Effects of the COVID-19 Pandemic on Health Services and Mitigation Measures in Uganda

Nazarius Mbona Tumwesigye, Okethwangu Denis, Mary Kaakyo, and Claire Biribawa

Abstract

On 21st March 2020, Uganda reported its first COVID-19 case. The government responded by instituting a lockdown and other measures. We assess the effects of the COVID-19 containment measures on health services to better inform the next preventive measures. We use a case study approach that involved document reviews and secondary analysis of data on attendance of key health services and mortality for the years 2019 and 2020. The services included outpatient department (OPD), antenatal care (ANC), malaria, immunization, TB, and hypertension. Interrupted time series analysis was applied to test the significance of difference between pre-and post-intervention. We find that from March to April 2020, attendance to health services reduced and then rose in June or July. Notable reduction was in general OPD (17%), malaria-OPD (7%), ANC (8%), immunization (10%), hypertension (17%), and diabetes (10%). Institutional mortality reduced in same period. The intervention significantly affected the level and trends of malaria-OPD and immunization. We conclude that the lockdown reduced access to health services while institutional mortality fell due to reduced number of patients. There is need to emphasize other mitigation measures rather than lockdowns.

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This work is part of a multi-country project that is seeking to understand the nature, scale, and scope of the indirect health effects of the COVID-19 pandemic. The project is managed by the Center for Global Development.

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Foreword

On March 11, 2020, the World Health Organization declared COVID-19 a global pandemic. With dire predictions about how the virus could devastate populations and overwhelm health systems, many countries imposed stringent measures to limit spread and the resulting morbidity and mortality. Yet most of these policy approaches focused narrowly on potential impacts for COVID-19, without sufficient attention to how the pandemic and various response measures would have broader indirect impacts across other health needs and health services. While the evidence of disruptions to essential health services was largely anecdotal to begin with, and its health effects mostly modeled, increasingly detailed evidence is beginning to emerge from countries.

Over the past year we partnered with research institutions in Kenya, the Philippines, South Africa, and Uganda to document, from a whole-of-health perspective, what we know about the nature, scale, and scope of the disruptions to essential health services in those countries, and the health effects of such disruptions. This research provides initial insights on the observed near-term indirect health impacts of the pandemic and response measures, relying on the best available data in the months following lockdown measures. However, it is important to recognize the limitations of conducting research during a pandemic and a continuously evolving epidemiological and policy context. We plan to build on these studies as more and better data become available, and as public health responses continue until the pandemic is brought under control.

In this paper, Nazarius Tumwesigye, Okethwangu Denis, Mary Kaakyo, and Claire Biribawa present findings on the indirect health effects of COVID-19 and its mitigation strategies in Uganda. The good news is that mitigation measures against COVID-19 appear to have been largely effective in containing the outbreak. The bad news is that this success has come at significant cost to other health services. Using data from the health management information system, they show us that there have been significant disruptions to essential health services, resulting in dramatic reductions in access to these critical services.

We are hopeful that the findings from this working paper—and the project as a whole—will contribute to our global knowledge about the ongoing and lingering effects of the pandemic, and ways to mitigate these effects. It is not too late for action. Armed with the kind of evidence in this working paper, national governments and global partners must focus their efforts on the most affected, most cost-effective services, and ensure that any lost generations due to the pandemic are minimized.

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1. Introduction

The novel coronavirus disease (COVID-19) was first reported in Wuhan City, China in December 2019 and has become a global phenomenon spreading worldwide. The Emergency Committee convened by the Director-General of the World Health Organization (WHO) under the International Health Regulations (2005) declared the COVID-19 outbreak a Public Health Emergency of International Concern on 30 January 2020[1, 2]. Countries have implemented stringent mitigation measures in order to reduce transmissions and enable their health system to manage the pandemic[3]. Globally, the COVID-19 pandemic and these mitigation measures have caused detrimental effects on countries' health systems, economies, and other sectors, especially in low-income countries like Uganda [4].

Initially, the WHO recommended that countries adopt lockdown measures, ensure social distancing, and encourage their populations to stay at home and to practice hand hygiene to contain the further spread of the virus[1]. Most countries in Africa adopted these measures without detailed models of their consequences[5].

The lockdown delayed community transmission in a number of sub-Saharan African countries but this came at a heavy cost as it disrupted the functioning of the health system and the economy[5]. Low-income countries were especially vulnerable because of a number of factors, such as poor infrastructure and a high burden of other diseases, like HIV/AIDS, tuberculosis (TB), and malaria, among others.

According to the Oxford COVID-19 Government Response Tracker, Uganda was rated above 90% stringency level on the range of measures instituted to tackle the COVID-19 outbreak [6]. Uganda undertook stringent mitigation measures including closing places of worship and nonessential workplaces and restricting and/or banning travel within the country and across international borders in efforts to reduce transmissions and improve the health system's response in the management of the pandemic[5]. This paper highlights the indirect health effects of both COVID-19 and the response to control its spread, using a selection of data and indicators. The investigators hope that this information will aide decision making in response to further spread of COVID-19 or future pandemics. Institution of COVID-19 mitigation measures is referred to as "intervention" in this work, and extraordinary changes in health service delivery, the general health situation in the country, and access to healthcare from the start of the intervention are assumed to be effects of the intervention. Several mitigation measures were taken at different times, but the major ones started in March 2020 with a lockdown; this is the intervention time used in data analysis for this report.

Objectives of the study

The primary objectives of this study are to assess the effects of both the COVID-19 pandemic and the response on health service delivery in Uganda. The specific objectives are to

1. establish the growth and patterns of the epidemic along the timeline of intervention measures;

2. establish secondary health effects of COVID-19 that are manifesting across the country, across priority health conditions and among vulnerable populations; and

3. assess the effects of responses to COVID-19 on health service delivery and access to healthcare and general population health.

We hypothesize that although instituting lockdown initially contained the outbreak, it was characterized by many detrimental and devastating health and non-health consequences.

2. Methods

Study approach and data sources

This work is part of a multi-country project aimed at describing the nature, scale, and scope of the indirect health effects of COVID-19 and response to the epidemic. We used a case study approach to undertake the work [7]. This approach allows focus on single or particular instances to build evidence against or for a hypothesis. We focused on particular health effects and incidents of response to answer objectives. The major data source was the Health Management Information System (HMIS) for generating trends of key health indicators (outpatient department visits, mortality, ANC attendance, immunization, TB incidence, malaria incidence, malaria mortality) as affected by the pandemic and document/record/media review for the response to the pandemic. The Ministry of Health's COVID-19 task force provided data specifically on the pandemic.

HMIS is now housed by the global District Health Information System (DHIS II) and it is accessible through a password given by the Ministry of Health. The HMIS is an integrated reporting system used by the Ministry of Health Uganda, development partners, and stakeholders to collect health information on a routine basis. The information in HMIS is collected on a routine basis from every health unit in all districts within Uganda. HMIS information flows from the lowest level (the community) to the health unit (health center two-, three-, and four-level facilities, general hospitals, and referral hospitals); the health subdistrict; the district; and finally to the National Health Databank at the Resource Centre of the Ministry of Health.

We reviewed documents, records, and media to get all data and write up about the response to the epidemic from March to October 2020. This kind of source provided both quantitative and qualitative data. The qualitative data referred here are from the media, reports, and peer review papers and they are mainly about the authors' personal views rather new information from analysis of data. The media included print and electric media.

Data analysis

For the growth patterns of the epidemic and response timelines we plotted the daily numbers of cases against time and superimposed the extent of restrictions by the government. The mitigation and lockdown measures instituted by the government are well documented in the government reports, newspapers, and international agencies like WHO. The specific documents reviewed included the COVID-19 weekly analytical reports, daily analytical reports, and the media. The media selected were credible newspapers and websites. The newspapers included most popular local newspapers such as New Vision—Uganda News and Daily Monitor, while the websites include the Ministry of Health, WHO, and the British Broadcasting Corporation (BBC).

For secondary health effects of COVID-19 manifesting in priority health conditions we carried out a scoping review of available evidence from peer-reviewed papers published since March 2020, reports from the Ministry of Health, the media, and international agencies. Key among the health conditions were HIV/AIDS, mental health, cancer, and other non-communicable diseases.

To assess the effects of responses to COVID-19 on health service delivery, access to healthcare, and general population health, we constructed the trends in data on several indicators comparing pre- and post-intervention period using the HMIS data. Specifically, we compared levels and trends in OPD, malaria OPD, ANC, immunization, and non-communicable disease care between pre (April 2019—March 2020) and post intervention (April 2020–September 2020). Mortality due to malaria, non-communicable diseases, TB, and maternal causes were also examined as one of the indicators of population health. Beside the quantitative results we provide a qualitative assessment of the effects of the COVID-19. The COVID-19 cases in the database were laboratory-confirmed by real-time RT-PCR starting from March 21st, 2020.

Table 2.1 shows the list of specific indicators used in the analysis of effects of COVID-19 on health service delivery/utilization.

Table 2. 1 Indicators used in analysis

Category of indicators	Specific indicators used
Health service utilization/delivery	• Outpatient attendance—Number of people reporting at outpatient department (OPD) • Malaria cases—number of malaria cases confirmed • ANC—number of antenatal care visits in first quarter • DPT3 vaccination—number of children vaccinated against DPT3 • Hypertension patients—number of people reporting at health facilities with hypertension. • Diabetes patients—number of cases reporting at health facilities
Mortality	• All-cause mortality • Maternal mortality—number of pregnancy related deaths reported at health facilities • Malaria deaths—number of malaria deaths reported at health facilities • Deaths from hypertension—number of deaths due to hypertension as reported at health facilities • Deaths from diabetes—number of deaths due to diabetes as reported at health facilities

To get a statistical difference between pre and post intervention we applied an interrupted time series analysis. It is a kind of analysis that compares the level and trend of the data before and after intervention. The time series refers to the data over the period, while the interruption is the intervention, which is a controlled external influence or set of influences[8]. Changes in level and trend are expected in a period subsequent to introduction of the intervention[9]. Interrupted time series (ITS) analysis is a strong quasi experimental design that can be used to evaluate the effectiveness of a population-level intervention that is clearly defined at a given time point[10].

The ITS model specification goes as follows: $Y_t = \beta_0 + \beta_1 T + \beta_2 X_t + \beta_3 T X_t + e_t$

Where,

T= The time since the start of the study time. In this analysis this is in months starting from January 2019 to September 2020.

Xt= A dummy variable indicating the pre- or the post- intervention period. The intervention period was set at March 2020 the start of lockdown.

Yt= The outcome at time t.

et =The error estimate.

β_0= Base level of the outcome

β_1= Gradient coefficient of the base trend

β_2= The change in the level of outcome in the post intervention segment

β_3= The change in trend in the post intervention segment

To carry out an ITS in stata you first set the data as time series (*tsset*) and then you enter a command that specifies the period for which the ITS will be used, the intervention period and the time lag to use *(itsa depvar variable [if], trperiod ( ) lag (1) fig posttrend)*. In this analysis the intervention period is March 2020 and the periods compared are April 2019 to March 2020 and April to September 2020[11].

Ethics approval

Administrative authorization to access the data was received from the Uganda Ministry of Health. In an effort to get to some of the data sources we consulted key government and nongovernment officials. Although all data sources and documents were publicly available, some required minor bureaucratic procedures before access was granted.

3. Results

Epidemiology curve and national response

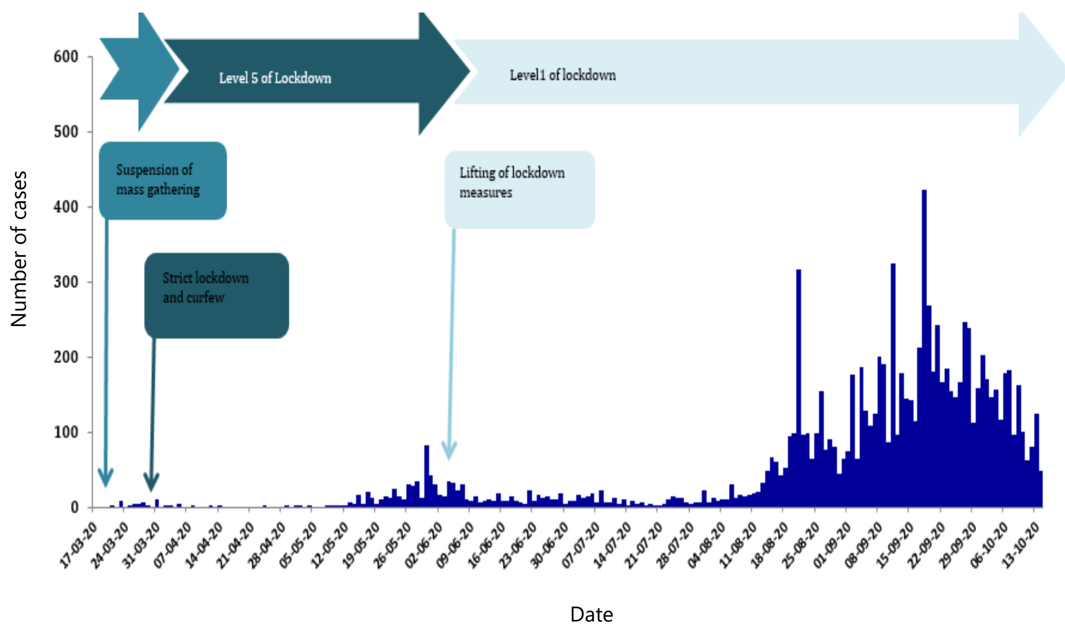
COVID-19 situation in the country as it evolved, and mitigation measures

Uganda's first case of COVID-19 was reported on the 21st March 2020 and as of 17th November 2020, Uganda had reported 16,563 confirmed cases with 150 deaths and 8,277 recoveries[12]. Analysis of data from the first 203 COVID-19 patients showed that their median age was 34.2 years and 67.9% were males. More than half (57%) were asymptomatic[13]. Testing services had been stepped up but still insufficient. As of 15th November, the total COVID-19 laboratory tests conducted were 591,658[14], making a percentage of 1.4 given the population of 42 million. From the beginning of August 2020, the number of cases and death rose partly due to presidential, parliamentary, and local council election campaigns.

In response to the pandemic Uganda set up a national task force chaired by the Prime Minister. The Ministry of Health took the central role for technical guidance in the COVID-19 response. The goal of the Ministry was to provide a framework for coordination and control of COVID-19 by reduction of importation, transmission, morbidity, and mortality in a bid to minimize the social economic disruption that might result from this outbreak[15]. Other ministries and government agencies in the national task force took on roles of enforcement, security, and others.

Figure 3.1 shows a time line of government interventions that were instituted to contain the spread of the pandemic. Prior to the confirmation of the first case in Uganda, all public gatherings were banned on the 18th of March 2020 for a period of 32 days and foreigners entering the country were quarantined for 14 days at their cost. Effective from 20th March, all schools were closed for 20 days and the borders were subsequently closed except for cargo and goods. On 31st March 2020 a nationwide lockdown was declared, and it imposed a complete curfew for the next 14 days except for essential workers such as those in healthcare, pharmaceutical services, veterinary services, agriculture. and construction. All forms of public transport were suspended except for cargo planes, trucks, and trains, and restrictions on private vehicles movements were also instituted. From 4th June, the lockdown measures were progressively eased with reopening of business and borders, and all public transport operating under standard procedures[16]. In October schools and tertiary institutions were allowed to open but for only finalists, and the curfew was eased to run from 9pm to 5am the following morning.

Figure 3.1. Timeline of COVID 19 cases, response and epidemiological curve



Legend

■	Level 5	31st-03-20 to 02-06-20	Only essential services allowed; group gatherings suspended; ban on public and private transport; curfew of 6:00 am to 7:00 pm; cargo trucks, planes, & trains were allowed.
■	Level 3	18th-03-20	Mass gatherings suspended, all schools and tertiary institutions closed
■	Level 1	02-06-20	All retail (food and nonfood) businesses permitted; public transport allowed but restricted to half capacity; curfew from 19:00 to 6:30 the following morning; restricted mass gathering with approximately 70 people; strict hand washing hygiene, wearing of masks compulsory; hotels, allowed to re-open; travel ban still applies in border districts

The government's response with the lockdown and other restrictions partly explains the relatively low number of COVID-19 infections and deaths, but the resultant cost of disruption of health services needs extensive assessment.

Indirect/secondary effects of COVID-19 on health services: Qualitative assessment from documents and media

The initial lockdown contained the outbreak and slowed down its spread, but the cost of that containment was quite heavy, with all kinds of public service systems and livelihoods disrupted. A mathematical model showed the impact of the COVID-19 public response on non-COVID diseases could outweigh the direct impact of the COVID-19 outbreak[17]. The government, through the Ministry of Health, diverted personnel and resources away from priority diseases like HIV/AIDS, malaria, and mental health, as well as maternal and child health-related conditions[18, 19].

Deterioration in essential health services in the early months of the pandemic was manifested in a reduced number of facility-based deliveries and reduced case finding for HIV/AIDS and malaria[17]. Patients with chronic conditions who continuously relied on drugs for their survival and improved quality of life were unable to get their refills, while others could not afford medication due to lack of income [20]. Patients who had been newly diagnosed with cancer were not able to be initiated into treatment, while others missed their three-month refills for hormonal treatment [21]. Therefore, a majority of patients with these conditions faced an increased risk of complications and death due to inability to access healthcare because of transport restrictions, curfew, and fear of contracting the virus from healthcare settings[18, 22]. These delayed initiations and interruption of treatment cycles resulted in increased stress, anxiety, disease progression, recurrence, and premature deaths [18, 20, 21].

Individuals' health status and access to healthcare was worsened by socio-economic disruptions, inability to meet basic needs, and engaging in unhealthy behaviors such as sedentary life [19] and alcohol consumption[23]. Violent re-enforcement of public health restrictions was mentioned as another hindrance to seeking healthcare[24].

COVID-19 restrictions reduced health workers' ability to offer health services in several ways. Their own livelihood was disrupted and they could not easily access the health facilities as a result of curfew and travel restrictions. The government gave travel passes to health workers who had means of transport and institutions that had shuttle services for their staff, but for majority of health workers, especially in upcountry areas, travelling was a big challenge. There was reduced attendance of health workers at health facilities, increased stock-out of medicines, and increased incidence of preventable deaths[25]. More still, the clinicians suggested that clinic activities such as antenatal care were non-urgent and therefore could be postponed [22]. Self-purchasing and stockpiling of antibiotics and other medicines for those who could afford them presented another challenge of medication safety, including antimicrobial resistance [18]. Other challenges included, among others, perennial problems of inadequate human resources and financial, infrastructural, supply chain, and logistical challenges [18].

Child abuse and domestic violence were other secondary effects of the pandemic on the health of the population. A review of studies and media found a rise in the physical and sexual abuse of children and women during the COVID-19 lockdown in Uganda [26-28].

According to ActionAid, which manages 13 gender-based violence (GBV) sites in Uganda, there was a 72% increase in GBV between April and August 2020, with 8,680 cases reported in that period compared to 5,040 reported between April to August 2019[29]. Preventing and responding to gender-based violence during the restricted movement posed a challenge as the lockdown provided a conducive environment for the crime. According to data from the Ministry of Gender, Labor and Social Development, reported cases of gender-based violence more than tripled, with over 1,000 monthly cases in the first nine months of 2020, compared to about 315 monthly cases in 2019[30].

Loss of livelihood and poor living standards directly affect the health of individuals and communities. A study found that the negative effect of the pandemic in Uganda has been large for informal workers, who constitute the majority of the working poor in the region and yet several developing countries cannot sustain rescue packages for the poor and struggling companies[31]. Another study found that more than two-thirds of households in Uganda experienced income shocks and worsened food security during COVID-19 and that food security outcomes were worse among the income poor and households dependent on labour income[32].

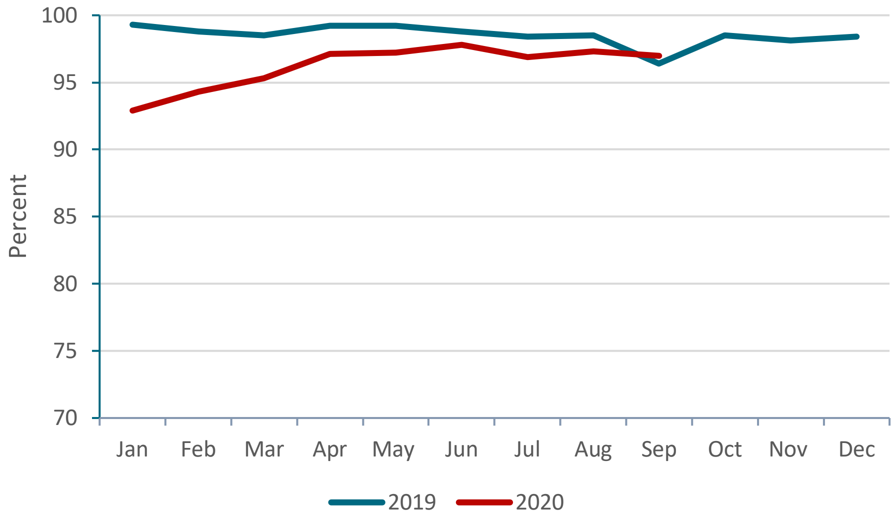
The easing of the restrictions in June 2020 enabled many people to reach the facilities but with a lot of difficulty since some could not afford transport and cost of medicines. Many had lost jobs, businesses, and other forms of livelihood and could not afford to pay for the services in private facilities. A study found that found that 10% of individuals in rural areas in the country lost their source of incomes during the pandemic [33].

Secondary health effects of COVID-19

Quality of HMIS data

This section assesses secondary health effects of COVID-19 using data mainly from the HMIS database housed on the DHIS2 platform. It starts with assessing the quality of data measured by health facility reporting rate in 2019 and 2020 (Figure 3.2). The reporting rates for 2020 started at a relatively low level (93%) but rose to the highest point in June (98%) while the rates for 2019 were generally high for much of the year. A transition to a new reporting form in January 2020 may explain the low rate at the beginning of the year.

Figure 3.2. Reporting rates for health facilities in 2020 compared with those of 2019



Source of data: HMIS

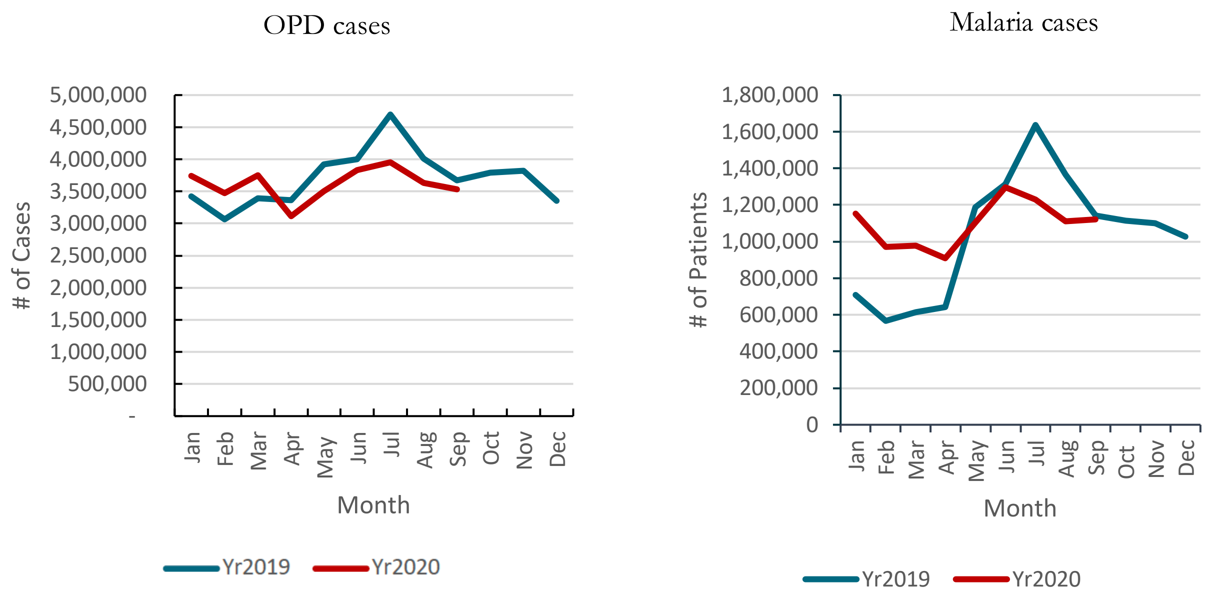
Access to health service and utilization

OPD attendance and malaria cases

Access to healthcare services measured by the level of OPD attendance in 2020 started off at higher level than that for 2019, but a drop in the April lockdown kept it at lower level than that of 2019 (Figure 3.3). From March to April 2020 OPD attendance reduced by 17% (from 3.75 to 3.11 million) but increased by 27% to 3.95 million by July 2020. In 2019 the March-April drop was only 1% (from 3.39 million to 3.3 6million), while the rise from April to July was 40% (from 3.36 million to 4.70 million). An interrupted time series analysis comparing levels and trends of OPD attendance in pre- and post-intervention periods did not find any statistically significant difference at 5% level.

Like OPD cases, the number of people reporting at the facilities with malaria started at a higher level in 2020 compared to 2019 but reduced to the lowest level in April 2020. From March to April 2020 the number of cases reduced by 7 %, from 977, 259 to 908,972) and rose by 43% to the peak of 1,296, 646 patients in June 2020. In 2019 there was no reduction in malaria cases between March and April and the number rose from 615,169 in March to 1.64 million (166%) patients in July 2019.

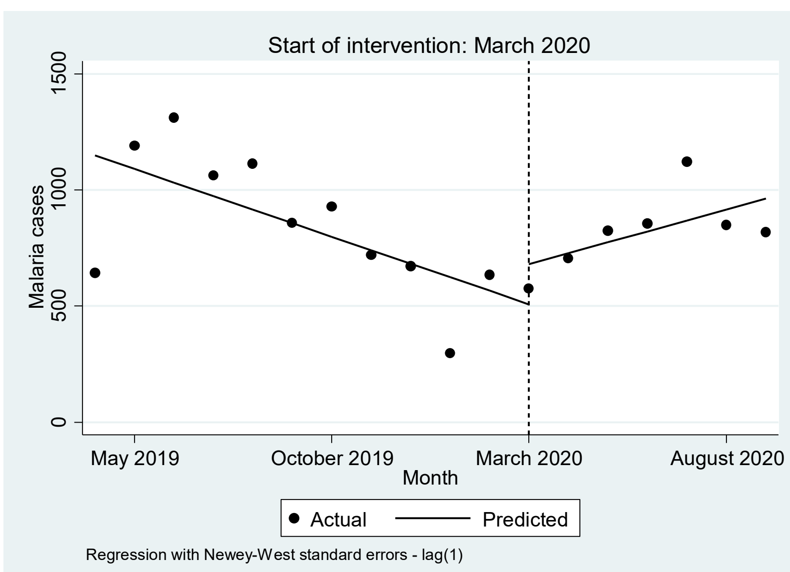
Figure 3.3. OPD attendance and malaria cases in 2019 and 2020



Source of data: HMIS

Figure 3.4 shows results from interrupted time series analysis for confirmed malaria patients reporting at facilities from April 2019 to September 2020. The trend in the pre-intervention period and the change in the number of malaria patients in the first month of intervention were not significant at 5% level, but the change in trend of the post-intervention period in relation to the pre-intervention period was significant (p=0.017).

Figure 3.4. Interrupted time series for confirmed malaria cases reporting at facilities from October 2019 to June 2020

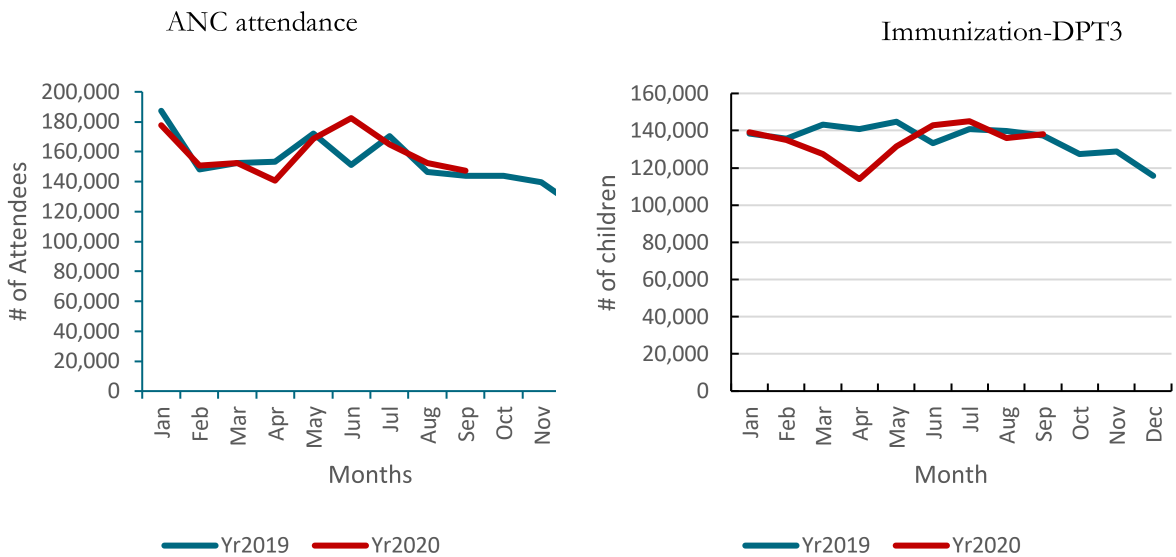


ITSA details: time—beta -58(29.7) p-value 0.07, Intervention (I)—beta 172(169.4) p-val 0.33, TxI Beta 105 (38.8) p-vµal= 0.017

ANC attendance and immunization

Figure 3.5 shows the trends in antenatal care (ANC) attendance and immunization. ANC attendance in 2020 followed a nearly similar level and trend to that of 2019 but had two distinct points where there was a clear difference (Figure 3.5). From March to April 2020 the number of women attending their ANC in their first trimester dropped by 7.8% (from 152,600 to 140,652) while in 2019 there was an increase (0.7%) in attendance over the same period. Another distinct point is the May-June period, where there was a rise of 8% (168,766 to 182,424) in ANC attendance in 2020 while there was a reduction of 12% (From 172,069–151,240) during the same time in 2019. An interrupted time series analysis aimed at assessing the difference in levels and trends between the pre- and post-intervention time did not find it significant.

Figure 3.5. ANC attendance (first trimester) and immunization in 2019 and 2020

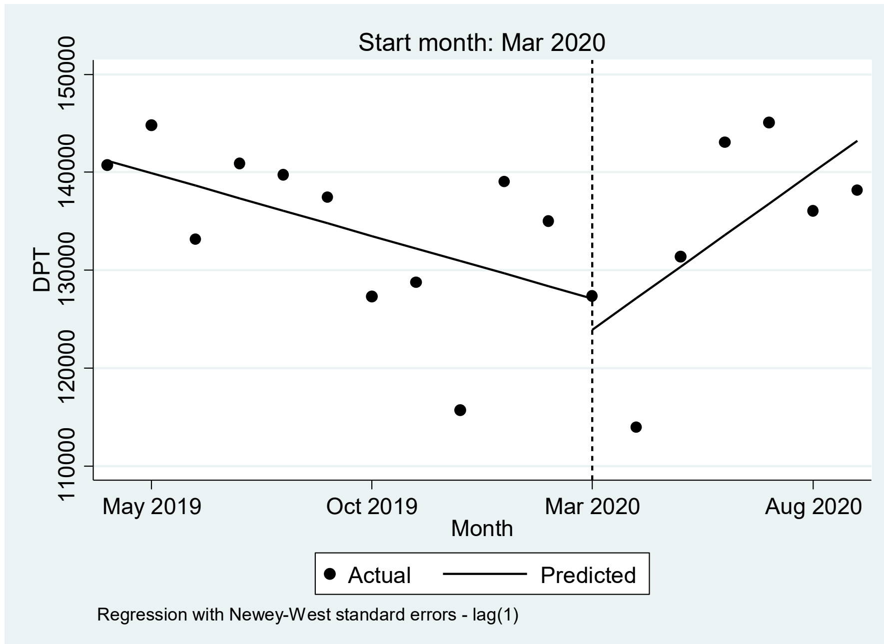


Source of data: HMIS

Immunization coverage measured by the number of children that received the DPT3 vaccine reduced by 10% (from 127,368 to 113,997) from March to April 2020. In the same period in 2019 the number of children immunized increased by 1.6%. In April 2020 the number of children that received DPT3 vaccine was 19% (26,782) lower than the number in 2019. The immunization level in 2020 rose in May and June to surpass the level for 2019. The drop in immunization level after July 2020 follows the pattern in 2019.

Figure 3.6 shows the interrupted time series analysis comparing levels and trends of immunization before and after March 2020. While the change in number of children immunized caused by intervention was not significant, the rate of increase in immunization level after intervention was generally higher compared to pre-intervention period (p=0.01).

Figure 3.6 Interrupted time series for number of children immunized against DPT from April 2019 to September 2020

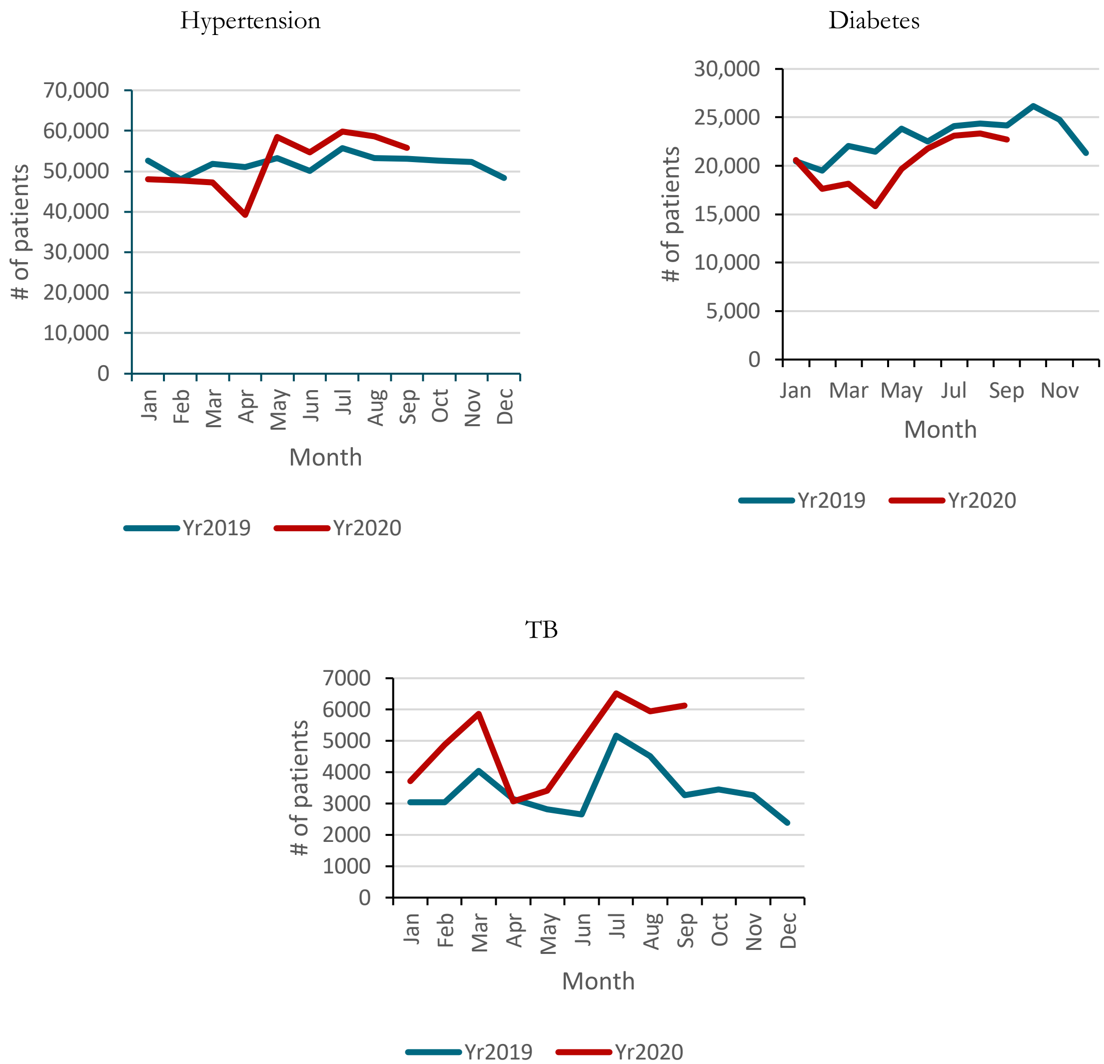


ITSA details: time—beta -1280(716.8) p-value 0.10, Intervention (I)—beta 3193(7670) p-val 0.68, TxI Beta 44500 (1473) p-val= 0.01

Hypertension, diabetes, and TB patients reporting at the facilities

From March to April 2020 the number of hypertension patients reporting at the facilities dropped by 17% from 47,238 to 39,227 while the same period in 2019 had a drop of only 1.5% (from 51,835 to 51,043) (Figure 3.7). The number of patients rose in May 2020 and kept high until September 2020. An interrupted time series analysis comparing the period before and after March 2020 did not show a significant difference in the level and trend of hypertensive cases. The interrupted time series table and chart are not shown.

Figure 3.7. Hypertension, diabetes, and TB patients reporting at health facilities



The number of diabetes patients accessing health facilities declined by 10% from 17,616 in February to 15,833 in April 2020, while in the same period in 2019 there was a 10% increase (from 19,504 to 21,488). The number of patients rose by 31% thereafter to peak at 23,092 in July 2020 (Figure 3.7). An interrupted time series analysis comparing the pre- and post-intervention periods did not find a significant difference in trends nor in number of diabetic patients reporting at health facilities.

TB patients reporting at health facilities in 2020 followed a nearly similar trend with 2019. Both two years had peaks in March and July. However, the 48% drop in number of patients from March to April in 2020 (from 5,864 to 3,071) was much higher than the 22% in the same period in 2019(from 4,035 to 3,139). An interrupted time series analysis comparing trends and levels in number of patients reporting at facilities did not show a significant effect of the intervention.

Mortality

Mortality—All cause, hypertension, malaria, and TB

The all-cause mortality trend for 2020 was nearly similar to that of 2019. However, there was a 7.6% drop (from 3,562 to 3,291) in reported deaths between March and April 2020 compared to a rise of 5.7% (from 3,393 to 3,586) in the previous year. The reported number of deaths rose in May 2020 and peaked in June (figure 3.8). An interrupted time series analysis did not find any significant difference in levels and trends between pre- and post-intervention period.

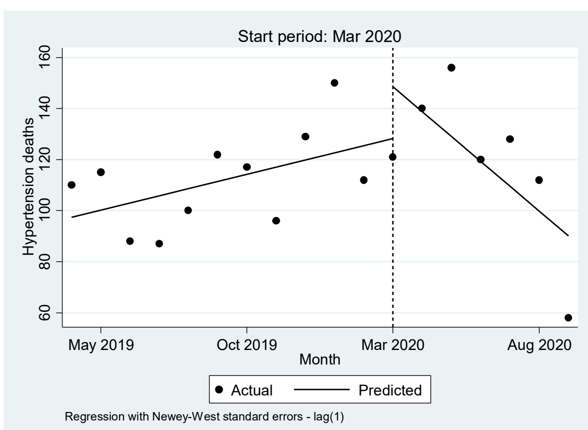
Figure 3.8. Mortality—All cause, hypertension, malaria ,and TB in 2019 and 2020

Hypertension-related deaths were generally higher in 2020 than in 2019 (Figure 3.8). The number of deaths in 2020 rose by 29% from 121 in March to 156 in May and dropped thereafter. In the same period in 2019 the number of hypertension deaths increased by 55% from 74 in March to 115 in May. An interrupted time series analysis comparing deaths pre- and post-intervention showed that the change in trend after the intervention was significant (p=0.04) (Figure 3.9).

The malaria-related deaths in 2020 reduced by 12% from 334 in March to 294 in April but peaked in August with 630 deaths. On the other hand, the number of deaths in 2019 rose straight away from March at 240 and peaked in July with 716. The lower number of deaths in the period May-August may be attributed to the COVID restrictions in the March-June period. A higher number of deaths may have occurred in the community rather than at health facilities. An interrupted time series analysis comparing pre-and post-intervention levels and trends for malaria-related deaths in figure 3.9 shows that the intervention caused a significant reduction in malaria-related deaths in the facilities by around 208 (p=0.01), a higher trend for post intervention compared to pre-intervention (p=0.03).

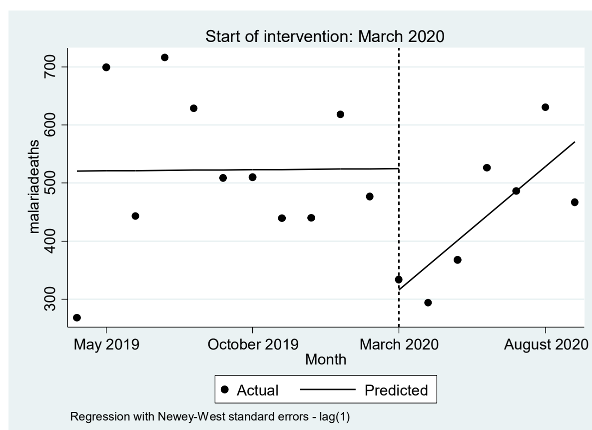
Figure 3.9. Interrupted time series analysis for hypertension and malaria-related deaths

Hypertension



ITSA details: time- beta 2.8(1.7) p-value 0.12, Intervention (I)- beta 20.3(18.7) p-val 0.30, TxI Beta -12.6 (5.6) p-val= 0.04

Malaria



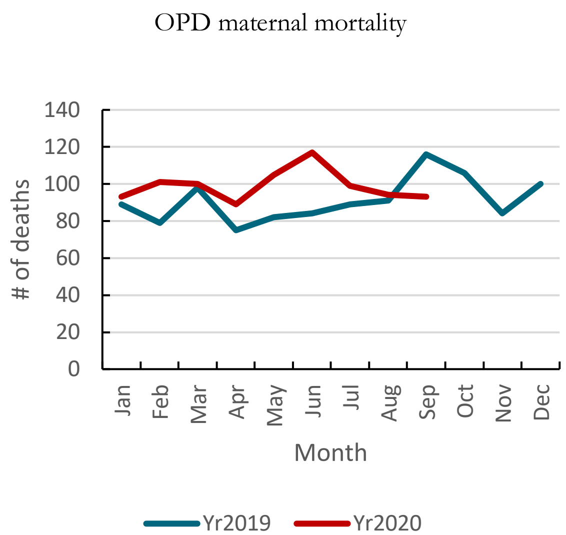
ITSA details: time- beta 0.36(12.0) p-value 0.98, Intervention (I)- beta -208(69.4) p-val 0.01, TxI Beta -42.1 (17.1) p-val= 0.03

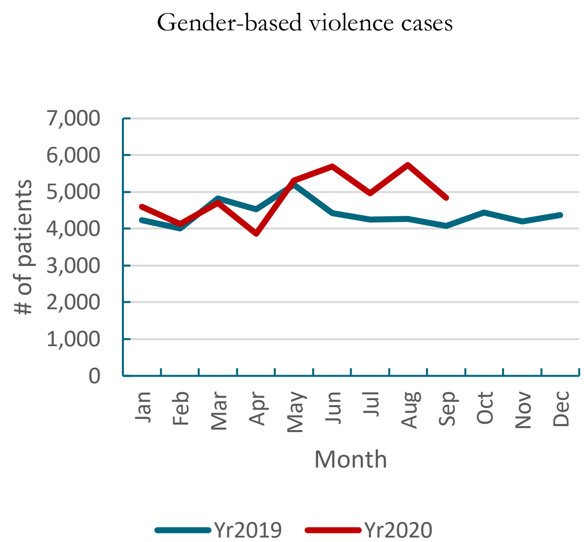
The trend in number of TB-related deaths in the facilities for the period of March to June was similar for both 2020 and 2019. Both periods are characterized by a drop in the number of deaths between March and April and rise to June. From March to April 2020, the number of TB-related deaths in the facilities reduced by 18% (from 55 to 45), which was lower than 31% (from 75 to 52) in 2019. An interrupted time series analysis comparing levels and trends of deaths in pre- and post-intervention periods did not show a significant difference as a result of the intervention.

Outpatient department maternal mortality and gender-based violence

Figure 3.10 compares maternal mortality and gender-based violence (GBV) recorded in the outpatient department (OPD) of health facilities in 2020 and 2019. In both years there was a drop in maternal deaths between March and April 2020, 11% for 2020 (from 101 to 89) and 23% for 2019 (from 98 to 75). The period April-June was characterized by a higher rise of deaths in 2020 (31%) compared to 2019 (12%). The total number of maternal deaths in the period April to June 2020 was 29% higher than the maternal deaths in 2019 (311 vs 241). In March 2020 there was a slight decline in OPD maternal mortality (from 101 to 89) but the trend rose gently to peak in June 2020 at 117 maternal deaths (17%). The mortality in the facilities reduced in July and subsequent months when most of the COVID-19 restrictions were eased. An interrupted time series analysis shows there was no significant difference in levels and trends of maternal deaths between pre-and post-intervention.

Figure 3.10. Outpatient department (OPD) maternal mortality and gender-based violence comparing 2020 and 2019

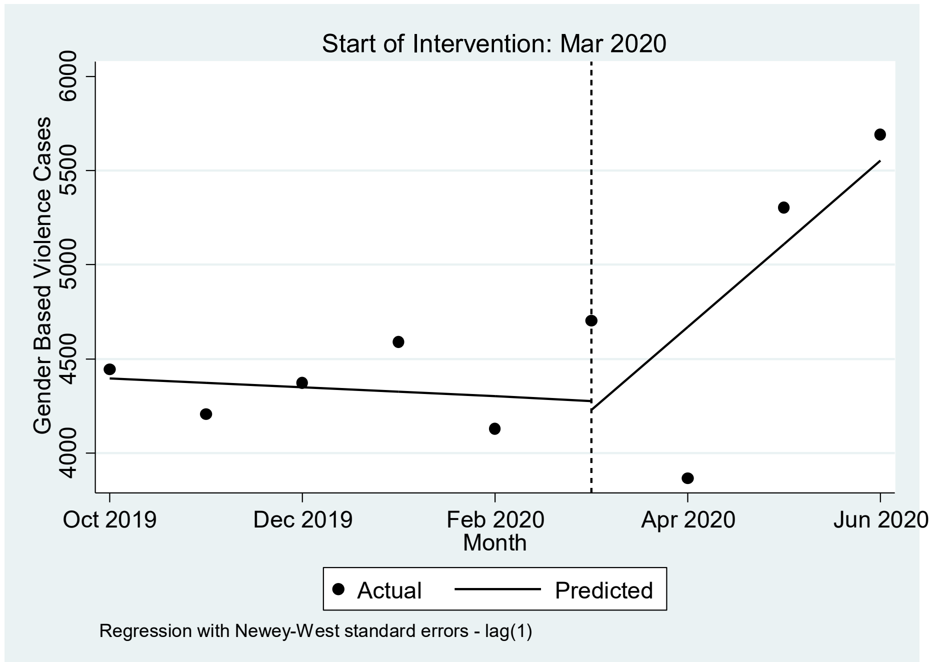




Source of data: HMIS

On GBV, it is evident that in both years the number of cases in April were less than those in March but rose to reach different peaks in May and June. In 2020, from March to April the number reduced by 18% (4,700 to 3,865) while in 2019 it reduced by 6% (4,821 to 4,521). After April the number increased by 47% (3,865 to 5,691) to reach the peak in June in 2020, while it increased by 17% (4,521 to 5,301) to reach an early peak in May in 2019. Results from an interrupted time series analysis showed there was a minimum change in GBV cases during the intervention period of March 2020 (Figure 3.11). Before COVID intervention the trend for GBV was quite stagnant but it rose sharply after intervention. Relative to the trend before intervention, the rise in GBV cases was about 465 cases per month and this was significant at 5% level (p=0.04).

Figure 3.11. An interrupted time series analysis for gender-based violence cases from October 2019 to June 2020



ITSA details: time—beta -24(46.0) p-value 0.62, Intervention (I)—beta -48.4(545.1) p-val 0.93, TxI Beta 465 (169.4) p-val= 0.04

4. Discussion

Findings of this study have shown that the hard lockdown in Uganda during the months of March, April, and May greatly affected access to and utilization of healthcare services including OPD, malaria treatment, ANC services, and immunization. The most remarkable difference in the utilization of most of the healthcare services was noted between March and April. In the same period, the number of deaths in health facilities due to hypertension, malaria, TB, and maternal causes greatly reduced. Differences in levels and trends in utilization of health services between pre-and post-intervention periods were found to be significant for immunization and malaria OPD services. The same difference was observed for mortality related to malaria and hypertension. Utilization of health services increased with easing of COVID-19 restrictions. Excess deaths were observed in June for all-cause mortality, from July-September for TB mortality and May-July for OPD maternal mortality.

The findings on reduced utilization of health services are consistent with the WHO report that showed that during the COVID-19 lockdown about a half of the countries partially disrupted their health services, with specific examples of some non-communicable diseases [34]. This could be attributed to many factors, including health workers that focused on responding to the COVID-19 pandemic and therefore neglected other healthcare services like HIV/AID prevention and treatment, maternal health needs, and other healthcare provision [35, 36]. The finding that utilization of some of the services declined even earlier than March 2020 may be explained by a possibility that prior knowledge of COVID-19 might have influenced prior health-seeking behavior[17].

The gradual increase in the utilization level of healthcare services after April 2020 can be attributed to easing of restrictions as private and public cars were allowed to operate in May 2020[37]. Findings from the consultations with District Health Teams highlighted strategies specific to immunization services that were employed. These were increased community outreach, the availability of vaccines, and adequate human resources supplemented by student nurse volunteers, which improved immunization coverage[38].

Our study found that there were no significant excess overall deaths in the post-intervention compared to the pre-intervention period, although deaths due to malaria, maternal causes, and TB were higher than the level of 2019 for some months. This finding shows that the excess mortality in health facilities due to COVID-19 may be measured better by disease rather than overall mortality. Another explanation for the findings is that mortality due to disruption of health services may come later, after several months. In another aspect, with the scare of COVID-19 and the restrictions, people were not coming to health facilities and excess mortality could have occurred in the community rather than in health facilities. Because of the lack of systems to capture this data, community deaths were not assessed. COVID-19 lockdowns made it difficult for vulnerable people to access critical health services and preventive interventions particularly in remote communities[4].

The higher rise in maternal deaths for the period May-July 2020 is in conformity with the model by Bell et al. (2020), although the extent of excess deaths was much lower than the anticipated 486 in six months in the model [17].

The results further show that the impact of COVID-19 in terms of overall mortality in Uganda and other countries with similar population structure may be much lower compared to the impact of unnecessarily severe responses. For example, over 26,000 children missed their DPT3 vaccine in April 2020 due to lockdown, and this can lead to death or disability. Reduced utilization of health services may cause many more deaths than the 150 recorded to have died of COVID-19 by 17th November 2020. One model projected 190,000 COVID-19 deaths in Africa, while in 2018, over 2.7 million (mostly preventable) child deaths occurred on the continent[39].

It is important to note that early predictive models of the COVID-19 pandemic that could have informed decisions on response were based on European populations that are distinctively different from the African population—thus their failure in Africa [40]. External and internal pressures have forced governments to impose hard restrictions which are not necessarily best for those countries, especially the low-income countries[39].

5. Limitations

The main source of data for this study is HMIS, whose data are at times questionable especially before validation exercise and the limited number of grouping variables [41]. In many countries accumulated data are known to have high levels of inconsistency, missing values, and invalid records[42] and this is worse in low-resource settings like Uganda [43].

HMIS has aggregated data and thus further analysis is limited. This partly explains why we did not carry out controlled interrupted time series analysis.

Another limitation is that health education and general precautional communication against COVID-19 started earlier than March 2020. For example, screening for the pandemic started on 20th January 2020[44]. Some people may have stopped seeking healthcare as a preventive measure against COVID-19.

Thirdly, the analysis cannot fully attribute the changes to intervention because of lack of control or counterfactual data. The intervention affected the whole country and thus there were no areas that could work as control; thus stronger analytical techniques like controlled interrupted time series (CITS) analysis[11] cannot be applied.

Conclusions and recommendations

We conclude that the response to COVID-19 had a significant negative effect on utilization of health services, and this was most evident in April 2020. For some months and for some diseases, the post intervention period had excess mortality.

We recommend the following:

- Governments in developing countries whose population is mostly young need to rethink their priorities. For a country of approximately 44 million there were very few COVID-19 cases and deaths. As several studies have shown, although public health responses to COVID-19 should be prioritized, prior morbidities should not be de-prioritized as found in other studies, [17, 20] otherwise achievements in the fight against these other morbidities will be wiped out.

- Public responses to COVID-19 need to be evidence based. Hard restrictions disrupt services, and this can have a devastating effect on the health system and whole economy. More benefits in reducing transmission would be realized if there is enforcement of standard operating procedures other than imposing a lockdown.

- The governments in resource-limited settings like Uganda need to invest in systems that capture data from communities. Reliance on health facility-based systems is limited. There could have been more deaths in the communities that are not reflected in the HMIS data.

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