2014 Ebola outbreak.¹⁴⁻¹⁹

The significant decline in child health services across the country is alarming, although not surprising. Similar findings

were observed in Guinea and Sierra Leone during the Ebola outbreak.^{17,19} The interruptions and reductions in childhood vaccinations could have detrimental vaccine-preventable disease outbreaks in the future.^{20,21} In Guinea, 2 years after a decrease in measles vaccination during the Ebola outbreak, the measles incidence drastically increased from 2.7 per million in 2015 to 11.5 per million in 2016.²²

Some of the imminent challenges due to the COVID-19 outbreak were related to transport restrictions, reduced communication on existing routine health services due to heightened focus and resource allocation to the public health crisis response, as well as fear of contracting the virus by leaving home and going for routine medical checkups and procedures.^{6,15,17,18,23-25} However, the decreases could be compounded by pre-existing chal-

TABLE 4 Changes in Utilization of MCH Services, Northern Province

Variables	March and April 2019		March and April 2020		Change	P value
	Utilization rate*	SD	Utilization rate	SD		
ANC-related indicators						
ANC new registrations	1.01	0.13	0.89	0.08	-0.123	0.021†
ANC first standard visit	0.53	0.11	0.45	0.04	-0.072	0.069
ANC fourth standard visit	0.38	0.12	0.34	0.07	-0.038	0.387
ANC TT 1 given	0.34	0.05	0.32	0.03	-0.017	0.317
ANC TT 2 to 5 given	0.73	0.14	0.67	0.08	-0.060	0.247
ANC new registrations full course of iron and folic acid supplements	0.96	0.15	0.85	0.09	-0.103	0.073
ANC new registrations tested for anemia	0.69	0.14	0.62	0.15	-0.063	0.353
Indicators related to deliveries at health facility						
Deliveries at health facility	0.89	0.09	0.77	0.11	-0.125	0.011†
Mothers in labor referred to higher level for delivery	0.16	0.06	0.16	0.06	0.005	0.836
Live births	0.89	0.08	0.77	0.11	-0.123	0.011†
PNC-related indicators						
PNC 1 visit: baby	0.82	0.09	0.74	0.10	-0.081	0.074
PNC 1 visit: mother	0.84	0.10	0.76	0.11	-0.084	0.093
PNC 4 visit: baby	0.46	0.06	0.53	0.14	-0.076	0.14
PNC 4 visit: mother	0.47	0.06	0.53	0.14	-0.067	0.189
Indicators related to childhood vaccinations						
BCG	0.95	0.12	0.84	0.11	-0.110	0.044†
Polio Zero_PO	0.90	0.11	0.79	0.11	-0.108	0.041†
Polio 1	0.92	0.11	0.81	0.11	-0.116	0.031†
Polio 2	0.90	0.12	0.82	0.10	-0.084	0.109
Polio 3	0.90	0.11	0.83	0.10	-0.069	0.146
IPV	0.89	0.11	0.83	0.10	-0.067	0.159
DTP_HepB_Hib1	0.92	0.12	0.81	0.11	-0.115	0.033†
DTP_HepB_Hib2	0.90	0.12	0.82	0.10	-0.083	0.115
DTP_HepB_Hib3	0.89	0.11	0.83	0.10	-0.066	0.170
Pneumococcus 1	0.92	0.11	0.81	0.11	-0.115	0.032†
Pneumococcus 2	0.90	0.12	0.82	0.10	-0.082	0.118
Pneumococcus 3	0.89	0.10	0.83	0.10	-0.068	0.144
Rotavirus 1	0.92	0.11	0.81	0.11	-0.115	0.033†
Rotavirus 2	0.90	0.12	0.82	0.10	-0.083	0.114
Measles + rubella 1	0.91	0.10	0.90	0.12	-0.007	0.888
Measles + rubella 2	0.87	0.07	0.86	0.11	-0.005	0.902

*The reported utilization rate is the average utilization of each service across the five districts in the Northern Province.

†Significant at $P = 0.05$.

MCH = maternal and child health; SD = standard deviation; ANC = antenatal care; TT = tetanus toxoid; PNC = postnatal care; BCG = bacille Calmette-Guérin; IPV = inactivated polio vaccine; DTP = diphtheria; HepB = hepatitis B; Hib = hemophilus influenza.

lenges, such as poor quality of services, poor road conditions, interrupted delivery of supplies to health facilities, and lack of infrastructure for domestic production of medical supplies.^{8,23,24}

Regional variations were also seen across different provinces. The Western Province had the highest number of changes in MCH service utilization. Its close proximity to the Democratic Republic of Congo, where a huge number of COVID-19 cases were reported might have increased the burden on the already limited healthcare workforce and diverted resources to cater to COVID-19 patients.^{26,27} As reported in a recent study, health workers, facilities and equipment have been reassigned to address the influx of COVID-19 cases, which may have affected the provision and utilization of MCH services.⁸ Vertical efforts to mitigate COVID-19

may undermine other essential health services and leave women and children vulnerable to delays in accessing care which may lead to life-threatening complications and future public health crises.²⁸ Furthermore, the stay-at-home order issued by the Rwandan government in different provinces²⁹ also likely contributed to the disparities in health service utilization, as the restrictions and ability to move varied from region to region depending on the number of COVID-19 cases in each area. Furthermore, although the spread of COVID-19 was concentrated in Kigali City, the awareness of the ongoing transmission may have influenced health-seeking behavior in all the other provinces across the country.¹³ Despite the overall decline in service utilization, the utilization of PNC by both babies and mothers in Kigali, and the

TABLE 5 Changes in Utilization of MCH Services, Western Province

Variables	March and April 2019		March and April 2020		Change	P value
	Utilization rate*	SD	Utilization rate	SD		
ANC-related indicators						
ANC new registrations	1.01	0.11	0.97	0.14	-0.048	0.320
ANC first standard visit	0.40	0.13	0.41	0.07	0.014	0.733
ANC fourth standard visit	0.30	0.11	0.32	0.07	0.013	0.699
ANC TT 1 given	0.28	0.04	0.29	0.04	0.008	0.629
ANC TT 2 to 5 given	0.68	0.09	0.67	0.13	-0.009	0.837
ANC new registrations full course of iron and folic acid supplements	0.93	0.11	0.93	0.14	-0.001	0.991
ANC new registrations tested for anemia	0.70	0.20	0.76	0.22	0.058	0.478
Indicators related to deliveries at health facility						
Deliveries at health facility	0.94	0.08	0.82	0.09	-0.119	0.002†
Mothers in labor referred to higher level for delivery	0.20	0.06	0.20	0.04	-0.000	0.981
Live births	0.93	0.09	0.80	0.10	-0.128	0.001†
PNC-related indicators						
PNC 1 visit: baby	0.86	0.12	0.80	0.09	-0.058	0.152
PNC 1 visit: mother	0.86	0.12	0.81	0.09	-0.051	0.199
PNC 4 visit: baby	0.48	0.11	0.55	0.10	0.070	0.091
PNC 4 visit: mother	0.49	0.12	0.56	0.09	0.065	0.116
Indicators related to childhood vaccinations						
BCG	1.01	0.10	0.89	0.12	-0.118	0.009†
Polio Zero_P0	0.92	0.11	0.80	0.12	-0.119	0.009†
Polio 1	0.97	0.12	0.84	0.12	-0.121	0.012†
Polio 2	0.97	0.15	0.84	0.11	-0.132	0.016†
Polio 3	0.94	0.14	0.86	0.11	-0.088	0.078
IPV	0.94	0.14	0.86	0.11	-0.086	0.087
DTP_HepB_Hib1	0.97	0.12	0.84	0.12	-0.122	0.011†
DTP_HepB_Hib2	0.97	0.15	0.84	0.11	-0.131	0.016†
DTP_HepB_Hib3	0.94	0.14	0.86	0.11	-0.088	0.078
Pneumococcus 1	0.97	0.12	0.84	0.12	-0.121	0.012†
Pneumococcus 2	0.97	0.15	0.84	0.11	-0.132	0.016†
Pneumococcus 3	0.94	0.14	0.86	0.11	-0.088	0.078
Rotavirus 1	0.97	0.12	0.84	0.12	-0.120	0.012†
Rotavirus 2	0.97	0.15	0.84	0.11	-0.130	0.017†
Measles and rubella 1	0.96	0.15	0.93	0.10	-0.037	0.456
Measles and rubella 2	0.93	0.08	0.87	0.11	-0.058	0.120

*The reported utilization rate is the average utilization of each service across the seven districts in the Western Province.

†Significant at $P = 0.05$.

MCH = maternal and child health; SD = standard deviation; ANC = antenatal care; TT = tetanus toxoid; PNC = postnatal care; BCG = bacille Calmette-Guérin; IPV = inactivated polio vaccine; DTP = diphtheria; HepB = hepatitis B; Hib = hemophilus influenza.

measles and rubella (MR) 1 vaccination service in the Southern Province increased (Tables 6 and 7). Such variations could be due to the continuation of community-based interventions in the South and the recent community PNC sensitization campaigns in Kigali.²⁹⁻³¹ However, further investigation is needed to find out the root causes of the changes observed in service utilization.

MCH care is a national priority and the Rwandan government has worked hard to reverse negative trends and improve MCH care in all parts of the country through various strategies.³² The COVID-19 outbreak threatens these improvements, and therefore the results from this study are useful to inform policies and practices to mitigate and reverse the negative impacts of the outbreak. One important implication of this study is

its emphasis on the need for proactive measures to be put in place to prepare for any outbreaks that may occur in the future. These measures include planning for resources such as strict implementation of safe practices in health facilities, infection, prevention and control (IPC) trainings, routine monitoring, rapid COVID-19 screening for staff, and infrastructural changes to assure the public that they are safe once they come to health facilities.^{6,33}

Innovative strategies to provide services during COVID-19 need to be implemented such as different and safe modes of transportation, or bringing MCH services closer to the community through home visits and mobile clinics. Supplemental immunization activities (SIAs) should also be conducted to address

TABLE 6 Changes in utilization of MCH services, Southern Province

Variables	March and April 2019		March and April 2020		Change	P value
	Utilization rate*	SD	Utilization rate	SD		
ANC-related indicators						
ANC new registrations	0.91	0.06	0.90	0.09	-0.004	0.879
ANC first standard visit	0.47	0.08	0.46	0.10	-0.012	0.718
ANC fourth standard visit	0.40	0.09	0.36	0.08	-0.040	0.199
ANC TT 1 given	0.28	0.05	0.31	0.04	0.022	0.192
ANC TT 2 to 5 given	0.69	0.11	0.69	0.10	0.003	0.932
ANC new registrations full course of iron and folic acid supplements	0.86	0.07	0.88	0.09	0.015	0.614
ANC new registrations tested for anemia	0.62	0.15	0.62	0.15	0.004	0.935
Indicators related to deliveries at health facility						
Deliveries at health facility	0.89	0.15	0.80	0.13	-0.092	0.074
Mothers in labor referred to higher level for delivery	0.22	0.07	0.21	0.07	-0.015	0.565
Live births	0.89	0.15	0.80	0.13	-0.090	0.081
PNC-related indicators						
PNC 1 visit: baby	0.77	0.15	0.75	0.12	-0.020	0.673
PNC 1 visit: mother	0.78	0.15	0.76	0.12	-0.018	0.702
PNC 4 visit: baby	0.37	0.11	0.43	0.16	0.058	0.243
PNC 4 visit: mother	0.38	0.11	0.44	0.15	0.061	0.211
Indicators related to childhood vaccinations						
BCG	0.97	0.12	0.88	0.10	-0.097	0.021 [†]
Polio Zero_PO	0.91	0.12	0.81	0.09	-0.094	0.016 [†]
Polio 1	0.86	0.13	0.81	0.11	-0.046	0.275
Polio 2	0.83	0.10	0.79	0.08	-0.035	0.279
Polio 3	0.83	0.08	0.82	0.09	-0.017	0.577
IPV	0.83	0.09	0.82	0.09	-0.013	0.674
DTP_HepB_Hib1	0.86	0.12	0.81	0.11	-0.050	0.227
DTP_HepB_Hib2	0.83	0.10	0.79	0.08	-0.036	0.259
DTP_HepB_Hib3	0.84	0.08	0.82	0.09	-0.019	0.535
Pneumococcus 1	0.86	0.12	0.81	0.11	-0.050	0.227
Pneumococcus 2	0.83	0.09	0.79	0.08	-0.036	0.258
Pneumococcus 3	0.83	0.09	0.82	0.09	-0.015	0.643
Rotavirus 1	0.87	0.12	0.81	0.11	-0.054	0.197
Rotavirus 2	0.82	0.09	0.79	0.08	-0.027	0.364
Measles + rubella 1	0.85	0.08	0.92	0.06	0.066 [‡]	0.019 [†]
Measles + rubella 2	0.77	0.07	0.82	0.08	0.050	0.076

*The reported utilization rate is the average utilization of each service across the eight districts in the Southern Province.

[†]Significant at $P = 0.05$.

[‡]MCH services that experienced an increase in average utilization rate.

MCH = maternal and child health; SD = standard deviation; ANC = antenatal care; TT = tetanus toxoid; PNC = postnatal care; BCG = bacille Calmette-Guérin; IPV = inactivated polio vaccine; DTP = diphtheria; HepB = hepatitis B; Hib = hemophilus influenza.

the observed reductions in child vaccinations during this COVID-19 era. Finally, it is crucial to integrate outbreak response and communication with existing healthcare services, such as malaria, HIV, TB and MCH services, to ensure the progress made in routine healthcare services is not weakened during emergency response.²⁵

This study successfully quantified the change in MCH services utilization in public health facilities across all five provinces in Rwanda during the COVID-19 outbreak. However, the findings of the study should be viewed in light of its limitations. First, when this study was conducted, HMIS data was only available up to April 2020, while the COVID-19 outbreak was still in its early stages in Rwanda. We anticipate that the

utilization of MCH services would be further affected as the outbreak continues. Further follow-up is therefore needed to determine the continued effects of coronavirus disease on MCH care in Rwanda. Second, the available HMIS reports at the Ministry of Health only presented aggregated data. The lowest level of data that was analyzed in this study was at the provincial level. It would be useful to further analyze the impact at the district level and at individual health facilities in order to observe a more detailed pattern and design even more specific interventions. Third, since in this “before and after” study we observed the change through the course of a 1-year timeline, we cannot fully attribute the change solely to the pandemic. Finally, the specific root causes of the change in

TABLE 7 Changes in utilization of MCH services, Kigali Province

Variables	March and April 2019		March and April 2020		Change	P value
	Utilization rate*	SD	Utilization rate	SD		
ANC-related indicators						
ANC new registrations	1.50	0.37	1.35	0.24	-0.149	0.428
ANC first standard visit	0.62	0.10	0.42	0.08	-0.195	0.003 [†]
ANC fourth standard visit	0.60	0.21	0.42	0.12	-0.175	0.109
ANC TT 1 given	0.82	0.66	0.50	0.05	-0.314	0.271
ANC TT 2 to 5 given	1.27	0.13	1.02	0.09	-0.244	0.004 [†]
ANC new registrations full course of iron and folic acid supplements	1.30	0.23	1.12	0.17	-0.179	0.153
ANC new registrations tested for anemia	0.96	0.29	0.70	0.21	-0.264	0.103
Indicators related to deliveries at health facility						
Deliveries at health facility	1.34	0.17	1.27	0.18	-0.073	0.487
Mothers in labor referred to higher level for delivery	0.14	0.03	0.15	0.02	0.018	0.182
Live births	1.33	0.17	1.27	0.18	-0.067	0.522
PNC-related indicators						
PNC 1 visit: baby	0.83	0.10	0.93	0.16	0.106	0.204
PNC 1 visit: mother	0.85	0.09	0.89	0.09	0.043	0.410
PNC 4 visit: baby	0.30	0.06	0.39	0.04	0.086 [‡]	0.015 [†]
PNC 4 visit: mother	0.32	0.07	0.40	0.05	0.079 [‡]	0.046 [†]
Indicators related to childhood vaccinations						
BCG	1.38	0.17	1.25	0.16	-0.134	0.189
Polio Zero_P0	1.28	0.17	1.13	0.15	-0.146	0.141
Polio 1	1.21	0.14	1.14	0.13	-0.072	0.368
Polio 2	1.22	0.11	1.10	0.10	-0.123	0.079
Polio 3	1.24	0.13	1.10	0.13	-0.138	0.091
IPV	1.23	0.14	1.10	0.13	-0.130	0.118
DTP_HepB_Hib1	1.21	0.14	1.13	0.12	-0.078	0.314
DTP_HepB_Hib2	1.22	0.12	1.09	0.10	-0.129	0.061
DTP_HepB_Hib3	1.23	0.13	1.09	0.12	-0.138	0.08
Pneumococcus 1	1.21	0.14	1.13	0.12	-0.081	0.299
Pneumococcus 2	1.23	0.12	1.09	0.10	-0.132	0.056
Pneumococcus 3	1.24	0.13	1.09	0.12	-0.142	0.074
Rotavirus 1	1.22	0.14	1.13	0.12	-0.093	0.232
Rotavirus 2	1.24	0.11	1.09	0.10	-0.143	0.039 [†]
Measles + rubella 1	1.24	0.17	1.16	0.14	-0.086	0.368
Measles + rubella 2	1.06	0.08	0.95	0.17	-0.112	0.171

*The reported utilization rate is the average utilization of each service across the eight districts in the Southern Province.

[†]Significant at $P = 0.05$.

[‡]MCH services that experienced an increase in average utilization rate.

MCH = maternal and child health; SD = standard deviation; ANC = antenatal care; TT = tetanus toxoid; PNC = postnatal care; BCG = bacille Calmette-Guérin; IPV = inactivated polio vaccine; DTP = diphtheria; HepB = hepatitis B; Hib = hemophilus influenza.

MCH utilization were not investigated in this rapid assessment study. However, as in previous epidemics, potential causes have been disruptions in provision of routine health services as human resources, medical equipment and efforts are shifted to respond to the emergency. Campaigns to offer MCH services may have been minimized, postponed or cancelled, and global medical and pharmaceutical supply chains disrupted due to COVID-19.⁸ Movement restrictions and reduced public transportation methods have negative effects on the economy, which likely pushed marginalized populations further into poverty, thus increasing their barriers to healthcare access.⁸ Nonetheless, this study provided the basis for further investiga-

tion on the barriers and facilitators of accessing MCH services in Rwanda during the COVID-19 global health crisis.

CONCLUSION

This study quantified the current utilization of MCH services and highlighted the need for pre-emptive measures to avoid disruptions in health service delivery and to maintain routine health services during outbreaks. In order for these reductions in MCH service utilization to be reversed, proactive and targeted interventions are needed. Further studies to identify the root causes of the reduction and long-term impact of the decrease in MCH service

utilization on the health outcomes of mothers and children should also be conducted.

References

- World Health Organization. WHO Director-General's opening remarks at the media briefing on COVID-19. Geneva, Switzerland: WHO, 2020. <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19—11-march-2020> Accessed May 2020.
- Johns Hopkins University. Coronavirus Resource Center. Baltimore, MD, USA: Johns Hopkins University, 2020. <https://coronavirus.jhu.edu/> Accessed May 2020.
- Johns Hopkins. Coronavirus Resource Center: Mortality analyses. Baltimore, MD, USA: Johns Hopkins University, 2020. <https://coronavirus.jhu.edu/data/mortality> Accessed May 2020.
- Li Q, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *N Engl J Med* 2020; 382(13): 1199–1207.
- World Health Organization. Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations. Geneva, Switzerland: WHO, 2020. <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations> Accessed May 2020.
- Shannon FQ, et al. Effects of the 2014 Ebola outbreak on antenatal care and delivery outcomes in Liberia: a nationwide analysis. *Public Health Action* 2017; 7(Suppl 1): S88–S93.
- Delamou A, et al. Effect of Ebola virus disease on maternal and child health services in Guinea: a retrospective observational cohort study. *Lancet Glob Health* 2017; 5(4): e448–457.
- Roberton T, et al. Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study. *Lancet Glob Health* 2020; 8(7): e901–908.
- Rwanda Biomedical Centre. Coronavirus Disease COVID-19: Rwanda's preparedness and response. Kigali, Rwanda: RBC, 2020. <https://www.rbc.gov.rw/index.php?id=707>
- Mugabo A. Covid-19: Rwanda courts go online during lockdown. *The East African*, April 23, 2020. <https://www.theeastafrican.co.ke/tea/news/east-africa/covid-19-rwanda-courts-go-online-during-lockdown-1440324>
- Mutanganshuro L. Rwanda orders wearing of masks in public. *The New Times*, 2020. <https://www.newtimes.co.rw/covid-19/rwanda-orders-compulsory-wearing-masks-public> Accessed May 2020.
- National Institute of Statistics of Rwanda. Population size, structure and distribution. Kigali, Rwanda: NIS, 2014. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=13&ved=2ahUKEwid3vmx5IjnAhVIJVAkHRXIAX4QFjAMegQIBBAB&url=http%3A%2F%2Fstatistics.gov.rw%2Ffile%2F2907%2Fdownload%3Ftoken%3Di09m0Bly&usq=AOvVaw0Ya_IlQXrzE2YGrlcr60V5
- National Institute of Statistic of Rwanda. Rwanda Demographic and Health Survey 2014–2015. Kigali, Rwanda: NIS, 2015.
- Quaglio G, et al. Impact of Ebola outbreak on reproductive health services in a rural district of Sierra Leone: a prospective observational study. *BMJ Open* 2019; 9(9): e029093–e029093.
- Jones SA, Gopalakrishnan S, Ameh CA, White S, van den Broek NR. "Women and babies are dying but not of Ebola": the effect of the Ebola virus epidemic on the availability, uptake and outcomes of maternal and newborn health services in Sierra Leone. *BMJ Glob Health* 2016; 1(3): e000065–e000065.
- Brolin Ribacke KJ, et al. The impact of the West Africa Ebola outbreak on obstetric health care in Sierra Leone. *PLoS One* 2016; 11(2): e0150080–e0150080.
- Barden-O'Fallon J, et al. Rapid assessment of Ebola-related implications for reproductive, maternal, newborn and child health service delivery and utilization in Guinea. *PLoS Curr* 2015; 7.
- Dynes MM, et al. Perceptions of the risk for Ebola and health facility use among health workers and pregnant and lactating women—Kenema District, Sierra Leone, September 2014. *MMWR Morb Mortal Wkly Rep* 2015; 63(51): 1226–1227.
- Sun X, et al. Impact of the Ebola outbreak on routine immunization in western area, Sierra Leone—a field survey from an Ebola epidemic area. *BMC Public Health* 2017; 17(1): 363.
- Takahashi S, et al. Reduced vaccination and the risk of measles and other childhood infections post-Ebola. *Science* 2015; 347(6227): 1240–1242.
- World Health Organization. Vaccination must be scaled up in Ebola-affected countries. Geneva, Switzerland: WHO, 2015. <https://www.who.int/mediacentre/news/releases/2015/vaccination-ebola-countries/en/> Accessed July 2020.
- Masresha BG, et al. The impact of a prolonged ebola outbreak on measles elimination activities in Guinea, Liberia and Sierra Leone, 2014–2015. *Pan Afr Med J*. 2020; 35(Suppl 1): 8.
- GAVI. Rwanda's efforts to strengthen its health system paying off in midst of COVID-19 pandemic. Geneva, Switzerland: GAVI, The Vaccine Alliance, 2020. <https://www.gavi.org/vaccineswork/rwandas-efforts-strengthen-its-health-system-paying-midst-covid-19-pandemic> Accessed July 2020.
- Lewis M. Addressing efficiency and quality in Rwanda's health system. S-19041-RWA-1. London, UK: International Growth Centre, 2019: pp 1–21. <https://www.theigc.org/wp-content/uploads/2020/01/Lewis-2019-final-paper.pdf>
- Abraham T. Lessons from the pandemic: the need for new tools for risk and outbreak communication. *Emerg Health Threats J* 2011; 4(1): 7160.
- United Nations High Commissioner for Refugees. As COVID-19 and conflict surge, DR Congo displaced face deadly consequences of chronic underfunding. Geneva, Switzerland: UNHCR, 2020. <https://www.unhcr.org/news/briefing/2020/6/Sedf42a14/covid-19-conflict-surge-dr-congo-displaced-face-deadly-consequences-chronic.html>
- Mæstad O, Shumbullo EL. Ebola outbreak 2014–2016: effects on other health services. *CMI Brief no. 2020:03*. Bergen, Norway: Christian Michelsen Institute, (4)2020.
- Dmello BS, et al. Impact of COVID-19 on maternal and child health. *Lancet Glob Health* 2020; 8(10): e1259.
- World Health Organization Africa Region. COVID-19 in Rwanda: a country's response. Cairo, Egypt: WHO, 2020. <https://www.afro.who.int/news/covid-19-rwanda-countrys-response>.
- Ministry of Health. Coronavirus Disease 2019, National Preparedness and Response Plan. Kigali, Rwanda: MOH, 2020.
- Lundeen T, et al. Nurses' and midwives' experiences of providing group antenatal and postnatal care at 18 health centers in Rwanda: A mixed methods study. *PLoS One* 2019; 14(7): e0219471–e0219471.
- World Health Organization. Success factors for women's and children's health. Geneva, Switzerland: WHO, 2015. https://www.who.int/pmnch/knowledge/publications/rwanda_country_report.pdf
- Smith RD. Responding to global infectious disease outbreaks: Lessons from SARS on the role of risk perception, communication and management. *Soc Sci Med* 2006; 63(12): 3113–3123.

CONTEXTE : Toutes les structures de santé publique au Rwanda, Afrique de l'Est.

OBJECTIF : Evaluer les modifications de l'utilisation des services de santé maternelle et infantile (MCH) pendant la flambée de COVID-19.

SCHÉMA : Ceci est une étude quantitative transversale.

RÉSULTATS : Pendant la flambée de COVID-19 au Rwanda, l'utilisation de 15 services de MCH des quatre catégories—soins prénataux (ANC), accouchements, soins post natus (PNC) et vaccinations—ont significativement décliné. Les provinces du Nord et de l'Ouest ont été les plus affectées, avec une diminution significative dans neuf et douze services respectivement. La province de l'Est n'a pas montré de modifications statistiquement significatives de l'utilisation. Kigali a été la seule province ayant eu une augmentation significative dans les

soins postnataux (PNC 4) pour les bébés et les mères, tandis que la province du Sud a montré une augmentation significative de l'utilisation du premier vaccin rougeole et rubéole (MR).

CONCLUSION : L'accès et l'utilisation des services de base de MCH ont été considérablement affectés pendant la flambée de COVID-19 au Rwanda. Cette étude a mis en lumière le besoin de mesures préventives pour éviter les perturbations de la fourniture de services de MCH et des services de santé de routine pendant les épidémies. Pour éviter les réductions de l'utilisation des services de MCH, des ressources ciblées et une promotion active des soins anténataux, des accouchements en institution et des vaccinations doivent avoir priorité. D'autres études sur l'impact à long terme et les variations géographiques sont requises.

Public Health Action (PHA) welcomes the submission of articles on all aspects of operational research, including quality improvements, cost-benefit analysis, ethics, equity, access to services and capacity building, with a focus on relevant areas of public health (e.g. infection control, nutrition, TB, HIV, vaccines, smoking, COVID-19, microbial resistance, outbreaks etc).

This is an Open Access article distributed under the terms of the [Creative Commons Attribution License CC-BY 4.0](https://creativecommons.org/licenses/by/4.0/) published by The Union (www.theunion.org).

Contact: pha@theunion.org

Information on PHA: <http://www.theunion.org/what-we-do/journals/pha>