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Impact of COVID-19 on health care service delivery in urban and rural Malawi

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3 **Title: Impact of COVID-19 on health care service delivery in urban and rural Malawi**

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Abstract

Objective Across Africa, the impact of COVID-19 continues to be acutely felt. This includes Malawi, where a key component of health service delivery to mitigate against COVID-19 are the primary health care facilities, strategically placed throughout districts to offer primary and maternal health care. These facilities have limited infrastructure and capacity, but are the most accessible and play a crucial role in responding to the COVID-19 pandemic. This study assessed health facility preparedness for COVID-19 and the impact of the pandemic on health service delivery and frontline workers.

Setting Primary and maternal health care in Blantyre District, Malawi.

Participants We conducted monthly visits to 31 health care facilities and a series of telephone-based qualitative interviews with frontline workers (n=52 with 28 participants) between August and October 2020.

Results Despite significant financial and infrastructure constraints health centres continued to remain open, with the majority being trained and having access to key resources for COVID-19 prevention measures. Nevertheless, the number of clients attending key services was seen to reduce. Key barriers to implementing COVID-19 prevention measures observed during health facility visits and through interviews were periodic shortages of resources (soap, hand sanitizer, water, masks, staff), and challenges in managing physical distancing and in handling suspected COVID-19 cases. However, even when available, we observed that access to resources, (e.g. face masks), did not always equate to use, despite the perceived risk reported. Frontline workers felt COVID-19 had negatively impacted their lives. They experienced fatigue and stress due to heavy workloads, stigma in the community, and worries about becoming infected with and transmitting COVID-19.

Conclusion Resource (human and material) inadequacy shaped the health facility capacity for support and response to COVID-19, and frontline workers may require psychosocial support to manage the impacts of the COVID-19 pandemic.

Summary box

Study strengths and limitations

- Using a mixed method approach allowed us to capture data from across the district and gain an in-depth understanding of the findings.
- In-depth interviews were useful in allowing participants to express their lived realities through their own words.
- Quantitative structured data collection tools enabled real time data to be captured through direct observations at each health care facility.
- Collecting data from health care facility registers was challenging and required efforts to compare registers to centralised health management information records to ensure they were consistent.
- We only interviewed frontline workers, meaning that findings around patient behaviour were filtered through frontline workers perspectives.

Introduction

Since COVID-19 was identified in Wuhan, China in late 2019, this highly infectious respiratory disease has spread across the world causing a complex global health crisis. The devastating impact of the pandemic has been felt both within and beyond the health sector (1). Early research has demonstrated the extreme pressure on health workers to both treat patients with COVID-19, and also to maintain essential services (2). In low-and-middle income contexts, where health systems are often fragile and care-seeking pathways for patients more challenging, the ramifications of the pandemic are being felt in complex ways (3).

In Africa, the health sector has been impacted by critical shortages of health care workers and constrained infrastructure including water, sanitation and hygiene (WASH), a crucial component of ensuring good hygiene and infection control (4). Prior to COVID-19, studies have demonstrated that only half of health facilities in Sub Saharan Africa had basic access to water, and even less to soap or alcohol based hand sanitizer (5–7). This situation is further exacerbated by global shortages in access to Personal Protective Equipment (PPE) increasing the risk to health care workers and patients (8,9). Research has also demonstrated the detrimental effect caring for patients with COVID-19 in combination with an elevated risk of infection is having on health care workers psychosocial well-being across the globe (10,11).

Disruptions to health services have had both a direct and indirect impact on mortality, as care for all patients is affected (12). Recent work from the World Health Organization (WHO) analysed data on attendance for five key essential services (outpatient and inpatient admission, skilled birth attendance, treatment of confirmed malaria cases and provision of the combination pentavalent vaccine) from 14 countries in Africa, and found a reduction of 50% in May, June and July 2020 (13). This work speaks to the importance of capturing the impacts of COVID-19 on health service delivery in a wide range of contexts.

In April 2020, in response to the first cases of COVID-19, the Malawian Government closed international borders, suspended all flights and shut educational institutions. Legal injunctions prevented the implementation of any other restrictions of movement (14). The

1
2 first wave (March-September 2020) saw a much lower number of registered cases and
3 deaths than initial models projected (15), reflecting wider trends in Sub-Saharan Africa (16).
4 At the time of writing, registered deaths from the first wave in Malawi stood at 185 with
5 6,049 recorded cases (17). Preliminary immunology research undertaken with
6 asymptomatic health workers found that 12.3% had antibodies for COVID-19, suggesting a
7 higher rate of cases than was reported in official statistics (18). However, testing capacity
8 was extremely limited meaning that an accurate picture of transmission was challenging.
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17 The Malawian health system is structured around three levels, tertiary (large referral
18 hospitals situated in major urban centres), secondary (district hospital) and primary (health
19 facilities, community and home-based services). Primary health care facilities are central to
20 Malawi's health service and provide a range of services including outpatient department
21 (OPD), family planning (FP), maternal and child health (MCH), expanded programme of
22 immunisation (EPI), tuberculosis (TB) testing and treatment, HIV testing, counselling and
23 treatment, and cancer screening. Changes to service delivery in these facilities is likely to
24 have significant impacts on health outcomes. This study was guided by three research
25 objectives: (1) to assess preparedness for the pandemic in health facilities in Blantyre
26 District; (2) to understand front-line workers experiences of providing care during COVID-19;
27 and (3) to create feedback loops for assessment results to the district health office to help
28 inform COVID-19 action plans.
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41 **Methods**

42 ***Study context***

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44 Funding for the health sector is heavily dependent on international donors (20). Health
45 services are provided by government, private and faith-based organisations; government
46 services are the only ones provided without fees and recent estimates suggest they provide
47 approximately 60% of services accessed (21,22). Despite policies being well-designed, key
48 challenges faced in the health sector include chronic underfunding, shortage of staff and
49 fragmentation of services (22). Management and oversight of primary health care facilities
50 is provided by district health offices (23). This study was situated in Blantyre district in the
51 Southern region, which is serviced by 31 government and faith based primary health care
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2 facilities (n=14 urban; n=17 rural). The district has a total population of 1.25 million
3 including Blantyre city (64%), the second largest city in Malawi.
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8 ***Study Design***

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10 To understand the impact of COVID-19 on primary health care provision we used a mixed
11 method approach. Combining qualitative and quantitative research methods allowed us to
12 capture data from across the district and gain a deeper understanding of the findings
13 through qualitative interviews. Quantitative structured data collection tools were selected
14 to enable real time data to be captured through direct observations at each health care
15 facility. Tools focused on the key components of the National COVID-19 Preparedness and
16 Response Plan (24), reporting on preparedness proxies (e.g. hand washing facilities, soap,
17 thermometers), and observed behaviour of frontline workers and clients (e.g. mask wearing,
18 physical distancing). Qualitative interviews were selected because they allow participants
19 to express their lived realities through their own words (25). To reduce the risk of COVID-19
20 transmission with prolonged contact with participants we conducted qualitative interviews
21 over the telephone.
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34 ***Data collection***

35 Working in all 31 rural and urban health facilities in Blantyre District, we collected
36 structured data at three time points (August, September and October 2020). Experienced
37 researchers administered a questionnaire with the clinician responsible for managing the
38 health facility or their representative. All quantitative data were collected using a pre-
39 programmed questionnaire on KoboCollect (<https://www.kobotoolbox.org>). The questions
40 included data on patient management, physical distancing, water, sanitation and hygiene
41 (WASH) provision and practices, the presence and use of personal protective equipment
42 (PPE) and patient attendance at routine health services. The team photographed clinic
43 registers (without any identifying patient data) for OPD, EPI, TB, FP, HIV and cancer
44 screening services; this data was collected from January 2019 to September 2020 to allow
45 for comparison of patient numbers pre-COVID.
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3 Following analysis of each round of data collection, “score cards” were generated for each
4 health facility. The score cards summarised how the health care facilities were
5
6 implementing COVID-19 preventative measures, including training of frontline staff, stock of
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8 WASH materials including location and presence hand washing facilities (with soap and
9
10 water), stock and use of PPE including face masks at the health care facility, stock and use of
11
12 thermometers, waste management, and case management. These scorecards were then
13
14 provided to the District Health Office team through monthly feedback loops, to provide
15
16 guidance on which health care facilities had managed to adapt their practices, and which
17
18 facilities required further support.
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21 Following the generation of the scorecards from the first round of quantitative data
22
23 collection, eight health care facilities were purposively sampled to be included in the
24
25 qualitative component of the study. In the sample we included both rural (n=4) and urban
26
27 facilities (n=4). In these health care facilities, we conducted a total of 52 interviews with 28
28
29 participants. Interviews were conducted at three time points (August, September and
30
31 October) to allow us to capture the dynamic nature of the pandemic (Table 1).
32

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34 The first round selected up to four participants in each health care facility, this allowed us to
35
36 capture a range of front-line workers including health workers and those employed to
37
38 support operations at the clinic including grounds staff and cleaners. During the second
39
40 round due to time and resource constraints we interviewed two participants per healthcare
41
42 facility. In the third round we included only healthcare facility in-charges, those who
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44 manage the clinic (or their representative), this was because the final round of interviews
45
46 focused more on broader changes to care provision. During the interviews key themes
47
48 included experiences of COVID-19 preparedness activities including training, changes in
49
50 work practices exploring both access to and use of key resources, access to psychological
51
52 support, the impact of working during a pandemic on frontline workers life and well-being,
53
54 and future changes to health care practice.
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56 **Data analysis**

57 Quantitative discrete data was downloaded from KoboCollect
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59 (<https://www.kobotoolbox.org>) as a .csv file, cleaned and analysed using Microsoft Excel
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3 V16 (Microsoft Corporation, Redmond, WA). Continuous data from health records were
4 abstracted from photographs to Microsoft Excel V16 (Microsoft Corporation, Redmond, WA)
5 for comparative analysis between 2019 and 2020 attendance. All data were analysed for
6 Blantyre as a whole, and as a comparison between urban and rural facilities.
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10 For the qualitative data we used thematic content analysis (26). All transcripts were
11 transcribed, initial themes identified, and key gaps included in subsequent rounds of data
12 collection. The study team (drawing together the quantitative and qualitative researchers)
13 held weekly debriefing sessions to allow for discussion of findings from each week's data
14 collection. Any new avenues of inquiry were incorporated into the data collection. Halfway
15 through the study we presented initial findings to the District Health Office to gain feedback
16 and participant checking.
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24 ***Ethical approval***

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26 Ethical approval was granted from the National Health Science Research Committee
27 (#20/06/2534). For the qualitative interviews, the participant information sheet and consent
28 form were shared on WhatsApp before the interview to allow participants to review the
29 information. Before the research began, the information was reviewed again, and oral
30 consent was taken from the participants. No data collected from the clinic, including clinic
31 registers contained patient's personal information.
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39 ***Patient Involvement***

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41 This study was developed in partnership with the Blantyre District Health Office (DHO),
42 specifically the team leading the COVID-19 preparedness and response for primary health
43 care within Blantyre District. Halfway through the project we presented our initial findings
44 to the District Health COVID-19 Task Force during their weekly meetings for direct feedback,
45 incorporating their suggestions into the qualitative data collection.
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52 **Results**

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54 We present the qualitative and quantitative results concurrently around three themes: (1)
55 implementation of COVID response policies and practices; (2) impacts of COVID on health
56 service provision: and (3) the well-being of frontline workers. Table 2 illustrates a summary
57 of quantitative measures implemented in the healthcare facilities across the three-month
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3 monitoring period. A breakdown of urban versus rural coverage is available as
4 supplementary material (S1) although no significant differences were noted.
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8 **Implementation of COVID-19 response policies and practices**

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10 While clinics remained open, the implementation of COVID-19 prevention measures were
11 constrained. These constraints related both to existing infrastructure such as a lack of
12 running water, limited space for implementing physical distancing, and provision and use of
13 resources including PPE.
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17 *Training of frontline staff*

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19 Training of frontline staff was relatively rapid and well supported by the Blantyre DHO team.
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21 Over the three-month period there was a steady increase in the number of facilities which
22 had over 90% of frontline staff trained (Month 1: 35%; Month 2: 48%; Month 3: 70%).
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28 *WASH*

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30 Despite provision of adequate moveable hand washing facilities (HWF) (e.g. buckets with
31 taps), the placement, use and access to HWFs at entrances to the health care facilities (33%)
32 and specific service areas was low (Table 2) with an average of two HWF available per
33 facility during observation visits. The lack of use of HWF was attributed by health workers to
34 lack of human resource to manage and refill these as needed to maintain use by staff and
35 patients. Most concerningly HWF access and use appeared to drop off as the three months
36 progressed (Table 2), in line with the reduced number of positive COVID-19 cases (Figure 1).
37
38 It was difficult for the health care facilities to channel clients through one entrance to
39 ensure hand washing on arrival, due to the open design of the facility. The location of HWF
40 varied from clinic to clinic, and there was little consistency in the provision and location of
41 HWFs over the three-month period in each facility. The highest concentration of consistent
42 provision (i.e. available all three months) was found at OPD service areas (Month 1: 71%;
43 Month 2: 58.1%; Month 3: 54.8%). Pleasingly, relatively small proportion of HWFs were
44 found with no soap or water available over the three-month period (5.2%; 8.7%; 18.6%).
45
46 This may be attributed to the fact that 77% of facilities had a tapped water supply within the
47 facility compound, with only 2 having to access water from a borehole in the community
48 outside the facility. Intermittent water cuts severely affected the ability of people in the
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2 facility spaces to implement good handwashing. Staff at one facility reported having no
3 access to potable water, which left them relying on hand sanitiser, a scarce resource (Table
4 2). In this situation there was insufficient sanitiser to share with patients, which meant
5
6 patients were unable to wash their hands during visits to the health facilities.
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10 ...we are facing a challenge of water, which is making it difficult for us to wash our
11 hands. We just depend on hand sanitizers. We can't share them with the patients
12 because there isn't enough. **[Health Surveillance Assistant, IDI20]**
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17 Of significant concern, was the low provision of soap at available hand washing facilities
18 throughout the study period, with this reducing to under 15% by October (Table 2); this was
19 attributed to a number of factors including unavailability, theft by clients, and lack of
20 understanding by both health workers and patients of the importance of soap in the
21 reduction of COVID-19 transmission. Clients were more likely to follow social norms in only
22 washing hands with water. In the absence of water and soap, particularly in consultation
23 rooms, it was concerning to note low access to hand sanitiser for frontline workers, as a
24 means of protecting both themselves and clients from transmission between consultations.
25 During health care facility visits, it was noted on a number of occasions that HWFs were only
26 put out for use when the research team arrived for assessment, indicating that there may
27 have been some reflexive bias in observed practices. The team also noted that HWFs were
28 often empty of water at the time of client arrival and were only filled once patients were
29 asked to collect water from communal water points.
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43 *Client screening and isolation*

44 Access to and use of thermometers for temperature checks was inconsistent with only 25%
45 of facilities having thermometers available at any given time (Table 2). Indication of fever
46 was established by visual assessment of patients during consultation, and no pre-
47 consultation checks were conducted to isolate potential cases from others in the waiting
48 areas. Sixty-one percent of the health care facilities had reported a suspected COVID-19
49 case by October 2020, with the main responses being to provide the patient with a mask,
50 isolate where possible, and call the COVID-19 response team for advice and action.
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3 *PPE*

4 The provision of PPE to health care facilities, particularly surgical masks, for frontline
5 workers was high (Table 2), although in early visits and interviews healthcare workers
6 reported shortages of PPE such as gloves, aprons and masks. Of the PPE available, a small
7 amount that was initially supplied had passed expiry dates and staff were reluctant to use it.
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11 As one medical assistant narrated:

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13 We didn't have PPEs. The PPEs we were using had expired, so we were forced to
14 move consultations outside. Yes, for example the date of the face masks that we had
15 at the hospital had expired a long time ago **[Medical Assistant, IDI04]**.

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21 However, supply improved in the later stages of the data collection, with healthcare
22 workers reporting more stable stock. For example, one Pharmacy Assistant reflected:

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24 Previously, it was hard to work because we didn't have enough personal protective
25 equipment and as you know we reached a point of starting strikes. But as for now
26 we have the PPEs" **[Pharmacy Assistant IDI06]**.

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32 Despite availability, mask wearing was intermittent. During the qualitative interviews,
33 frontline workers reported adhering to the mask wearing regulations, however even in
34 facilities where masks were available (83.9 – 100% of facilities) the quantitative team
35 observed far less uptake than was reported, with less than 52% of health and frontline
36 workers wearing masks all of the time they were observed (Table 2). To understand this,
37 during the second round of qualitative interviews, we probed why frontline workers may
38 not wear masks. We asked this question in the third person to ensure that frontline workers
39 did not feel we were accusing them. The most common reason provided during these
40 interviews was that masks were uncomfortable and impacted health:

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48 Some of the health workers that are not wearing a mask complain that the mask
49 gives them a headache, others say the reason why they don't wear a mask is
50 because they want free circulation of oxygen when breathing **[Health Surveillance**
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Assistant, IDI15]

Mask wearing (primarily cloth) by patients and guardians (family members taking care of patients) was seen to increase from month 1 (Patients not wearing: 74.2%; Guardians not

1
2 wearing: 96.8%) to month 2 (Patients not wearing: 19.4%; Guardians not wearing: 22.6%)
3
4 with a slight decline again in month 3 (Table 2). Across the dataset, frontline workers
5
6 reported some patients were reluctant to wear masks. They attributed this behaviour to the
7
8 uncomfortableness in wearing a mask.

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10 Some people [patients] have been complaining that they suffocate when breathing
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12 through a mask and other people don't even know how to properly wear the masks.
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14 So those could be some of the reasons. **[Clinical Officer, IDI09]**

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17 Disposal of PPE was relatively consistent, with 77% of facilities burning materials in either an
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19 incinerator or open fire. Concerningly, seven facilities were still disposing of PPE and clinical
20
21 waste in an open pit which may expose others to infection and did not follow good clinical
22
23 practice.

24 25 26 *Physical distancing*

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28 Up to 58% of health facilities attempted to implement some level of physical distancing
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30 (Table 2), which reduced as the months progressed, and reported cases of COVID-19
31
32 declined. Physical distancing was particularly challenging upon arrival of patients, although
33
34 efforts were made to support distancing in the waiting and consultation areas through word
35
36 of mouth, spacing chairs or marking benches (Table 2). However, during facility visits, clients
37
38 were seen to be crowding and failing to maintain an appropriate physical distance. Frontline
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40 workers felt patients failed to physically distance from each other in the queues because
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42 patients wanted to be seen "rapidly". This behaviour is likely to be shaped in part by long
43
44 waiting periods commonly reported in primary health facilities in Malawi.

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46 As you know people are very difficult to deal with, they just maintain it for a short
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48 period of time then they get closer to each other again, because they all want to
49
50 receive treatment quickly. **[Security guard, IDI02]**

51 52 *Behavioural barriers for implementing COVID-19 prevention*

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54 In addition to the limitations associated with infrastructure and consumables, we also
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56 considered how behaviour evolved throughout this period of the pandemic.
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58 The COVID-19 pandemic in Malawi has been very dynamic. Reflecting the unpredictable
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60 nature of the pandemic, reported behaviour change has been both dynamic and

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3 heterogenous. Some frontline workers perceived a relaxation of precautionary measures by
4 patients as the number of reported cases went down. As noted below:

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6 People think that COVID-19 has vanished. I don't know where they're getting that
7 information from. They have stopped wearing masks and they are no longer washing
8 their hands on their own as before. So, I would say people are reckless now and are
9 back to their normal life **[Clinical Officer, IDI09]**

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15 Whereas some frontline workers reported better uptake in prevention behaviours by
16 patients. They felt patients were being cautious about prevention and cooperative when it
17 came to mask wearing and hand washing for instance:

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21 Yes, there have been some changes. People are now wearing masks and they are
22 also washing their hands. People are observing social distance. **[Clinical officer,**
23 **IDI04]**

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28 Healthcare workers believed the change in patient behaviours was helped by the
29 government legislating that everyone must wear a mask when visiting public offices. Some
30 health facilities refused to treat patients who were not wearing masks which meant patients
31 modified their behaviour:

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35 People [...] now obey all the measures that have been put in place at the facility such
36 as wearing a face mask, [which] is mandatory either at the facility or when travelling.
37 It has brought a great change because when we send them back, they inform others
38 in their community. And now people prepare when coming to the hospital because
39 they are afraid of being sent back without treatment [...] **[Ground labourer, IDI01]**

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46 However, some frontline workers felt such punitive measures had unintended
47 consequences. They reported that once patients started to be turned away, mask sharing
48 became far more common undermining prevention efforts:

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52 We have however stopped sending them back because people were borrowing mask
53 from each other which is a big problem. So now we just inform the village chiefs to
54 inform their people to stop being reckless **[Clinical officer, IDI09]**

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3 Frontline workers felt public behaviour had changed as communities started working
4 together with community and religious leaders. Healthcare workers felt this helped both in
5 disseminating COVID-19 information and encouraging people to use a mask:
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8 The number of people that are wearing masks has now increased a lot. The change
9 has resulted from the meeting we had at the hospital here with the village chiefs,
10 where we explained to them that everyone should comply with the preventive
11 measures being implemented at the hospital when coming to the hospital. Church
12 leaders have also been encouraging people to wear masks. So our village chiefs and
13 church leaders have also played a major part. **[Nurse, IDI12]**
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21 **Impact of COVID-19 on routine health services**

22 Frontline workers felt that the COVID-19 pandemic had negatively impacted provision of
23 healthcare services. They cited cancellation of routine services such as screening for
24 cervical cancer and HIV viral load as two of the most significant impacts.
25
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28 It is very challenging. Actually, the entire system came to a halt because we are all
29 focused on COVID-19. **[DHO representative]**
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33 [...] recently some services have been stopped due to COVID-19, [e.g.] growth
34 monitoring services, cervical cancer screening and [HIV] viral load services. **[Clinical**
35 **officer, IDI13]**
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41 We found a reduction in the number of patients attending outpatient services from April
42 onwards, which corresponds with the first confirmed cases of COVID-19 in Blantyre District
43 (Figure 1). However, the facilities did not suspend all services, rather adapted strategies for
44 providing healthcare. For instance, people with HIV or TB normally received a three-month
45 dosage but were getting prescriptions for six months. As one District Health Office
46 representative narrated the reason for the modification was to reduce in-person
47 consultations and decongest the clinics.
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53 Review clinics for HIV and TB patients have been extended, so instead of giving them
54 medical supplies for 3 months we are giving them medicine supplies of 6 months so
55 that we should try to reduce congestion and minimize time of contact with these
56 patients. **[DHO representative]**
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4 Patients attendance reduced for TB services (Figure 2) could therefore reflect the extended
5 period for which clients received drugs as opposed to reduced attendance and should be
6 assessed over a more prolonged period to determine if service delivery was affected.
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10 We also found modifications in the way child vaccination was offered. Rather than following
11 the immunisation calendar, mothers were grouped and assigned new vaccination dates.
12

13 Those [in need of vaccination] have been divided into several groups and each group
14 is told to come on their own specific day. **[Hospital attendant, IDI18]**
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19 Despite these efforts, and overall reduction in immunisation was seen in attendance
20 records, particularly in relation to facilities located in urban areas. This may reflect the
21 higher perceived risk of COVID-19 in urban contexts (Figure 3).
22

23 Similarly, delivery of reproductive health services was altered, with women accessing family
24 planning given instructions to self-administer the injection at home. However, this strategy
25 raised important questions about disposal and safety of used syringes and needles in the
26 community.
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29 And when it comes to family planning; women are being trained to inject themselves
30 at home so when they come here we just give them all the required materials.
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33 **[Clinical officer, IDI21]**
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39 Adaptation of existing services may explain some of the reduction in access to family
40 planning services as cases of COVID-19 were seen to increase (Figure 4).
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45 The pandemic interrupted the way daily facility data was being recorded. Data entry clerks,
46 the staff responsible for completing daily registers, were not included in the risk allowance
47 provided by the government. This led to long absences by this cadre from some of the
48 facilities.
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51 Our department is still not receiving the risk allowances [...] data officers were not
52 working due to the same issue, but they have just accepted the situation and have
53 resumed their work. **[Security guard, IDI02]**
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3 As part of managing the risk of exposure, health workers reduced their days and the amount
4 of time spent at the health care facility, alternating between the different weeks.
5
6 Consequently, facilities closed earlier than normal, and this further impacted on patients
7
8 travelling long distances to access care:
9

10 The other thing is that we are told to work for a limited time which is less time than
11 before, but that is challenging for the patients that can't make it to the hospital on
12 time **[Hospital attendant, IDI05]**
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17 It is difficult to assess the impact the lack of data clerks may have had on the records
18 maintained within health care facilities and reported here.
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23 *Improved work practices*

24 Health workers also reflected on the positive lessons drawn from responding to COVID-19,
25 reflecting that prevention measures had shaped their work practices in ways that could be
26 useful for preventing other diseases in future:
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30 It has encouraged us to observe hygiene; previously we used to wash our hands only
31 when we wanted to eat but now, we wash our hands regularly, after meeting each
32 patient. We also wear PPE such as masks, aprons and gloves which we never used to
33 do before COVID-19. We now observe social distancing. Social distancing protects us
34 from a lot of other diseases such as TB and others that transmit through droplets.
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36 We will use masks even when COVID-19 is over. **[Medical assistant, IDI01]**
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43 **The impact of COVID-19 on frontline workers**

44 Frontline workers reported severe impacts on their well-being from working during the
45 pandemic. They faced constant anxiety about the risk of exposure, which appeared to be
46 two-fold. For non-clinicians, frontline workers articulated their concerns around regular
47 contact with clinicians who were seeing the patients:
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52 I have worries because of the way things are right now [...] I work at the clinic and
53 sometimes I come into contact with the doctors and that worries me because you
54 wonder if all the patients that were in contact with the doctors have the disease.
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56 **[Ground labourer, IDI03]**
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3 Secondly, they saw themselves as potentially exposing others to the same risk they were
4 experiencing, and felt particularly concerned for their family members about this:
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6 I feel worried that I may infect my little child and my whole family should I be
7 infected because it takes time for a person to notice if they have COVID-19. **[Clinical**
8 **officer, IDI04]**
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10 11 12 13 *Stress and helplessness*

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15 There was a deep sense of helplessness among frontline workers about continuing to work
16 during the pandemic. Some frontline workers narrated their desire for a break from work
17 but felt powerless to act. Their lack of agency stemmed from a sense of social responsibility
18 to work but also the need to provide for their families. For most frontline workers they
19 continued to work because they could not afford to stop:
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24 I cannot quit my job despite having so many worries because the job is what gives
25 me money for food. People are just going to work because they want to earn some
26 money for food, but everybody is worried. **[Medical Assistant, IDI16]**
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32 Some frontline workers also drew inspiration to continue to work from the principles of
33 humanitarianism and sacrifice. Responding to 'What motivates you to continue working
34 despite the situation?' one said, 'The desire to assist people.' This demonstrates that facility
35 workers felt an ethical duty to serve their communities despite the perceived risk:
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39 There is no way I can say we will stop going to work due to COVID-19, because that's
40 our job, assisting people. So, there is no way the hospital would be closed because of
41 the pandemic. **[Nurse, IDI10]**
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46 During July and August 2020, the Ministry of Health required all health workers to be tested
47 for COVID-19. This led to a significant proportion of health care workers being diagnosed.
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49 The requirement for these health workers to self-isolate placed pressure and stress on staff
50 in health care facilities who still needed to deliver services.
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53 We are working more than before the start of COVID-19 [...] because if say three
54 workers test positive to the virus, they go on quarantine, leaving behind more work
55 for their colleagues. **[Clinical officer, IDI21]**
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Wider community stigma

Across the dataset, we found consistent testimonies of frontline workers experiencing stigma within the wider community because they were perceived to be the ones spreading the virus. This may have been a result of the mass testing programme initiated by the government. In this quote, one front-line worker shared his experience of being ostracized by bus operators and fellow passengers simply because they were from the health service.

We fail to board a minibus when going to work because people say we will infect them with the disease on the bus. [...] this other day I was in my work uniform standing at the bus stop waiting to catch a minibus, but none of the buses stopped and other people at the bus stop started accusing me that I was the reason why the buses were not stopping.” **[Ground labourer, ID114]**

To mitigate this situation the district health officer reported providing health workers with additional buses allowing them to get to work. Although only health workers were provided access to the buses with other frontline workers left to find their own way to work.

They reported [the discrimination on public transport] to the head office and the office hired staff buses which were carrying only health workers. But after sometime, the buses stopped carrying them. **[Clinical officer, ID114]**

Tension between health workers at the healthcare facility was also reported. Fear of infection led to mistrust between health workers, particularly for those who were diagnosed having COVID-19.

Some health workers diagnosed with COVID-19 were being ignored by fellow health workers, saying they will infect them, and that was affecting them psychologically.

[Clinical officer, ID112]

Discussion

This mixed methods study took place during the first wave of COVID-19, capturing real-time data around how primary health care facilities prepared for, and then responded to the pandemic. Exploring in-depth with a range of frontline workers how the COVID-19 pandemic affected their work practices and lives more broadly. Initial modelling predicted that Malawi would have a high rate of hospitalizations and deaths, but this did not materialise at the

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3 time of this study. In Blantyre, the COVID-19 pandemic and response took place in the
4 context of severe resource constraints, where health service even before the pandemic
5 were strained. Our research found that despite this challenging context, primary healthcare
6 facilities remained open and patients continued to seek care. The DHO led the rapid roll out
7 of COVID-19 related training to frontline health workers, implementing key COVID-19
8 measures but this was inhibited both by the absence of materials and limited infrastructure.
9 The numbers of people attending health care facilities was radically reduced, particularly
10 during the first peak and some key services were also suspended.
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19 Although pragmatic guidance has been published for low and middle income countries (27),
20 case management at health care facilities was challenging, with limited staff available for
21 patient consultations, and the layout of health care facilities making it challenging manage
22 patients arriving. This was compounded by inadequate resourcing (e.g. thermometers,
23 isolation rooms) to facilitate screening upon arrival and isolation of suspected cases. There
24 was heavy reliance on the centralised team from the District Health Office to respond and
25 handle all suspected cases, which overburdened this team.
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34 In some health facilities an authoritarian approach to increase patient's adherence to mask
35 wearing had a detrimental impact on prevention measures. We found that despite frontline
36 health workers reported stress and anxiety of contracting COVID-19, the uptake of
37 preventative measures including mask wearing was low, suggesting a complex relationship
38 between knowledge and behaviour of health care workers. Frontline workers reported
39 significant stigmatisation and increased stress during work that impacted their lives.
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48 The fear, stress and anxiety reported by frontline workers in our study reflects trends across
49 the globe. Studies undertaken in a wide range of high-, middle-, and low-income contexts
50 speak to devastating impact COVID-19 is having on health care workers' psychosocial well-
51 being (28,29). In sub-Saharan Africa, where health systems are more fragile, referral
52 pathways are more complex and access to PPE challenging; these are all factors that
53 contribute further stress for health care workers. By including a wider cadre of staff
54 including guards and patient attendants, we demonstrated that the psychosocial impact is
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2 not limited to frontline health care workers. Our work speaks to the urgent need to provide
3 psychosocial support for all frontline workers.
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8 The importance of hand hygiene in the prevention of communicable diseases, including
9 respiratory infections cannot be overemphasized, particularly with regard to COVID-19 (30–
10 32). Prior to this pandemic, WASH campaigns were emphasising the importance of hand
11 washing with soap after toilet use and during consultations in healthcare facilities (33–35).
12 However, opportunities for hand washing in this setting were rarely found, with reasons
13 cited as lack of hand washing facilities, access to water, and the need for constant
14 maintenance (33–35). Nevertheless, our results indicate that despite the provision of the
15 necessary hand washing facilities and regular access to water, few health facilities made
16 adequate hand washing stations with soap or sanitisers available at either toilets or other
17 areas of the health care setting. Where they were available, their presence was intermittent
18 implying that recommended hand hygiene practice (hand washing with soap or use of hand
19 sanitizer) was limited. By failing to utilise the handwashing facilities available to them (i.e.,
20 keeping provided buckets and soap in storage) health facility staff are indicating that they
21 are either overburdened, or do not understand the value of hand washing with soap in
22 COVID-19 prevention. This was a missed opportunity to promote effective hand washing
23 with soap to the community members utilising the health care facilities, as lack of proper
24 hand hygiene in the healthcare facilities has been found to reflect inadequate handwashing
25 at the household level (36,37), as WASH norms are shared in community settings (38).
26 Research as demonstrated that the availability of WASH infrastructure (e.g. hand washing
27 facility with soap) in accessible locations motivates behaviour performance, acts as a cue for
28 action and enhances social norms (39). As such it is imperative that hand washing facilities
29 are made accessible to all staff and patients to promote their effective use, and where
30 possible supported with supervision, nudges and appropriate behaviour change techniques
31 to improve hand hygiene in healthcare settings both for the short and long term (40–42).
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54 Overall clinical waste management was found to be well managed in the majority of health
55 care facilities, with incineration of used masks being undertaken on a regular basis.

56 However, as found in previous reports in Blantyre, some masks were disposed of into open
57 pits which were potentially exposing community members to infection (43). A consistent
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3 and context appropriate response to clinical waste management is needed for all health
4 care facilities to reduce the risk of infection transmission while taking into consideration the
5 environmental impacts of disposal in the long term (43).
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10 **Limitations**

11 Our study has a number of limitations. As we were collecting data during the pandemic, we
12 limited the time the study team was in the health care facilities. In-depth interviews were
13 conducted over the phone, which may have made it more challenging for the interviewer to
14 build rapport with participants and inhibited their responses. The study focused on frontline
15 workers, and we did not conduct interviews with patients, this means that findings around
16 patient behaviour was filtered through frontline workers perspectives. Collecting data from
17 health care facility registers was challenging and required efforts to compare registers to
18 centralised health management information records to ensure they were consistent. Longer
19 term attendance data comparisons are also recommended to assess the impacts on key
20 services.
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31 **Conclusion**

32 Despite the significant challenges placed on health care facilities, they remained open and
33 managed to maintain the majority of key services, albeit with reduced attendance. Although
34 efforts were made to supply health care facilities with resources for COVID-19 prevention,
35 there were limitations to their implementation (e.g. hand washing facility use with soap,
36 mask wearing, etc). Complex factors seem to shape staff behaviours and knowledge did not
37 always translate into practice. Providing additional supervision, support and training may
38 lead to better adherence to preventative measures. Our study also speaks to the need to
39 provide psychosocial support for all those working on the frontline in health facilities.
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Author Contribution statement

Author	Contribution/Role in the study
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Eleanor MacPherson	Study design, lead, paper writing support
Mindy Penulo	Data collection, paper review
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Zuziwe Gundah	Study lead, paper review
Penjani Chunda	Study lead, paper review
Tracy Morse	Study design, lead, paper writing support

Declaration of competing interest

The authors declare that there is no conflict of interest.

Data sharing

The data supporting results of this study are available on request from the Department of Civil and Environmental Engineering, University of Strathclyde (tracy.thomson@strath.ac.uk). For the qualitative research, we can provide second order summaries of transcripts to ensure anonymity of participants.

Figure 1

Outpatient service attendance 2019 versus 2020 with the number of positive confirmed cases of COVID-19 in Blantyre District (n=27 health facilities)

Figure 2

TB service attendance 2019 versus 2020 with the number of positive confirmed cases of COVID-19 in Blantyre District (n=27 health facilities)

Figure 3

Child health (including immunisation) service attendance 2019 versus 2020 with the number of positive confirmed cases of COVID-19 in Blantyre District (n=27 health facilities)

Figure 4

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3 Family planning service attendance 2019 versus 2020 with the number of positive confirmed
4 cases of COVID-19 in Blantyre District (n=27 health facilities)
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Table 1: Summary of Qualitative Sampling

Health Facility	Location	First round	Second round	Third round
001clk	Rural	<ul style="list-style-type: none"> • Hospital Attendant • Medical Assistant (Clinic in charge) • Security Guard • Ground Labourer 	<ul style="list-style-type: none"> • Medical Assistant (Clinic in charge) • Ground Labourer 	<ul style="list-style-type: none"> • Medical Assistant (Clinic in charge)
002mpm	Rural	<ul style="list-style-type: none"> • Clinical Officer (Clinic in charge) • Pharmacy Assistant • Ground Labourer 	<ul style="list-style-type: none"> • Clinical Officer (Clinic in charge) • Ground Labourer 	<ul style="list-style-type: none"> • Clinical Officer (Clinic in charge)
003mdk	Rural	<ul style="list-style-type: none"> • Security Guard • Data clerk • Clinical Officer (Clinic in charge) 	<ul style="list-style-type: none"> • Security Guard • Clinical Officer (Clinic in charge) 	<ul style="list-style-type: none"> • Clinical Officer (Clinic in charge)
004nmk	Rural	<ul style="list-style-type: none"> • Medical Assistant (Clinic in charge) • Hospital attendant 	<ul style="list-style-type: none"> • Medical Assistant (Clinic in charge) • Hospital attendant 	<ul style="list-style-type: none"> • Medical Assistant (Clinical in charge)
005nrd	Urban	<ul style="list-style-type: none"> • Hospital Attendant • Security Guard • Nurse (Clinic in charge) • Data Clerk 	<ul style="list-style-type: none"> • Hospital attendant • Nurse (Clinic in charge) 	<ul style="list-style-type: none"> • Nurse (Clinic in charge)
006gty	Urban	<ul style="list-style-type: none"> • Clinical Officer (Clinic in charge) • Ground Labourer • Nurse 	<ul style="list-style-type: none"> • Clinical Officer (Clinic in charge) • Ground Labourer 	<ul style="list-style-type: none"> • Clinical Officer (Clinic in charge)
007slz	Urban	<ul style="list-style-type: none"> • Nurse (Clinic in charge) • Hospital Attendant • Security Guard 	<ul style="list-style-type: none"> • Nurse (Clinic in charge) • Hospital attendant 	<ul style="list-style-type: none"> • Nurse (Clinic in charge)
008bng	Urban	<ul style="list-style-type: none"> • Clinical Officer 	<ul style="list-style-type: none"> • Clinical Officer (Clinic in charge) 	<ul style="list-style-type: none"> • Clinical Officer (Clinic in charge)

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	(Clinic in charge) • Health Surveillance Assistant	• Health Surveillance Assistant	
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Table 2: Summary of COVID preparedness from 31 health facilities across Blantyre District from August – October 2020.

Staff training		August	September	October
All frontline workers	Percentage trained in COVID-19	51.6%	69.6%	80.4%
Hand washing		August	September	October
HWF at entrance	Percentage of facilities	32.3%	32.3%	32.3%
HWF at OPD	Percentage of facilities	71.0%	58.1%	54.8%
HWF HIV	Percentage of facilities	25.81%	22.58%	19.35%
HWF at EPI	Percentage of facilities	19.35%	6.45%	3.23%
HWF at Maternity / antenatal	Percentage of facilities	32.26%	32.26%	29.03%
HWF at toilets	Percentage of facilities	3.23%	0.00%	0.00%
HWF in consultation room	Percentage of facilities	32.26%	25.81%	9.68%
No. HWF per facility	Average number per facility	2.4	2.1	1.7
HWF with soap and water	Percentage with	32.0	29.5	14.9
HWF with water only	Percentage with	61.8	51.8	66.5
Hand sanitiser	Number with access (from 31)	3.0	2.0	0.0
Temperature checks		August	September	October
Thermometer available	Number with access (from 31)	9.0	8.0	4.0
Checks at entrance	Number of the 31 health facilities	0.0	1.0	0.0
Checks at waiting area	Number of the 31 health facilities	0.0	0.0	1.0
Checks in consultation room	Number of the 31 health facilities	8.0	7.0	0.0
Masks		August	September	October
Surgical masks available	Percentage of facilities with available	83.87%	100.00%	90.32%
N95 masks available	Percentage of facilities with available	38.71%	38.71%	35.48%
<i>Mask wearing</i>				
Health workers (non nursing)	Always wearing	25.8%	51.6%	19.4%
	Sometimes wearing	48.4%	45.2%	64.5%
	Not wearing	25.8%	3.2%	16.1%
Nurses	Always wearing	29.0%	51.6%	22.6%
	Sometimes wearing	38.7%	29.0%	54.8%
	Not wearing	32.3%	19.4%	22.6%
Auxiliary staff	Always wearing	6.5%	41.9%	12.9%
	Sometimes wearing	48.4%	35.5%	67.7%
	Not wearing	45.2%	22.6%	19.4%
Patients	Always wearing	0.0%	16.1%	3.2%
	Sometimes wearing	25.8%	64.5%	67.7%
	Not wearing	74.2%	19.4%	29.0%
Guardians	Always wearing	0.0%	19.4%	3.2%

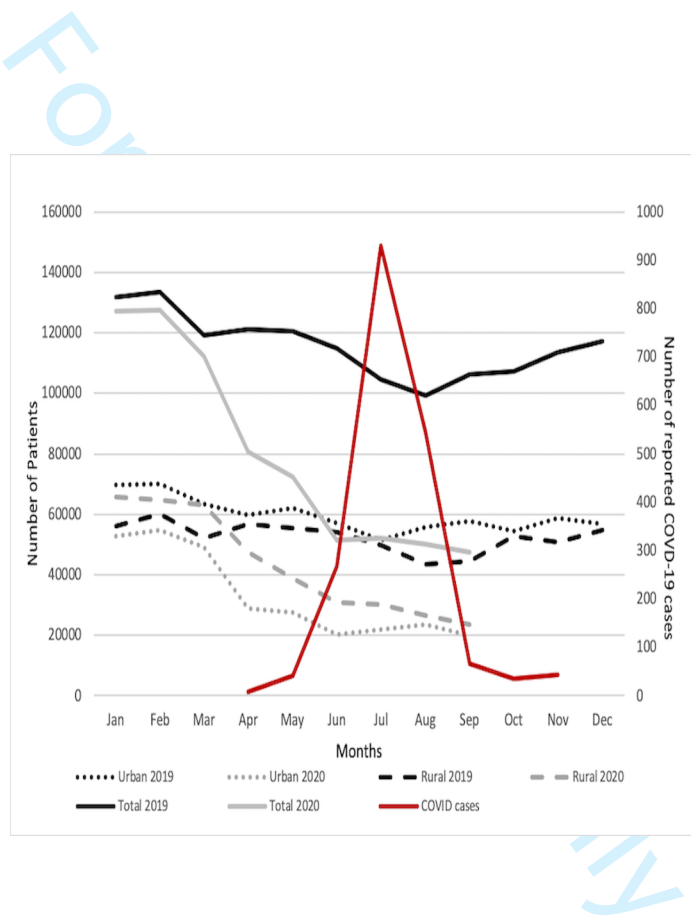
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	Sometimes wearing	3.2%	58.1%	67.7%
	Not wearing	96.8%	22.6%	29.0%
Mask type				
Health workers (general)	Surgical	68.97%	76.9%	92.9%
	N95	27.59%	15.4%	7.1%
	Cloth	3.45%	7.7%	0.0%
Nurses	Surgical	80.8%	85.2%	96.0%
	N95	19.2%	14.8%	4.0%
	Cloth	0.0%	0.0%	0.0%
Auxiliary staff	Surgical	81.8%	85.2%	88.9%
	N95	18.2%	11.1%	3.7%
	Cloth	0.0%	3.7%	7.4%
Patients	Surgical	53.3%	41.0%	35.9%
	N95	0.0%	2.6%	7.7%
	Cloth	46.7%	56.4%	56.4%
Guardians	Surgical	50.0%	44.4%	36.8%
	N95	0.0%	2.8%	5.3%
	Cloth	50.0%	52.8%	57.9%
Waste management				
Pit	Number of the 31 health facilities	9	5	7
Incinerator	Number of the 31 health facilities	19	21	19
Open burning	Number of the 31 health facilities	3	5	5
Physical distancing		August	September	October
Physical distancing on arrival	Number of the 31 health facilities	9	14	6
	Word of mouth	54%	69.2%	100%
	Chairs spaced	38%	15.4%	0%
	Floor markings	8%	15.4%	0%
Physical distancing in waiting area	Number of the 31 health facilities	13	18	13
	Word of mouth	41%	45.0%	52.9%
	Chairs spaced	41%	30.0%	41.2%
	Floor markings	18%	25.0%	5.9%
Physical distancing in consultation area	Number of the 31 health facilities	16	17	14
	Word of mouth	50%	33.3%	0.0%
	Chairs spaced	50%	66.7%	91.7%
	Floor markings	0%	0.0%	8.3%
Physical distancing in wards	Number of the 31 health facilities	6	2	1
	Word of mouth	37.50%	0.0%	0.0%
	Chairs spaced	62.50%	100.0%	100.0%
	Floor markings	0%	0.0%	0.0%
Case management		August	September	October

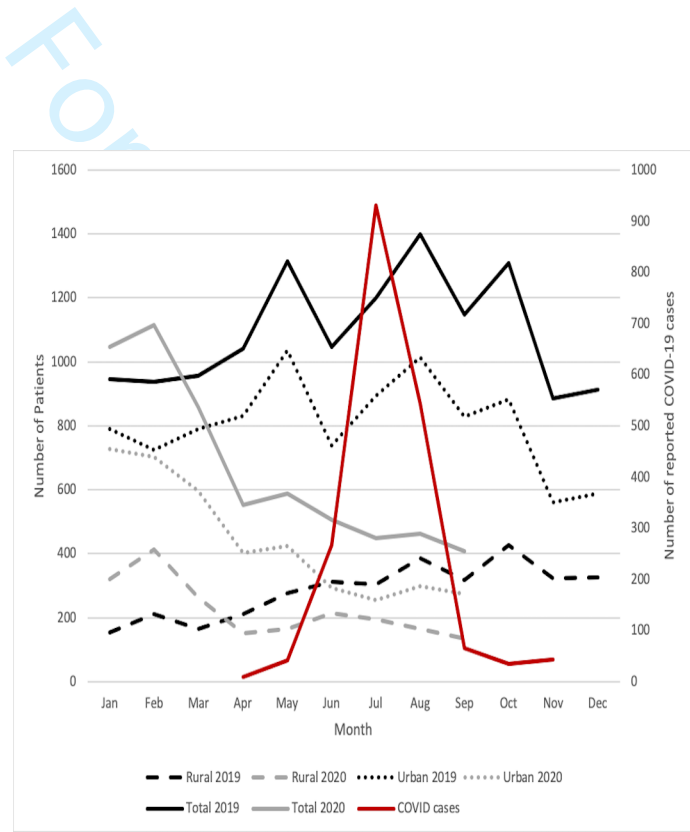
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3		Number of the 31 health			
4	Isolation room	facilities	3	4	4
5		Number of the 31 health			
6	Presence of suspected cases	facilities	12	15	19
7	Action to take when case is	Give a mask	11.11%	17.24%	17.07%
8	available	Isolation	37.04%	31.03%	29%
9		Call covid-19 team at DHO	40.74%	44.83%	29%
10		Call hotline number	3.70%	0.00%	0%
11		Other	7.41%	6.90%	24%
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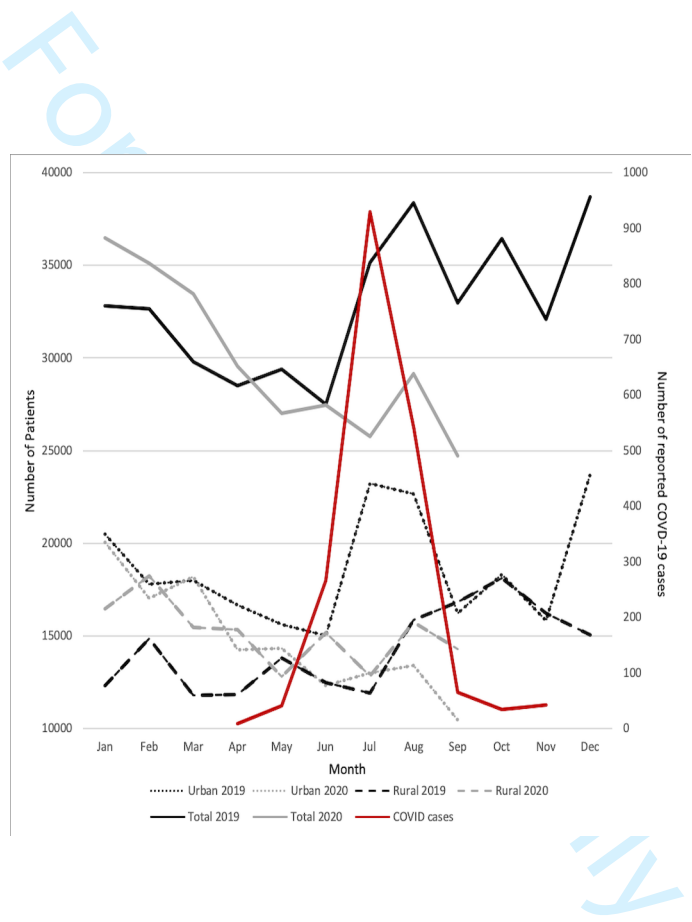
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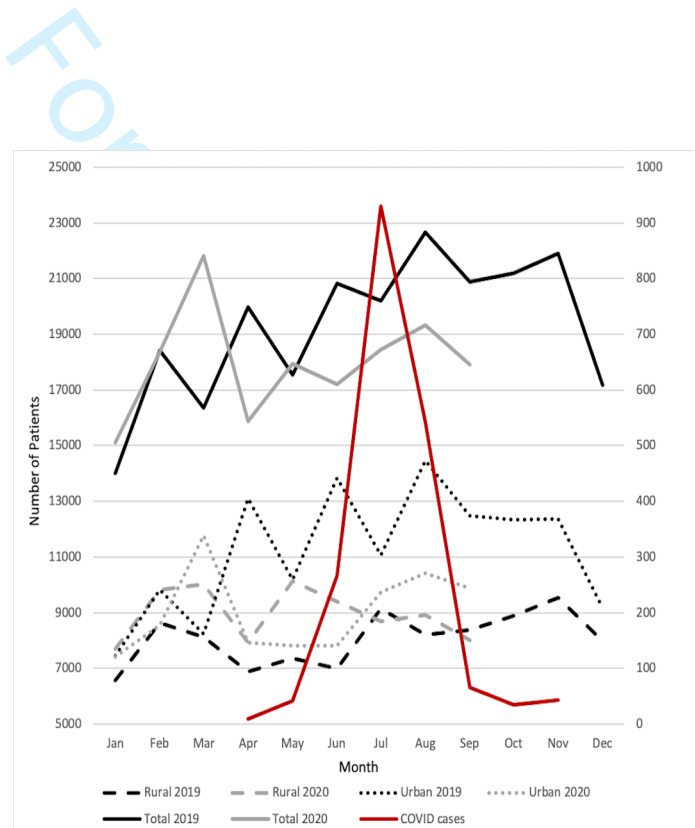
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Summary of COVID preparedness from 31 health facilities across Blantyre District (Urban vs Rural) from August – October 2020

		Urban			Rural		
		August	September	October	August	September	October
Staff training		August	September	October	August	September	October
All frontline workers	Percentage trained in COVID-19	41.10%	67.10%	80.70%	63.10%	73.80%	84.70%
Hand washing		August	September	October	August	September	October
HWF at entrance	Percentage of facilities	33.33%	33.3%	25.0%	36.8%	37%	42.1%
HWF at OPD	Percentage of facilities	67%	33.3%	41.7%	68.4%	74%	78.9%
HWF HIV	Percentage of facilities	8%	16.67%	8.33%	31.58%	26%	31.58%
HWF at EPI	Percentage of facilities	8%	0.00%	0.00%	26.32%	11%	5.26%
HWF at Maternity / antenatal	Percentage of facilities	17%	8.33%	33.33%	73.68%	68%	47%
HWF at toilets	Percentage of facilities	0%	0.00%	0.00%	10.53%	0%	0%
HWF in consultation room	Percentage of facilities	25%	33.33%	8.33%	36.84%	26%	11%
No. HWF per facility	Average number per facility	1.58	1.25	1.27	2.14	2.22	2.11
HWF with soap and water	Percentage with	31.58%	28.57%	28.57%	46.00%	44.44%	33.33%
HWF with water only	Percentage with	68.42%	64.29%	71.43%	52.00%	55.56%	66.67%
Hand sanitiser	Number with access (from 31)	2	1	0	1	1	0
Temperature checks		August	September	October	August	September	October
Thermometer available	Number with access (from 31)	1	4	2	8	4	2
Checks at entrance	Number of the 31 health facilities	0	1	0	0	0	0
Checks at waiting area	Number of the 31 health facilities	0	0	0	0	0	1
Checks in consultation room	Number of the 31 health facilities	1	3	0	7	4	0
Masks		August	September	October	August	September	October
Surgical masks available	Percentage of facilities with available	91.67%	100.00%	83.33%	84.21%	100.00%	89.47%
N95 masks available	Percentage of facilities with available	16.67%	25.00%	66.67%	52.63%	42.11%	42.11%

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<i>Mask wearing</i>							
Health workers (non nursing)	Always wearing	41.67%	50.00%	8.33%	15.79%	47.37%	26.32%
	Sometimes wearing	58.33%	50.00%	83.33%	42.11%	47.37%	57.89%
	Not wearing	0.00%	0.00%	8.33%	42.11%	5.26%	15.79%
Nurses	Always wearing	27.27%	50.00%	25.00%	26.32%	42.11%	26.32%
	Sometimes wearing	63.64%	16.67%	66.67%	31.58%	36.84%	47.37%
	Not wearing	9.09%	33.33%	8.33%	42.11%	21.05%	26.32%
Auxiliary staff	Always wearing	16.67%	50.00%	0.00%	5.26%	36.84%	21.05%
	Sometimes wearing	50.00%	41.67%	25.00%	47.37%	31.58%	63.16%
	Not wearing	33.33%	8.33%	75.00%	47.37%	31.58%	15.79%
Patients	Always wearing	0.00%	33.33%	0.00%	0.00%	5.26%	5.26%
	Sometimes wearing	41.67%	66.67%	91.67%	21.05%	57.89%	57.89%
	Not wearing	58.33%	0.00%	8.33%	78.95%	36.84%	36.84%
Guardians	Always wearing	0.00%	41.67%	0.00%	0.00%	5.26%	5.26%
	Sometimes wearing	8.33%	41.67%	91.67%	5.26%	57.89%	57.89%
	Not wearing	91.67%	16.67%	8.33%	94.74%	36.84%	36.84%
<i>Mask type</i>							
Health workers (general)	Surgical	74.43%	80.00%	84.62%	76.92%	66.67%	94.12%
	N95	28.57%	13.33%	15.38%	23.08%	22.22%	5.88%
	Cloth	0.00%	6.67%	0.00%	0.00%	11.11%	0.00%
Nurses	Surgical	76.92%	88.89%	91.67%	84.62%	78.95%	93.33%
	N95	23.08%	11.11%	8.33%	15.38%	21.05%	6.67%
	Cloth	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Auxiliary staff	Surgical	77.78%	83.33%	75.00%	84.62%	86.67%	100.00%
	N95	22.22%	8.33%	8.33%	15.38%	13.33%	0.00%
	Cloth	0.00%	8.33%	16.67%	0.00%	0.00%	0.00%
Patients	Surgical	42.86%	40.91%	35.00%	80.00%	42.86%	38.10%
	N95	0.00%	4.55%	10.00%	0.00%	0.00%	4.76%
	Cloth	57.14%	54.55%	55.00%	20.00%	57.14%	57.14%

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Guardians	Surgical	50.00%	50.00%	40.00%	50.00%	42.86%	36.84%
	N95	0.00%	0.00%	5.00%	0.00%	4.76%	5.26%
	Cloth	50.00%	50.00%	55.00%	50.00%	52.38%	57.89%
Waste management		August	September	October	August	September	October
Pit	Number of the 31 health facilities	6	4	2	6	1	5
Incinerator	Number of the 31 health facilities	6	13	10	6	8	9
Open burning	Number of the 31 health facilities	0	3	0	0	2	5
Physical distancing		August	September	October	August	September	October
Physical distancing on arrival	Number of the 31 health facilities	5	6	3	4	8	3
	Word of mouth	50%	66.67%	25.00%	40.00%	75.00%	66.67%
	Chairs spaced	38%	16.67%	0.00%	60.00%	0.00%	0.00%
	Floor markings	13%	16.67%	0.00%	0.00%	25.00%	33.33%
Physical distancing in waiting area	Number of the 31 health facilities	7	9	6	6	9	7
	Word of mouth	45.46%	33.33%	42.67%	28.57%	50.00%	55.56%
	Chairs spaced	27.27%	16.67%	8.33%	74.43%	25.00%	0.00%
	Floor markings	27.27%	41.67%	33.33%	0.00%	25.00%	44.44%
Physical distancing in consultation area	Number of the 31 health facilities	9	6	5	7	11	9
	Word of mouth	54.55%	25.00%	0.00%	50.00%	26.67%	20.00%
	Chairs spaced	45.46%	50.00%	41.67%	50.00%	73.33%	70.00%
	Floor markings	0.00%	0.00%	0.00%	0.00%	0.00%	10.00%
Physical distancing in wards	Number of the 31 health facilities	1	0	0	1	2	1
	Word of mouth	100.00%	0.0%	0.0%	33.33%	0.00%	0%
	Chairs spaced	0.00%	0.0%	0.0%	66.67%	100.00%	100%
	Floor markings	0.00%	0.0%	0.0%	0.00%	0.00%	0%
Case management		August	September	October	August	September	October
Isolation room	Number of the 31 health facilities	1	2	2	2	2	2
Presence of suspected cases	Number of the 31 health facilities	8	8	8	8	7	11

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Action to take when case is available	Give a mask	11.11%	0.00%	11.11%	16.5%	8.70%	10.53%
	Isolation	33.33%	16.67%	44%	32.1%	30.43%	31.58%
	Call covid-19 team at DHO	33.33%	50.00%	33%	39.8%	34.78%	31.58%
	Call hotline number	0.00%	16.67%	0%	10.0%	13.04%	5.26%
	Other	22.22%	16.67%	11%	11.4%	13.04%	21.05%

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Research Checklist

#1	<p>Title</p> <p>Concise description of the nature and topic of the study identifying the study as qualitative or indicating the approach (e.g. ethnography, grounded theory) or data collection methods (e.g. interview, focus group) is recommended.</p>	<p>Page 1</p>
#2	<p>Abstract</p> <p>Summary of the key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results and conclusions.</p>	<p>Page 3</p>
#3	<p>Introduction</p> <p>Problem formulation</p> <p>Description and significance of the problem / phenomenon studied: review of relevant theory and empirical work; problem statement.</p>	<p>Pages 4, 5</p>
#4	<p>Purpose or research question</p> <p>Purpose of the study and specific objectives or questions.</p>	<p>Page 6</p>
#5	<p>Methods</p> <p>Qualitative approach and research paradigm</p> <p>Qualitative approach (e.g. ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g. postpositivist, constructivist / interpretivist) is also recommended; rationale. The</p>	<p>Pages 6, 7</p>

	<p>rationale should briefly discuss the justification for choosing that theory, approach, method or technique rather than other options available; the assumptions and limitations implicit in those choices and how those choices influence study conclusions and transferability. As appropriate the rationale for several items might be discussed together.</p>	
#6	<p>Researcher characteristics and reflexivity</p> <p>Researchers' characteristics that may influence the research, including personal attributes, qualifications / experience, relationship with participants, assumptions and / or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results and / or transferability.</p>	
#7	<p>Context</p> <p>Setting / site and salient contextual factors; rationale.</p>	Page 5
#8	<p>Sampling strategy</p> <p>How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g. sampling saturation); rationale.</p>	Pages 6, 7
#9	<p>Ethical issues pertaining to human subjects</p>	Page 8

	Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues.	
#10	<p>Data collection methods</p> <p>Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources / methods, and modification of procedures in response to evolving study findings; rationale.</p>	Pages 6, 7
#11	<p>Data collection instruments and technologies</p> <p>Description of instruments (e.g. interview guides, questionnaires) and devices (e.g. audio recorders) used for data collection; if / how the instruments(s) changed over the course of the study.</p>	Page 6,7
#12	<p>Units of study</p> <p>Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results).</p>	Pages 6,7
#13	<p>Data processing</p> <p>Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymisation / deidentification of excerpts.</p>	Page 7,8

#14	<p>Data analysis</p> <p>Process by which inferences, themes, etc. were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale.</p>	Page 7,8
#15	<p>Techniques to enhance trustworthiness</p> <p>Techniques to enhance trustworthiness and credibility of data analysis (e.g. member checking, audit trail, triangulation); rationale.</p>	Page 7
#16	<p>Results/findings</p> <p>Syntheses and interpretation</p> <p>Main findings (e.g. interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory.</p>	Pages 9-19
#17	<p>Links to empirical data</p> <p>Evidence (e.g. quotes, field notes, text excerpts, photographs) to substantiate analytic findings.</p>	Pages 9-19
#18	<p>Discussion</p> <p>Intergration with prior work, implications, transferability and contribution(s) to the field</p>	Pages 19-21

	Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application / generalizability; identification of unique contributions(s) to scholarship in a discipline or field.	
#19	Study strength and Limitations Trustworthiness and limitations of findings.	Page 21
#20	Other Conflicts of interest Potential sources of influence of perceived influence on study conduct and conclusions; how these were managed.	Page 22
#21	Funding Sources of funding and other support; role of funders in data collection, interpretation and reporting.	Page 22
#22	Author contributions Role of each other in the study and their contributions	Page

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Preparedness for and impact of COVID-19 on primary health care delivery in urban and rural Malawi: a mixed methods study

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3 1 **Title: Preparedness for and impact of COVID-19 on primary health care delivery in urban**
4 **and rural Malawi: a mixed methods study**

5
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3 21 **Abstract**

4 22 **Objective** Across Africa, the impact of COVID-19 continues to be acutely felt. This includes
5
6 23 Malawi, where a key component of health service delivery to mitigate against COVID-19 are
7
8 24 the primary health care facilities, strategically placed throughout districts to offer primary
9
10 25 and maternal health care. These facilities have limited infrastructure and capacity but are
11
12 26 the most accessible and play a crucial role in responding to the COVID-19 pandemic. This
13
14 27 study assessed health facility preparedness for COVID-19 and the impact of the pandemic
15
16 28 on health service delivery and frontline workers.

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18
19 30 **Setting** Primary and maternal health care in Blantyre District, Malawi.
20
21 31

22
23 32 **Participants** We conducted regular visits to 31 health care facilities and a series of telephone-
24
25 33 based qualitative interviews with frontline workers (n=81 with 38 participants) between August
26
27 34 2020 and May 2021.
28
29 35

30 36 **Results** Despite significant financial and infrastructural constraints health centres continued to
31
32 37 remain open. The majority of frontline health workers received training and access to
33
34 38 preventative COVID-19 materials. Nevertheless, we found disruptions to key services and a
35
36 39 reduction in clients attending facilities. Key barriers to implementing COVID-19 prevention
37
38 40 measures included periodic shortages of resources (soap, hand sanitizer, water, masks, staff).
39
40 41 Frontline workers reported challenges in managing physical distancing and in handling
41
42 42 suspected COVID-19 cases. We found discrepancies between reported behaviour and practice,
43
44 43 particularly with consistent use of masks, despite being provided. Frontline workers felt COVID-
45
46 44 19 had negatively impacted their lives. They experienced fatigue and stress due to heavy
47
48 45 workloads, stigma in the community, and worries about becoming infected with and
49
50 46 transmitting COVID-19.

51 47
52 48 **Conclusion** Resource (human and material) inadequacy shaped the health facility capacity for
53
54 49 support and response to COVID-19, and frontline workers may require psychosocial support to
55
56 50 manage the impacts of the COVID-19 pandemic.
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3 53 **Summary box**

4 54 **Study strengths and limitations**

- 5
6 55 • Using a mixed method approach allowed us to capture data in real time from across
7
8 56 the district and gain an in-depth understanding of the findings.
9
10 57 • Qualitative interviews allowed participants to express their lived realities through
11
12 58 conducting interviews at different time points, we were able to capture changes in
13
14 59 risk perception across the pandemic.
15
16 60 • Quantitative structured data collection tools enabled data to be captured through
17
18 61 direct observations at each health care facility allowing for triangulation of findings
19
20 62 captured through the qualitative interviews.
21
22 63 • Collecting data from health care facility registers was challenging and required
23
24 64 efforts to compare registers to centralised health management information records
25
26 65 which due to staff shortages were not always consistent.
27
28 66 • We only interviewed frontline workers, meaning that findings around patient
29
30 67 behaviour were filtered through frontline workers perspectives.
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69 Introduction

70 Since COVID-19 was identified in Wuhan, China in late 2019, this highly infectious
71 respiratory disease has spread across the world causing a complex global health crisis. The
72 devastating impact of the pandemic has been felt both within and beyond the health sector
73 (1). Research has demonstrated the extreme pressure on health workers to both treat
74 patients with COVID-19, and also to maintain essential services (2). In low-and-middle
75 income contexts, where health systems are often fragile and care-seeking pathways for
76 patients more challenging, the ramifications of the pandemic are being felt in complex ways
77 (3).

78
79 The global response to the pandemic has seen development and roll-out of vaccines to
80 prevent severe disease and hospitalisation at an unprecedented speed. However, the global
81 distribution of vaccines has seen significant inequalities with low-income countries,
82 particularly those in sub-Saharan African having some of the lowest vaccine coverage (4).

83
84 Prior to COVID-19, sub-Saharan African health systems have often been under-resourced
85 and faced critical shortages of health care-workers. Recent studies have demonstrated that
86 water, sanitation, and hygiene (WASH) infrastructure, a crucial component of good hygiene
87 and infection control, is significantly constrained in the region (5). Only half of health
88 facilities have basic access to water, and even less to soap or alcohol based hand sanitizer
89 (6–8). During the COVID-19 pandemic, the situation has been further exacerbated by global
90 shortages in access to Personal Protective Equipment (PPE) increasing the risk to health care
91 workers and patients (9,10). Psychosocial well-being of health care workers across the globe
92 has been detrimentally impacted both by overwhelming workloads and providing patient
93 care with inadequate PPE (11,12).

94
95 Disruptions to health services have had both a direct and indirect impact on mortality, as
96 care for all patients is affected (13). Recent work from the World Health Organization
97 (WHO) analysed data on attendance for five key essential services (outpatient and inpatient
98 admission, skilled birth attendance, treatment of confirmed malaria cases and provision of
99 the combination pentavalent vaccine) from 14 countries in Africa, and found a reduction of

1
2
3 100 50% in May, June and July 2020 (14). This work speaks to the importance of capturing the
4 101 impacts of COVID-19 on health service delivery in a wide range of contexts.
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6 102

7
8 103 In April 2020, responding to the first confirmed cases of COVID-19 in Malawi, the
9
10 104 government closed international borders, suspended all international flights, closed
11
12 105 educational institutions, banned large gatherings and mandated face coverings (15). Legal
13
14 106 injunctions prevented the implementation of any other restrictions of movement (16). In
15
16 107 Sub-Saharan Africa, there was significantly lower recorded deaths and cases than initial
17
18 108 models projected (17,18). However, testing capacity has been extremely limited meaning
19
20 109 that an accurate picture of transmission has been challenging. Reflecting wider regional
21
22 110 trends Malawi recorded lower than predicted deaths and hospitalisations. In May 2020,
23
24 111 initial modelling work projected up to 435,000 hospitalisations with up to 50,000 deaths in
25
26 112 the first year of the pandemic. However, the first wave (March-September 2020) saw 185
27
28 113 deaths with 6,049 and cases recorded (19). Subsequent immunological work has found that
29
30 114 by July 2021 there was high seropositive (Blantyre, 81.7%; Mzuzu, 71.0%) suggesting a
31
32 115 higher rate of cases than was reported in official statistics (20). Recent work in Malawi, has
33
34 116 found that the COVID-19 pandemic impacted on TB case notification (21).
35

36 117
37 118 Primary health care facilities are central to Malawi's health service and provide a range of
38
39 119 services including outpatient department (OPD), family planning (FP), maternal and child
40
41 120 health (MCH), expanded programme of immunisation (EPI), tuberculosis (TB) testing and
42
43 121 treatment, HIV testing, counselling and treatment, and cancer screening. The outpatient
44
45 122 facilities are one of the most important entry points into the health system and where most
46
47 123 suspected COVID-19 cases will present. Any changes to service delivery in these facilities is
48
49 124 likely to have significant impacts on long term health outcomes. This study was guided by
50
51 125 three research objectives: (1) to assess preparedness for the pandemic in health facilities in
52
53 126 Blantyre District; (2) to understand front-line workers experiences of providing care during
54
55 127 COVID-19; and (3) to create feedback loops for assessment results to the district health
56
57 128 office to help inform COVID-19 action plans.

129 **Methods**

130 **Study context**

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2
3 131 The Malawian health system is structured around three levels, tertiary (large referral
4 132 hospitals situated in major urban centres), secondary (district hospital) and primary (health
5 133 facilities, community, and home-based services). Funding for the health sector is heavily
6 134 dependent on international donors (22). Health services are provided by government,
7
8 135 private and faith-based organisations; government services are the only ones provided
9
10 136 without fees and recent estimates suggest they provide approximately 60% of services
11
12 137 accessed (23,24). Despite policies being well-designed, key challenges faced in the health
13
14 138 sector include chronic underfunding, shortage of staff and fragmentation of services (24).
15
16 139 The District Health Office is mandated to provide management and oversight of primary
17
18 140 health care facilities (25). This study was situated in Blantyre district in the Southern region,
19
20 141 which is serviced by 31 government and faith based primary health care facilities (n=14
21
22 142 urban; n=17 rural)(see supplementary 1 for further characteristics of the facilities). The
23
24 143 district has a total population of 1.25 million including Blantyre city (64%), the second
25
26 144 largest city in Malawi. The study ran from April 2020 – August 2021. This encompassed the
27
28 145 first and second waves of the COVID-19 pandemic in Malawi and the national rollout of the
29
30 146 preventative vaccine.

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33 148 **Study Design**

34
35 149 To understand the impact of COVID-19 on primary health care provision we used a mixed
36
37 150 method approach. Combining qualitative and quantitative research methods allowed us to
38
39 151 capture data from across the district and gain a deeper understanding of the findings
40
41 152 through qualitative interviews. All data collection tools were developed in consultation with
42
43 153 the Blantyre District Health Office and were reviewed regularly through feedback loops to
44
45 154 help inform service delivery improvements. Field work was conducted in two phases:

46 155 Phase 1: July – November 2020

47
48 156 For this phase we aligned qualitative and quantitative approaches to understand the impact
49
50 157 of the first wave of the pandemic. Quantitative structured data collection tools were
51
52 158 selected to enable real time data to be captured through direct observations at each health
53
54 159 care facility. Tools focused on the key components of the National COVID-19 Preparedness
55
56 160 and Response Plan (26), reporting on preparedness proxies (e.g. hand washing facilities,
57
58 161 soap, thermometers), and observed behaviour of frontline workers (inclusive of health care
59
60 162 workers and auxiliary staff) and clients (e.g. mask wearing, physical distancing)(see

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2
3 163 supplementary 2). Qualitative interviews were selected because they allowed frontline
4 164 workers to express their lived realities and explore a range of themes flexibly (27).
5
6 165 Conducting interviews at different time points allowed us to capture health workers
7
8 166 changing perceptions and experiences across the dynamic period of the pandemic. To
9
10 167 reduce the risk of COVID-19 transmission with prolonged contact with participants we
11
12 168 conducted qualitative interviews over the telephone.

13
14 169 Phase 2: April - August 2021

15 170 Following the second wave of the pandemic and the national roll out of the COVID-19
16
17 171 vaccine, we conducted a second phase of qualitative interviews. These interviews sought to
18
19 172 understand the perception of, and response to, the vaccine within primary health care
20
21 173 clinics.

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23 174

24 175 **Data collection**

25 176 *Quantitative methods*

26 177 Quantitative assessments were only conducted during the first phase of the study (July –
27
28 178 Nov 2020). Working in all 31 rural and urban health facilities in Blantyre District, we
29
30 179 collected structured data at three-time points (August, September, and October 2020).
31
32 180 Experienced researchers administered a questionnaire with the clinician responsible for
33
34 181 managing the health facility or their representative. All quantitative data were collected
35
36 182 using a pre-programmed questionnaire on KoboCollect (<https://www.kobotoolbox.org>)(see
37
38 183 supplementary 3). The questions included data on patient management, physical distancing,
39
40 184 water, sanitation and hygiene (WASH) provision and practices, the presence and use of
41
42 185 personal protective equipment (PPE) and patient attendance at routine health services. The
43
44 186 team photographed clinic registers (without any identifying patient data) for OPD, EPI, TB,
45
46 187 FP, HIV and cancer screening services; this data was collected from January 2019 to
47
48 188 September 2020 to allow for comparison of patient numbers pre-COVID.

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51
52 190 Following analysis of each round of data collection, “score cards” were generated for each
53
54 191 health facility. The score cards summarised how the health care facilities were
55
56 192 implementing COVID-19 preventative measures, including training of frontline staff and
57
58 193 WASH materials. This included the location and presence of hand washing facilities
59
60 194 (including soap and water), stock and use of PPE including face masks and thermometers,

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3 195 waste management, and case management of suspected COVID-19 cases. These scorecards
4 196 were then provided to the District Health Office team through monthly feedback loops, to
5 197 provide guidance on which health care facilities had managed to adapt their practices, and
6 198 which facilities required further support.
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10 199

11 200 *Qualitative research*

12 201 Qualitative assessments were undertaken across both phases of the study. Following the
13 202 generation of the scorecards from initial quantitative data collection, eight health care
14 203 facilities were purposively sampled to be included in the qualitative component. In the
15 204 sample, we included both rural (n=4) and urban facilities (n=4). In these health care
16 205 facilities, we conducted a total of 81 interviews with 38 participants, all frontline workers. In
17 206 Table 1, we provide a breakdown of the participants included in each round of the
18 207 interviews and the number conducted at each time point. Semi-structured qualitative
19 208 interviews were conducted over the telephone and guided by a discussion guide (see
20 209 supplementary 4). These interviews happened at five-time points (July-August, September,
21 210 October-November 2020, and April-May and August 2021) to allow us to capture the
22 211 dynamic nature of the pandemic and the rollout of the vaccine programme.
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35 213 For each round of the interviews, we used a purposive sampling approach which aimed to
36 214 sample a wide range of frontline workers including those employed in support and
37 215 operations at the health facilities. In July/August, we included auxiliary staff (guards, ground
38 216 staff, patient attendants and cleaners) recruiting up to four participants in each health care
39 217 facility. In September 2020, due to time and resource constraints, we repeated interviews
40 218 with 2 participants per healthcare facility, this sample included both a health worker and an
41 219 auxiliary worker. In October/November 2020, we conducted a third set of interviews with
42 220 the healthcare facility in-charges, those who manage the clinic (or their representative),
43 221 these interviews focused more on broader changes to care provision. Between April and
44 222 August 2021, we undertook a second phase of interviews with in-charges (or their
45 223 representative). Key themes included experiences delivering care during the COVID-19
46 224 pandemic. Participants were asked during the interviews to reflect on the pandemic
47 225 including preparedness of clinics and training on COVID-19, changes in the provision of care
48 226 as well as perceived changes in patient behaviour. Finally, the impact of working during the
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3 227 pandemic on frontline workers' well-being and lives. The second phase of interviews
4 228 explored the rollout of the COVID-19 vaccination programme and its impacts on patient
5 229 attendance. We took a pragmatic approach to sampling, constrained by conducting
6 230 fieldwork during the pandemic and financial limitations and did not seek to achieve data
7 231 saturation. However, we did generate a significant of data through the 81 interviews from a
8 232 range of participants which was triangulated with quantitative data and structured
9 233 observations.
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17 235 **Data analysis**

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19 236 Quantitative discrete data related to COVID preparedness within the facility was
20 237 downloaded from KoboCollect (<https://www.kobotoolbox.org>) as a .csv file, cleaned and
21 238 analysed using Microsoft Excel V16 (Microsoft Corporation, Redmond, WA). Continuous
22 239 data related to the department and attendance from health records were abstracted from
23 240 photographs to Microsoft Excel V16 (Microsoft Corporation, Redmond, WA) for comparative
24 241 analysis between 2019 and 2020 attendance across specific services. All data were analysed
25 242 for Blantyre as a whole, and as a comparison between urban and rural facilities.
26 243 For the qualitative data we used thematic content analysis (28)(see supplementary 5 for
27 244 coding strategy). All transcripts were transcribed and imported into NVIVO 12 (QSR,
28 245 International) to facilitate data management and analysis. Initial themes were identified and
29 246 key gaps were included in subsequent rounds of data collection. The study team (drawing
30 247 together the quantitative and qualitative researchers) held weekly debriefing sessions to
31 248 allow for discussion of findings from each week's data collection. Any new avenues of
32 249 inquiry were incorporated into the data collection. Halfway through the study, we
33 250 presented initial findings to the District Health Office to gain feedback and participant
34 251 checking.
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50 253 **Ethical approval**

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52 254 Ethical approval was granted from the National Health Science Research Committee
53 255 (#20/06/2534). For the qualitative interviews, the participant information sheet and consent
54 256 form were shared on WhatsApp before the interview to allow participants to review the
55 257 information. Before the research began, the information was reviewed again, and oral
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3 258 consent was taken from the participants. No data collected from the clinic, including clinic
4 259 registers contained patient's personal information.

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7 8 261 ***Patient and Public Involvement***

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10 262 This study was developed in partnership with the Blantyre District Health Office (DHO),
11 263 specifically the team leading the COVID-19 preparedness and response for primary health
12 264 care within Blantyre District. Halfway through the project we presented our initial findings
13 265 to the District Health COVID-19 Task Force during their weekly meetings for direct feedback,
14 266 incorporating their suggestions into the qualitative data collection.

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18 19 268 **Results**

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21 269 We present the qualitative and quantitative results concurrently around three themes: (1)
22 270 implementation of COVID response policies and practices; (2) impacts of COVID on health
23 271 service provision: and (3) the well-being of frontline workers. Table 2 illustrates a summary
24 272 of quantitative measures implemented in the healthcare facilities across the three-month
25 273 monitoring period. A breakdown of urban versus rural coverage is available as
26 274 supplementary material (S1) although no significant differences were noted.

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31 276 **Implementation of COVID-19 response policies and practices**

32 277 We found that clinics remained open throughout the pandemic. The District Health Office
33 278 (DHO) team were quick to implement training and provide new protocols to be followed to
34 279 reduce patient numbers. Over the initial three-month period of the pandemic there was a
35 280 steady increase in the number of facilities which had over 90% of frontline staff trained
36 281 (Month 1: 35%; Month 2: 48%; Month 3: 70%). However, infrastructure and resource
37 282 limitations meant implementing COVID-19 prevention measures, such as good hand hygiene
38 283 and social distancing was challenging. Limitations included lack of access to reliable running
39 284 water, over-crowded waiting areas and small consulting rooms. The provision of PPE was
40 285 limited particularly during the early part of the pandemic.

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45 287 **WASH**

46 288 There was an average of two moveable hand washing facilities (HWF) (e.g. buckets with
47 289 taps) available per facility. Despite this provision the uptake and use was low with only 33%

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3 290 adequately set up and used during the visits (Table 2). The limited use of HWF was
4
5 291 attributed by health workers to lack of time and support to manage and refill these buckets.
6
7 292 HWF access and use appeared to drop off as the three months progressed (Table 2), in line
8
9 293 with the reduced number of positive COVID-19 cases (Figure 1). It was difficult for the health
10
11 294 care facilities to channel clients through one entrance to ensure hand washing on arrival,
12
13 295 due to the open design of the facility. The location of HWF varied from clinic to clinic, and
14
15 296 there was little consistency in the provision and location of HWFs over the three-month
16
17 297 period in each facility. The highest concentration of consistent provision (i.e. available all
18
19 298 three months) was found at OPD service areas (Month 1: 71%; Month 2: 58.1%; Month 3:
20
21 299 54.8%). A relatively small proportion of HWFs were found with no soap or water available
22
23 300 over the three-month period (5.2%; 8.7%; 18.6%). This may be attributed to the fact that
24
25 301 77% of facilities had a tapped water supply within the facility compound, with only two
26
27 302 having to access water from a borehole in the community outside the facility. Intermittent
28
29 303 water cuts severely affected the ability of people in the facility spaces to implement good
30
31 304 handwashing. Staff at one facility reported having no access to potable water, which left
32
33 305 them relying on hand sanitiser, a scarce resource (Table 2). In this situation there was
34
35 306 insufficient sanitiser to share with patients, which meant patients were unable to wash their
36
37 307 hands during visits to the health facilities.

38
39 308 ...we are facing a challenge of water, which is making it difficult for us to wash our
40
41 309 hands. We just depend on hand sanitisers. We can't share them with the patients
42
43 310 because there isn't enough. **[Health Surveillance Assistant, IDI20, August 2020]**

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45 311
46
47 312 Of concern, was the low provision of soap at available hand washing facilities throughout
48
49 313 the study period, with this reducing to under 15% by October (Table 2); this was attributed
50
51 314 to several factors including stockouts, theft by clients, and lack of understanding by both
52
53 315 health workers and patients of the importance of soap in the reduction of COVID-19
54
55 316 transmission. Clients were more likely to follow social norms in washing hands with water
56
57 317 only. In the absence of water and soap, particularly in consultation rooms, it was concerning
58
59 318 to note low access to hand sanitiser for frontline workers, as a means of protecting both
60
319 themselves and clients from transmission between consultations. During health care facility
320 visits, there were times when the HWFs were only put out when the research team began
321 the assessment, indicating that there may have been some reflexive bias in observed

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3 322 practices. The team also noted that HWFs were often empty of water at the time of client
4 323 arrival and were only filled once patients were asked to collect water from communal water
5
6 324 points.
7

8 325

9
10 326 *Client screening and isolation*

11 327 Access to and use of thermometers for temperature checks was inconsistent with only 25%
12
13 328 of facilities having thermometers available at any given time (Table 2). Indication of fever
14
15 329 was established by visual assessment of patients during consultation, and no pre-
16
17 330 consultation checks were conducted to isolate potential cases from others in the waiting
18
19 331 areas. Sixty-one percent of the health care facilities had reported a suspected COVID-19
20
21 332 case by October 2020, with the main response being to provide the patient with a mask,
22
23 333 isolate where possible, and call the COVID-19 response team led by the DHO office for
24
25 334 advice and action.

26 335

27
28 336 *PPE*

29
30 337 The provision of PPE to health care facilities, particularly surgical masks, for frontline
31
32 338 workers was high (Table 2), although in early visits and interviews healthcare workers
33
34 339 reported shortages of PPE such as gloves, aprons, and masks. Of the PPE available, a small
35
36 340 amount initially supplied had expired and staff were reluctant to use it. As one medical
37
38 341 assistant commented:

39 342 We didn't have PPE. The PPE we were given had expired, so we were forced to move
40
41 343 consultations outside. Yes, for example the date of the face masks that we had at the
42
43 344 hospital had expired a long time ago [**Medical Assistant, IDI04, July 2020**].

44 345

45
46 346 However, supply improved in the later stages of the data collection, with healthcare
47
48 347 workers reporting more stable stock. For example, one Pharmacy Assistant reflected:

49
50 348 Previously, it was hard to work because we didn't have enough personal protective
51
52 349 equipment and as you know we reached a point of starting strikes. But as of now we
53
54 350 have the PPEs" [**Pharmacy Assistant IDI06, August 2020**].

55 351

56
57 352 Despite availability, we observed intermittent mask use. During the qualitative interviews,
58
59 353 frontline workers reported adhering to the mask wearing regulations, however even in
60

1
2
3 354 facilities where masks were available (83.9 – 100% of facilities in August 2020) the
4
5 355 quantitative team observed far less uptake than was reported, with less than 52% of health
6
7 356 and frontline workers wearing masks during periods of observation (Table 2). To understand
8
9 357 this, qualitative interviews conducted in September 2020, explored why frontline workers
10
11 358 may not wear masks. We asked this question in the third person to ensure that frontline
12
13 359 workers did not feel we were accusing them. The most common reason provided during
14
15 360 these interviews was that masks were uncomfortable and impacted health:

15 361 Some of the health workers that are not wearing a mask complain that the mask
16
17 362 gives them a headache, others say the reason why they don't wear a mask is
18
19 363 because they want free circulation of oxygen when breathing **[Clinical Officer, IDI13,**
20
21 364 **September 2020]**

22
23 365
24 366 Mask wearing (primarily cloth) by patients and guardians (family members taking care of
25
26 367 patients) was seen to increase from August 2020 (Patients not wearing: 74.2%; Guardians
27
28 368 not wearing: 96.8%) to September 2020 (Patients not wearing: 19.4%; Guardians not
29
30 369 wearing: 22.6%) with a slight decline again in October 2020 (Table 2). Across the dataset,
31
32 370 frontline workers reported some patients were reluctant to wear masks. They attributed
33
34 371 this behaviour to the uncomfortableness in wearing a mask.

35 372 Some people [patients] have been complaining that they suffocate when breathing
36
37 373 through a mask and other people don't even know how to properly wear the masks.
38
39 374 So those could be some of the reasons. **[Clinical Officer, IDI09, September 2020]**

40
41 375
42
43 376 Disposal of PPE was relatively consistent, with 77% of facilities burning materials in either an
44
45 377 incinerator or open fire. Although, seven facilities were still disposing of PPE and clinical
46
47 378 waste in an open pit which may expose others to infection and did not follow good clinical
48
49 379 practice.

50 380 51 52 381 *Physical distancing*

53 382 Up to 58% of health facilities attempted to implement some level of physical distancing
54
55 383 (Table 2), which reduced as the months progressed, and reported cases of COVID-19
56
57 384 declined. Physical distancing was particularly challenging upon arrival of patients, although
58
59 385 efforts were made to support distancing in the waiting and consultation areas through
60

1
2
3 386 directives from a frontline worker, spacing chairs or marking benches (Table 2). However,
4 387 during facility visits, clients were crowding with little maintenance of physical distance.
5
6 388 Frontline workers felt patients failed to physically distance from each other in the queues
7
8 389 because they wanted to be seen rapidly. This behaviour is likely to be shaped in part by long
9
10 390 waiting periods commonly reported in primary health facilities in Malawi.

11 391 As you know people are very difficult to deal with, they just maintain it for a short
12 392 period of time then they get closer to each other again, because they all want to
13 393 receive treatment quickly. **[Security guard, IDI02, July 2020]**

14 394

15 395 *Behavioural barriers for implementing COVID-19 prevention*

16 396 In addition to the limitations associated with infrastructure and consumables, we also
17 397 considered how behaviour of patients evolved throughout this period of the pandemic
18 398 shaping the ways people behaved at the health centre. At the start of the pandemic, health
19 399 workers reported patients feeling fearful, distrustful, and questioning whether COVID-19
20 400 was a hoax as well as making links to satanism. They felt this shaped treatment seeking
21 401 practices with patients staying away from the facilities (a point we return to in the next
22 402 theme) particularly in the early stages of the pandemic when there was a great deal of
23 403 uncertainty and fears patients may end up in isolation facilities. However, for those patients
24 404 who did attend the facilities, health workers felt they were initially cautious, but as time
25 405 went on, they saw a change in behaviour with less adherence to preventative measures. As
26 406 noted below:

27 407 People think that COVID-19 has vanished. I don't know where they're getting that
28 408 information from. They have stopped wearing masks and they are no longer washing
29 409 their hands on their own as before. So, I would say people are reckless now and are
30 410 back to their normal life **[Clinical Officer, IDI09 October 2020]**

31 411

32 412 Although not all health workers agreed with this, some reported patients were more
33 413 cautious about prevention and cooperative when it came to mask wearing and hand
34 414 washing for instance:

35 415 Yes, there have been some changes. People are now wearing masks and they are
36 416 also washing their hands. People are observing social distance. **[Clinical officer,**
37 417 **IDI04, October 2020]**

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3 418

4 419 Healthcare workers believed the change in patient behaviours was helped by the
5
6 420 government mandating mask wearing in public spaces. Some health facilities refused to
7
8 421 treat patients who were not wearing masks which meant patients modified their behaviour:

9
10 422 People [...] now obey all the measures that have been put in place at the facility such
11
12 423 as wearing a face mask, [which] is mandatory either at the facility or when travelling.
13
14 424 It has brought a great change because when we send them back, they inform others
15
16 425 in their community. And now people prepare when coming to the hospital because
17
18 426 they are afraid of being sent back without treatment [...] [**Ground labourer, IDI01,**
19 427 **August 2020**]

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22
23 429 However, some frontline workers felt such punitive measures had unintended
24
25 430 consequences. They reported that once patients started to be turned away, mask sharing
26
27 431 became far more common undermining prevention efforts:

28 432 We have however stopped sending them back because people were borrowing mask
29
30 433 from each other which is a big problem. So now we just inform the village chiefs to
31
32 434 inform their people to stop being reckless [**Clinical officer, IDI09, August 2020**]

33
34 435

35
36 436 Frontline workers felt public behaviour changed as community and religious leaders began
37
38 437 to spread public health messages that dispelled rumours and encouraged people to use a
39
40 438 mask:

41 439 The number of people that are wearing masks has now increased a lot [From April
42
43 440 2020]. The change has resulted from the meeting we had at the hospital here with
44
45 441 the village chiefs, where we explained to them that everyone should comply with the
46
47 442 preventive measures being implemented at the hospital when coming to the
48
49 443 hospital. Church leaders have also been encouraging people to wear masks. So our
50
51 444 village chiefs and church leaders have also played a major part. [**Nurse, IDI12,**
52 445 **August 2020**]

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56 447 By September 2020, frontline workers reported rumours about COVID-19 vaccines being
57
58 448 developed in the Global North that could cause harm to Malawians, which persisted when
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3 449 vaccines became available. Rumours linked serious vaccine side effects including death,
4 450 blood clots, losing fertility, or causing people to turn into animals. As noted here:

5 451
6
7
8 452 Some people were saying that the vaccine is associated with 666 and some were
9 saying that the vaccine is causing blood clotting, and some were saying that if you
10 453 receive the vaccine you may turn into some animal. **[Health Surveillance Assistant,
11 454 IDI15, Sept 2020]**

12
13
14 455 I have heard rumours that getting the vaccine will shorten your life span. Some say
15 456 that the vaccine will make you infertile. Others have been saying that the vaccine
16 457 causes blood clot. These rumours have been circulating through social media,
17 458 patients, and ordinary members of the public. **[Medical Assistant, IDI01, May 2021]**

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24 461 As the vaccines were rolled out in March and April 2021, health workers reported
25 462 widespread reluctance of both health workers and the wider community to vaccinate.
26
27 463 Safety concerns and trust issues between the public and health care facilities administering
28 464 the COVID-19 vaccine were reported, with rural facilities most affected. This impacted the
29 465 provision of services such as of injectable contraceptives, which women felt were COVID-19
30 466 vaccine in disguise.

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32
33
34 467 What I have observed is that people are still finding it hard to understand this
35 468 disease. And because of the COVID-19 vaccine people have been refusing to receive
36 469 injection treatments, fearing they [health workers] might inject them with the
37 470 COVID-19 vaccine. The turn up of patients coming for other services such as family
38 471 planning services has decreased, and I would say that trust between health workers
39 472 and the villagers when it comes to injections has declined. **[Clinical officer, IDI05,
40 473 May 2021]**

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44 474
45 475 However, over time, health workers did report changes in attitudes with people becoming
46 476 more trusting and accepting towards the COVID-19 vaccine. This was linked to evidence of
47 477 limited side effects through those that had vaccinated first. Additionally, working jointly
48 478 with influential people such as chiefs and church leaders also made communities more
49 479 receptive of the public health education that health workers were giving to encourage
50 480 vaccine uptake.

1
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3 481 People were encouraged to vaccinate after seeing that health workers and other
4 482 government officials received the vaccine, and nothing happened to them. **[Nurse,**
5 483 **IDI14, May 2021.**

6 484
7
8 485 We are working hand in hand with community leaders such as chiefs, and health
9 486 advisory committees and churches, so that people get enough messages on COVID-
10 487 19, and now they understand and accept. The health advisory committees act as a
11 488 bridge between the health workers and the communities. **[Medical Assistant, IDI01,**
12 489 **May 2021]**

13 490
14 491 In terms of gender, health workers reported more men than women getting vaccinated:
15 492 'Who showed up more to vaccinate?' 'All the people I found there were men.
16 493 (Medical assistant IDI26, August 2020).

17 494 Health workers linked this to some workplaces (including government offices) requiring all
18 495 their staff to be vaccinated. This may reflect the fact less women are employed in these
19 496 roles.

20 497 The number of people coming for the vaccine is increasing. We are hearing that
21 498 some companies are demanding that their employees vaccinate if they want to keep
22 499 their job. Some government companies are doing the same. That's perhaps why
23 500 people are vaccinating more than before. **[Clinical officer, IDI06, May 2021]**

24 501

25 502 **Impact of COVID-19 on routine health services**

26 503 Frontline workers felt that the COVID-19 pandemic had negatively impacted provision of
27 504 healthcare services. They cited cancellation of routine services such as screening for
28 505 cervical cancer and HIV viral load as two of the most significant impacts.

29 506 It is very challenging. Actually, the entire system came to a halt because we are all
30 507 focused on COVID-19. **[DHO representative, IDI August 2020]**

31 508

32 509 [...] recently some services have been stopped due to COVID-19, [e.g.] growth
33 510 monitoring services, cervical cancer screening and [HIV] viral load services. **[Clinical**
34 511 **Officer, IDI13, August 2020]**

35 512

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3 513 We found a reduction in the number of patients attending outpatient services from April
4 514 onwards, which corresponds with the first confirmed cases of COVID-19 in Blantyre District
5 515 (Figure 1). However, the facilities did not suspend all services, rather adapted strategies for
6 516 providing healthcare. For instance, people with HIV or TB normally received a three-month
7 517 dosage but were getting prescriptions for six months. As one District Health Office
8 518 representative narrated the reason for the modification was to reduce in-person
9 519 consultations and decongest the clinics.

15 520 Review clinics for HIV and TB patients have been extended, so instead of giving them
16 521 medical supplies for 3 months we are giving them medicine supplies of 6 months so
17 522 that we should try to reduce congestion and minimize time of contact with these
18 523 patients. **[DHO representative IDI August 2020]**

22 524

24 525 Patients' attendance reduced for TB services (Figure 2) could therefore reflect the extended
25 526 period for which clients received drugs as opposed to reduced attendance and should be
26 527 assessed over a more prolonged period to determine if service delivery was affected.

28 528 We also found modifications in the way child vaccination was offered. Rather than following
29 529 the immunisation calendar, mothers were grouped and assigned new vaccination dates.

33 530 Those [in need of vaccination] have been divided into several groups and each group
34 531 is told to come on their own specific day. **[Hospital attendant, IDI18, August 2020]**

36 532

39 533 Despite these efforts, and overall reduction in immunisation was seen in attendance
40 534 records, particularly in relation to facilities located in urban areas. This may reflect the
41 535 higher perceived risk of COVID-19 in urban contexts (Figure 3).

44 536 Similarly, delivery of reproductive health services was altered, with women accessing family
45 537 planning given instructions to self-administer the injection at home. However, this strategy
46 538 raised important questions about disposal and safety of used syringes and needles in the
47 539 community.

51 540 And when it comes to family planning; women are being trained to inject themselves
52 541 at home so when they come here, we just give them all the required materials.

54 542 **[Clinical officer, IDI21, August 2020]**

56 543

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3 544 Adaptation of existing services may explain some of the reduction in access to family
4 545 planning services as cases of COVID-19 were seen to increase (Figure 4). The pandemic
5
6 546 interrupted the way daily facility data was being recorded. Data entry clerks, the staff
7
8 547 responsible for completing daily registers, were not included in the risk allowance provided
9
10 548 by the government. This led to long absences by this cadre from some of the facilities.

11 549 Our department is still not receiving the risk allowances [...] data officers were not
12
13 550 working due to the same issue, but they have just accepted the situation and have
14
15 551 resumed their work. **[Ground labour, IDI14, September 2020]**

16
17 552

18
19 553 As part of managing the risk of exposure, health workers reduced their days and the amount
20
21 554 of time spent at the health care facility, alternating between the different weeks.

22
23 555 Consequently, facilities closed earlier than normal, and this further impacted on patients
24
25 556 travelling long distances to access care:

26 557 The other thing is that we are told to work for a limited time which is less time than
27
28 558 before, but that is challenging for the patients that can't make it to the hospital on
29
30 559 time **[Hospital attendant, IDI04, August 2020]**

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32 560

33
34 561 It is difficult to assess the impact the lack of data clerks may have had on the records
35
36 562 maintained within health care facilities and reported here.

37
38 563

39 564 *Improved work practices*

40
41 565 Health workers also reflected on the positive lessons drawn from responding to COVID-19,
42
43 566 reflecting that prevention measures had shaped their work practices in ways that could be
44
45 567 useful for preventing other diseases in future:

46 568 It has encouraged us to observe hygiene; previously we used to wash our hands only
47
48 569 when we wanted to eat but now, we wash our hands regularly, after meeting each
49
50 570 patient. We also wear PPE such as masks, aprons and gloves which we never used to
51
52 571 do before COVID-19. We now observe social distancing. Social distancing protects us
53
54 572 from a lot of other diseases such as TB and others that transmit through droplets.
55
56 573 We will use masks even when COVID-19 is over. **[Medical assistant, IDI01,**
57
58 574 **November 2020]**

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3 576 **The impact of COVID-19 on frontline workers**

4 577 Frontline workers reported severe impacts on their well-being from working during the
5
6 578 pandemic. They faced constant anxiety about the risk of exposure, which appeared to be
7
8 579 two-fold. For non-clinicians, frontline workers articulated their concerns around regular
9
10 580 contact with clinicians who were seeing the patients:

11 581 I have worries because of the way things are right now [...] I work at the clinic and
12
13 582 sometimes I come into contact with the doctors and that worries me because you
14
15 583 wonder if all the patients that were in contact with the doctors have the disease.

16
17 584 **[Ground labourer, IDI03, September 2020]**
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19 585

20
21 586 Secondly, they saw themselves as potentially exposing others to the same risk they were
22
23 587 experiencing, and felt particularly concerned for their family members about this:

24 588 I feel worried that I may infect my little child and my whole family should I be
25
26 589 infected because it takes time for a person to notice if they have COVID-19. **[Clinical**
27
28 590 **Officer, IDI04, September 2020]**
29

30 591

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32 592 *Stress and helplessness*

33 593 There was a deep sense of helplessness among frontline workers about continuing to work
34
35 594 during the pandemic. Some frontline workers narrated their desire for a break from work
36
37 595 but felt powerless to act. Their lack of agency stemmed from a sense of social responsibility
38
39 596 to work but also the need to provide for their families. For most frontline workers they
40
41 597 continued to work because they could not afford to stop:

42
43 598 I cannot quit my job despite having so many worries because the job is what gives
44
45 599 me money for food. People are just going to work because they want to earn some
46
47 600 money for food, but everybody is worried. **[Medical Assistant, IDI16, September**
48
49 601 **2020]**

50 602

51
52 603 Some frontline workers also drew inspiration to continue to work from the principles of
53
54 604 humanitarianism and sacrifice. Responding to 'What motivates you to continue working
55
56 605 despite the situation?' one said, 'The desire to assist people.' This demonstrates that facility
57
58 606 workers felt an ethical duty to serve their communities despite the perceived risk:
59
60

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3 607 There is no way I can say we will stop going to work due to COVID-19, because that's
4 608 our job, assisting people. So, there is no way the hospital would be closed because of
5
6 609 the pandemic. **[Nurse, IDI10, August 2020]**
7

8 610

9
10 611 During July and August 2020, the Ministry of Health required all health workers to be tested
11 612 for COVID-19. This led to a significant proportion of health care workers being diagnosed.
12
13 613 The requirement for these health workers to self-isolate placed pressure and stress on staff
14 614 in health care facilities who still needed to deliver services.

15
16
17 615 We are working more than before the start of COVID-19 [...] because if say three
18 616 workers test positive to the virus, they go on quarantine, leaving behind more work
19 617 for their colleagues. **[Clinical officer, IDI21, September 2020]**
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23 618

24 619 *Wider community stigma*

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26 620 Across the dataset, we found consistent testimonies of frontline workers experiencing
27 621 stigma within the wider community because they were perceived to be the ones spreading
28 622 the virus. This may have been a result of the mass testing programme initiated by the
29 623 government. In this quote, one front-line worker shared his experience of being ostracized
30 624 by bus operators and fellow passengers simply because they were from the health service.

31
32 625 We fail to board a minibus when going to work because people say we will infect
33 626 them with the disease on the bus. [...] this other day I was in my work uniform
34 627 standing at the bus stop waiting to catch a minibus, but none of the buses stopped
35 628 and other people at the bus stop started accusing me that I was the reason why the
36 629 buses were not stopping." **[Ground labourer, IDI14, August 2020]**
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45 630

46 631 To mitigate this situation the district health officer reported providing health workers with
47 632 additional buses allowing them to get to work. Although only health workers were provided
48 633 access to the buses with other frontline workers left to find their own way to work.

49
50
51 634 They reported [the discrimination on public transport] to the head office and the
52 635 office hired staff buses which were carrying only health workers. But after
53 636 sometime, the buses stopped carrying them. **[Clinical officer, IDI13, September**
54 637 **2020]**
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3 639 Tension between health workers at the healthcare facility was also reported. Fear of
4 640 infection led to mistrust between health workers, particularly for those who were diagnosed
5 641 having COVID-19.

8 642 Some health workers diagnosed with COVID-19 were being ignored by fellow health
9 643 workers, saying they will infect them, and that was affecting them psychologically.

11 644 **[Clinical officer, IDI21, September 2020]**

13 645

15 646 **Discussion**

17 647 This mixed methods study took place during the COVID-19 pandemic, capturing real-time
18 648 data around how primary health care facilities (a critical access point for patients) prepared
19 649 for, and then responded to the pandemic. Exploring in-depth with a range of frontline
22 650 workers how the COVID-19 pandemic affected their work practices and lives more broadly.
24 651 Initial modelling predicted that Malawi would have a high rate of hospitalizations (up to
26 652 435,000) and deaths (with up to 50,000 deaths), but this did not materialise at the time of
28 653 this study (17). As a low-income country, the COVID-19 pandemic and response took place
30 654 in the context of severe resource constraints in terms of both health service delivery and
32 655 infection prevention and control infrastructure. Our research found that despite this
34 656 challenging context, primary healthcare facilities remained open, and patients continued to
35 657 seek care, albeit in lower numbers. Notable we did not find significant differences between
37 658 rural and urban facilities across either the availability and use of preventative measures, or
39 659 the uptake of routine services. The DHO led the rapid roll out of COVID-19 related training
41 660 to frontline health workers, implementing key COVID-19 preventative measures but this was
43 661 inhibited both by the absence of materials and limited infrastructure. Nevertheless, across
44 662 the interviews it was evident that the training improved awareness and understanding of
46 663 health workers in relation to COVID-19 prevention and management of suspected cases.
48 664 The numbers of people attending health care facilities was radically reduced, particularly
49 665 during the first peak with some key services suspended. Frontline workers reported that
52 666 patients were fearful and distrusting of the health system, particularly at the start of the
54 667 pandemic. From October, there were concerns around the safety of the COVID-19 vaccine.
55 668 Once vaccines were rolled-out health workers perceived that there was an impact on uptake
57 669 of vaccines and fear from patients when they did present. Health care workers reported a
59 670 gendered difference, with more men presenting for vaccination.

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3 671

4 672 Although pragmatic guidance was published for low and middle income countries (29), case
5 673 management of suspected COVID-19 cases at health care facilities was challenging, with
6 674 limited staff available for patient consultations. The layout of health care facilities made
7
8 675 managing patients, and reducing over-crowding while maintaining high hygiene standards
9
10 676 throughout the clinic difficult. This was compounded by inadequate resourcing (including a
11
12 677 lack of thermometers and access to isolation rooms). There was heavy reliance on the
13
14 678 centralised team from the District Health Office to respond and handle all suspected cases,
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16 679 which overburdened this team.

17 680

18
19 681 In some health care facilities, an authoritarian approach to increase patient's adherence to
20
21 682 mask wearing had a detrimental impact on prevention measures. We found that despite
22
23 683 frontline health workers reported stress and anxiety of contracting COVID-19, the uptake of
24
25 684 preventative measures including mask wearing was low, suggesting a complex relationship
26
27 685 between knowledge and behaviour. Frontline workers reported significant stigmatisation
28
29 686 and increased stress during work that impacted their lives.

30 687

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33 688 The fear, stress and anxiety reported by frontline workers in our study reflects trends across
34
35 689 the globe. Studies undertaken in a wide range of high-, middle-, and low-income contexts
36
37 690 speak to devastating impact COVID-19 had on health care workers' psychosocial well-being
38
39 691 (30,31). In sub-Saharan Africa, where health systems are more fragile, referral pathways are
40
41 692 more complex and access to PPE challenging; all contributed further stress to health care
42
43 693 workers. By including a wider cadre of staff including guards and patient attendants, we
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45 694 demonstrated that the psychosocial impact was not limited to frontline health care workers.
46
47 695 Our work speaks to the urgent need to provide psychosocial support for all frontline and
48
49 696 auxiliary workers.

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52 698 Our findings on the reductions in patient attendance and the disruptions to routine health
53
54 699 services reflect wider global trends. In Malawi, the pandemic has also seen increases in
55
56 700 teenage pregnancies, as well as reductions in TB case detection (21,32,33). This has both
57
58 701 immediate and future impacts on patient outcomes from preventable and treatable
59
60 702 diseases leading to wider implications for wider economic and social development.

703

704 Malawi currently has vaccine coverage of 5.6% one of the lowest in the world (34). In
705 Malawi, men are generally more likely to be employed than women (35), meaning
706 mandatory workplace vaccination may have made men more likely to access the vaccine
707 than women. Women's hesitancy to vaccinate was also centred around rumours related to
708 both fertility and complications associated with contraceptives.

709

710 The importance of hand hygiene in the prevention of communicable diseases, including
711 respiratory infections cannot be overemphasized, particularly with regard to COVID-19 and
712 wider IPC interventions (36–38). Prior to this pandemic, WASH campaigns were emphasising
713 the importance of hand washing with soap after toilet use and during consultations in
714 healthcare facilities (39–41). However, opportunities for hand washing in this setting were
715 rarely found, with reasons cited as lack of hand washing facilities, access to water, and the
716 need for constant maintenance (39–41). Nevertheless, our results indicate that despite the
717 provision of the necessary hand washing facilities and regular access to water, few health
718 facilities made adequate hand washing stations with soap or sanitisers available at either
719 toilets or other areas of the health care setting. Where they were available, their presence
720 was intermittent meaning that adherence to recommended hand hygiene practice (hand
721 washing with soap or use of hand sanitizer) was limited by patients, HCWs and auxiliary
722 staff. By failing to utilise the handwashing facilities available to them (i.e., keeping provided
723 buckets and soap in storage) health facility staff are indicating that they are either
724 overburdened, or do not understand the value of hand washing with soap in COVID-19
725 prevention and IPC practices. This was a missed opportunity to promote effective hand
726 washing with soap to the community members utilising the health care facilities, as lack of
727 proper hand hygiene in the healthcare facilities has been found to reflect inadequate
728 handwashing at the household level (42,43), as WASH norms are shared in community
729 settings (44). Research has demonstrated that the availability of WASH infrastructure (e.g.
730 hand washing facility with soap) in accessible locations motivates behaviour performance,
731 acts as a cue for action and enhances social norms (45). As such it is imperative that hand
732 washing facilities are made accessible to all staff and patients to promote their effective
733 use, and where possible supported with supervision, nudges and appropriate behaviour

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3 734 change techniques to improve hand hygiene in healthcare settings both for the short and
4 735 long term (46–48).

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8 737 Overall clinical waste management was found to be well managed in the majority of health
9 738 care facilities, with incineration of used masks being undertaken on a regular basis.

10 739 However, as found in previous reports in Blantyre, some masks were disposed of into open
11 740 pits which were potentially exposing community members to infection (49). A consistent

12 741 and context appropriate response to clinical waste management is needed for all health

13 742 care facilities to reduce the risk of infection transmission while taking into consideration the

14 743 environmental impacts of disposal in the long term (49).

15
16 744

17 745 Despite the limited resource in these settings, the findings of our study indicate an effective

18 746 cross sectoral approach over the ten month period of the pandemic, enabling the rapid

19 747 deployment of materials to support preventative measures (e.g. masks, HWF) and

20 748 vaccination, alongside structured guidance and training. However, we also expose the

21 749 limitations of providing these resources and expecting their immediate implementation and

22 750 sustained practice, where basic IPC practices were not already in place. Policy and

23 751 programming should take advantage of the tipping point created by the pandemic to ensure

24 752 long term sustained support and resource to these instrumental primary health care

25 753 facilities, to facilitate the maintenance of effective IPC practices for not only COVID-19 but

26 754 other communicable diseases as well.

27
28 755

29 756 **Limitations**

30 757 Our study has several limitations. As we were collecting data during the pandemic, we

31 758 limited the time the study team was in the health care facilities. Qualitative interviews were

32 759 conducted over the phone, which may have made it more challenging for the interviewer to

33 760 build rapport with participants and inhibited their responses. The study focused on frontline

34 761 workers, and we did not conduct interviews with patients, this means that findings around

35 762 patient behaviour was filtered through frontline workers perspectives. Due to time and

36 763 resource constraints, we only interviewed frontline workers at two time points, and only

37 764 interviewed HC facilities in-charges for the last two time point. The views of HC facilities in

38 765 charge may not be the same as frontline workers' experiences. Collecting data from health

766 care facility registers was challenging and required efforts to compare registers to
 767 centralised health management information records to ensure they were consistent. Longer
 768 term attendance data comparisons are also recommended to assess the impacts on key
 769 services.

770

771 **Conclusion**

772 Despite the significant challenges placed on health care facilities, they remained open and
 773 managed to maintain the majority of key services, albeit with reduced attendance. Although
 774 efforts were made to supply health care facilities with resources for COVID-19 prevention,
 775 there were limitations to their implementation (e.g. hand washing facility use with soap,
 776 mask wearing, etc). Complex factors seem to shape staff behaviours and knowledge did not
 777 always translate into practice. Providing additional supervision, support and training may
 778 lead to sustained adherence to preventative measures in the long term. Our study also
 779 speaks to the need to provide psychosocial support for all those working on the frontline in
 780 health facilities.

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782

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 785 supported by the University of Strathclyde through the SFC GCRF Escalator Fund.

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787

788 **Author Contribution statement**

Author	Contribution/Role in the study
Mackwellings Phiri	Data collection, analysis, paper writing
Eleanor MacPherson	Study design, lead, paper writing support
Mindy Penulo	Data collection, paper review
Kondwani Chidziwisano	Data analysis, paper writing support
Khumbo Kalua	Study lead, paper review
Chawanangwa Mahebere Chirambo	Data collection, paper review
Gift Kawalazira	Study lead, paper review
Zuziwe Gundah	Study lead, paper review
Penjani Chunda	Study lead, paper review
Tracy Morse	Study design, lead, paper writing support

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3 790 **Declaration of competing interest**

4 791 The authors declare that there is no conflict of interest.
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7
8 793 **Data sharing**

9 794 The data supporting results of this study are available on request from the Department of
10 795 Civil and Environmental Engineering, University of Strathclyde
11 796 (tracy.thomson@strath.ac.uk). For the qualitative research, we can provide second order
12 797 summaries of transcripts to ensure anonymity of participants.
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19 799 **Figure 1**

20 800 Outpatient service attendance 2019 versus 2020 with the number of positive confirmed
21 801 cases of COVID-19 in Blantyre District (n=27 health facilities)
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26 803 **Figure 2**

27 804 TB service attendance 2019 versus 2020 with the number of positive confirmed cases of
28 805 COVID-19 in Blantyre District (n=27 health facilities)
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33 807 **Figure 3**

34 808 Child health (including immunisation) service attendance 2019 versus 2020 with the number
35 809 of positive confirmed cases of COVID-19 in Blantyre District (n=27 health facilities)
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38 810

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40 811 **Figure 4**

41 812 Family planning service attendance 2019 versus 2020 with the number of positive confirmed
42 813 cases of COVID-19 in Blantyre District (n=27 health facilities)
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46 815 **References**

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Table 1: Summary of Qualitative Sampling

Health Facility	Location	Phase 1			Phase 2	
		July-August 2020	September 2020	November 2020	April-May 2021	August 2021
001clk	Rural	<ul style="list-style-type: none"> Hospital Attendant (IDI04) Medical Assistant (Clinic in charge) (IDI01) Security Guard (IDI02) Ground Labourer (IDI03) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI01) Ground Labourer (IDI03) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI01) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI01) Nurse (IDI28) Clinician (IDI29) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI01)
002mpm	Rural	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI08) Pharmacy Assistant (IDI06) Ground Labourer (IDI14) Health Surveillance Assistant (IDI15) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI08) Ground Labourer (IDI14) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI08) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI08) Nurse (IDI30) Health Surveillance Assistant (IDI15) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI08)
003mdk	Rural	<ul style="list-style-type: none"> Security Guard (IDI10) Clinical Officer (Clinic in charge) (IDI23) 	<ul style="list-style-type: none"> Security Guard (IDI10) Clinical Officer (Clinic in charge) (IDI23) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI23) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI23) Nurse (IDI31) Health Surveillance Assistant (IDI15) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI23)
004nmk	Rural	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI26) Hospital attendant (IDI25) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI26) Hospital attendant (IDI25) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI26) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI26) Nurse (IDI27) Health Surveillance Assistant (IDI15) 	<ul style="list-style-type: none"> Nurse (IDI27)
005nrd	Urban	<ul style="list-style-type: none"> Hospital Attendant (IDI18) Security Guard (IDI2) Nurse (Clinic in charge) (IDI11) 	<ul style="list-style-type: none"> Hospital attendant (IDI18) Nurse (Clinic in charge) (IDI11) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI11) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI11) Health Surveillance Assistant (IDI15) 	<ul style="list-style-type: none"> Nurse (Clinic in-charge) (IDI11)

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		<ul style="list-style-type: none"> Data Clerk (IDI07) 			<ul style="list-style-type: none"> Nurse (IDI35) 	
006gty	Urban	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI19) Ground Labourer (IDI09) Nurse (IDI13) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI19) Ground Labourer (IDI09) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI19) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in-charge) (IDI19) Nurse (IDI13) Health Surveillance Assistant (IDI36) 	<ul style="list-style-type: none"> Nurse (IDI13)
007slz	Urban	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI12) Hospital Attendant (IDI17) Security Guard (IDI16) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI12) Hospital attendant (IDI17) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI12) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI12) Clinical Officer (IDI37) Nurse (IDI38) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI12)
008bng	Urban	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI21) Clinician (IDI24) Health Surveillance Assistant (IDI20) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI21) Health Surveillance Assistant (IDI20) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI21) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in-charge) (IDI21) Clinician (IDI24) Health Surveillance Assistant (IDI20) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI21)

Table 2: Summary of COVID preparedness from 31 health facilities across Blantyre District from August – October 2020.

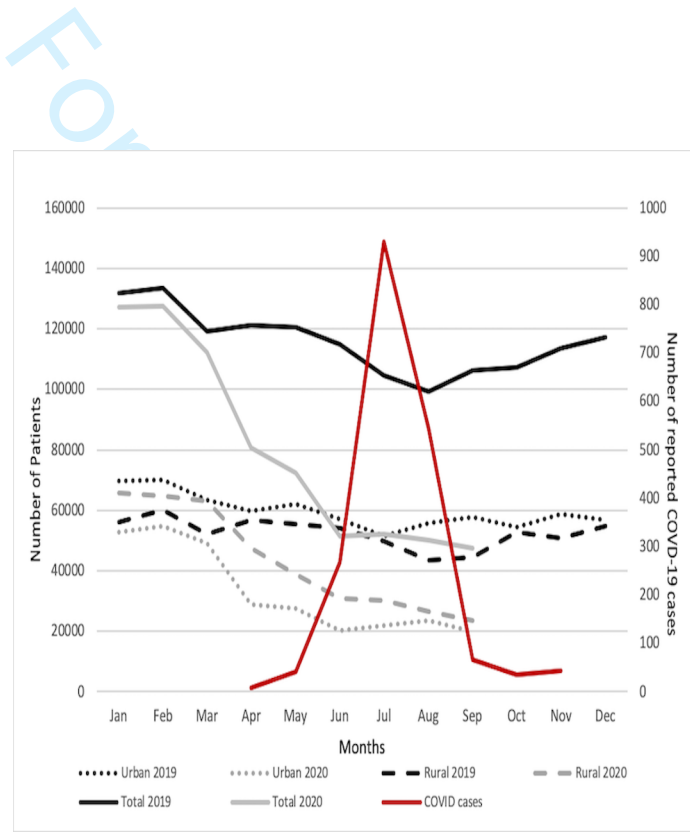
Staff training		August	September	October
All frontline workers	Percentage trained in COVID-19	51.6%	69.68%	80.4%
Hand washing		August	September	October
HWF at entrance	Percentage of facilities	32.3%	32.3%	32.3%
HWF at OPD	Percentage of facilities	71.0%	58.1%	54.8%
HWF HIV	Percentage of facilities	25.81%	22.58%	19.35%
HWF at EPI	Percentage of facilities	19.35%	6.45%	3.23%
HWF at Maternity / antenatal	Percentage of facilities	32.26%	32.26%	29.03%
HWF at toilets	Percentage of facilities	3.23%	0.00%	0.00%
HWF in consultation room	Percentage of facilities	32.26%	25.81%	9.68%
No. HWF per facility	Average number per facility	2.4	2.1	1.7
HWF with soap and water	Percentage with	32.0	29.5	14.9
HWF with water only	Percentage with	61.8	51.8	66.5
Hand sanitiser	Number with access (from 31)	3.0	2.0	0.0
Temperature checks		August	September	October
Thermometer available	Number with access (from 31)	9.0	8.0	4.0
Checks at entrance	Number of the 31 health facilities	0.0	1.0	0.0
Checks at waiting area	Number of the 31 health facilities	0.0	0.0	1.0
Checks in consultation room	Number of the 31 health facilities	8.0	7.0	0.0
Masks		August	September	October
Surgical masks available	Percentage of facilities with available	83.87%	100.00%	90.32%
N95 masks available	Percentage of facilities with available	38.71%	38.71%	35.48%
<i>Mask wearing</i>				
Health workers (non nursing)	Always wearing	25.8%	51.6%	19.4%
	Sometimes wearing	48.4%	45.2%	64.5%
	Not wearing	25.8%	3.2%	16.1%
Nurses	Always wearing	29.0%	51.6%	22.6%
	Sometimes wearing	38.7%	29.0%	54.8%
	Not wearing	32.3%	19.4%	22.6%
Auxiliary staff	Always wearing	6.5%	41.9%	12.9%
	Sometimes wearing	48.4%	35.5%	67.7%
	Not wearing	45.2%	22.6%	19.4%
Patients	Always wearing	0.0%	16.1%	3.2%
	Sometimes wearing	25.8%	64.5%	67.7%
	Not wearing	74.2%	19.4%	29.0%

Guardians	Always wearing	0.0%	19.4%	3.2%
	Sometimes wearing	3.2%	58.1%	67.7%
	Not wearing	96.8%	22.6%	29.0%
Mask type				
Health workers (general)	Surgical	68.97%	76.9%	92.9%
	N95	27.59%	15.4%	7.1%
	Cloth	3.45%	7.7%	0.0%
Nurses	Surgical	80.8%	85.2%	96.0%
	N95	19.2%	14.8%	4.0%
	Cloth	0.0%	0.0%	0.0%
Auxiliary staff	Surgical	81.8%	85.2%	88.9%
	N95	18.2%	11.1%	3.7%
	Cloth	0.0%	3.7%	7.4%
Patients	Surgical	53.3%	41.0%	35.9%
	N95	0.0%	2.6%	7.7%
	Cloth	46.7%	56.4%	56.4%
Guardians	Surgical	50.0%	44.4%	36.8%
	N95	0.0%	2.8%	5.3%
	Cloth	50.0%	52.8%	57.9%
Waste management				
Pit	Number of the 31 health facilities	9	5	7
Incinerator	Number of the 31 health facilities	19	21	19
Open burning	Number of the 31 health facilities	3	5	5
Physical distancing		August	September	October
Physical distancing on arrival	Number of the 31 health facilities	9	14	6
	Word of mouth	54%	69.2%	100%
	Chairs spaced	38%	15.4%	0%
	Floor markings	8%	15.4%	0%
Physical distancing in waiting area	Number of the 31 health facilities	13	18	13
	Word of mouth	41%	45.0%	52.9%
	Chairs spaced	41%	30.0%	41.2%
	Floor markings	18%	25.0%	5.9%
Physical distancing in consultation area	Number of the 31 health facilities	16	17	14
	Word of mouth	50%	33.3%	0.0%
	Chairs spaced	50%	66.7%	91.7%
	Floor markings	0%	0.0%	8.3%
Physical distancing in wards	Number of the 31 health facilities	6	2	1
	Word of mouth	37.50%	0.0%	0.0%
	Chairs spaced	62.50%	100.0%	100.0%
	Floor markings	0%	0.0%	0.0%

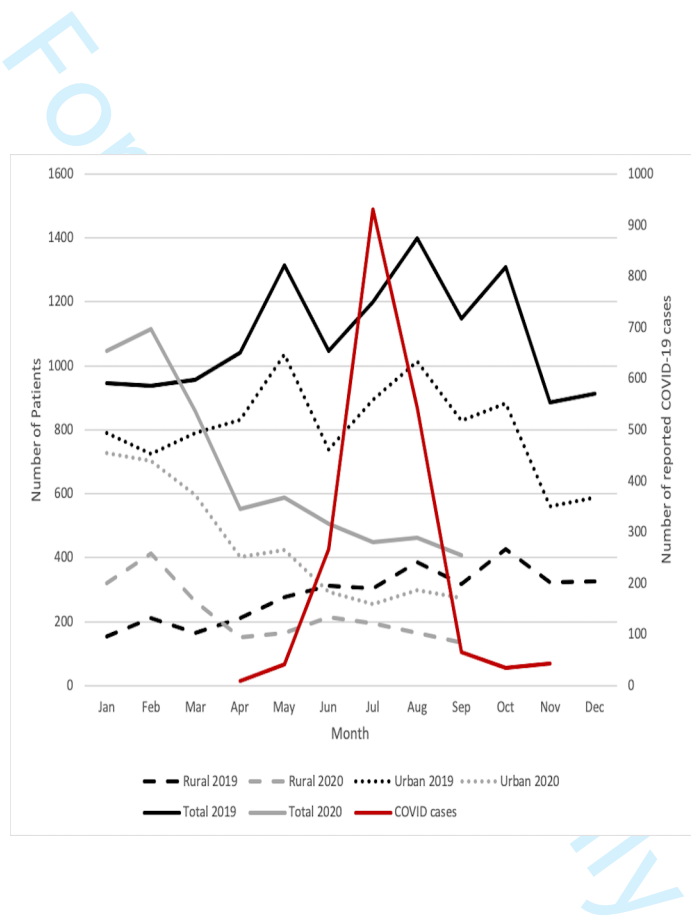
Case management		August	September	October
Isolation room	Number of the 31 health facilities	3	4	4
Presence of suspected cases	Number of the 31 health facilities	12	15	19
Action to take when case is available	Give a mask	11.11%	17.24%	17.07%
	Isolation	37.04%	31.03%	29%
	Call covid-19 team at DHO	40.74%	44.83%	29%
	Call hotline number	3.70%	0.00%	0%
	Other	7.41%	6.90%	24%

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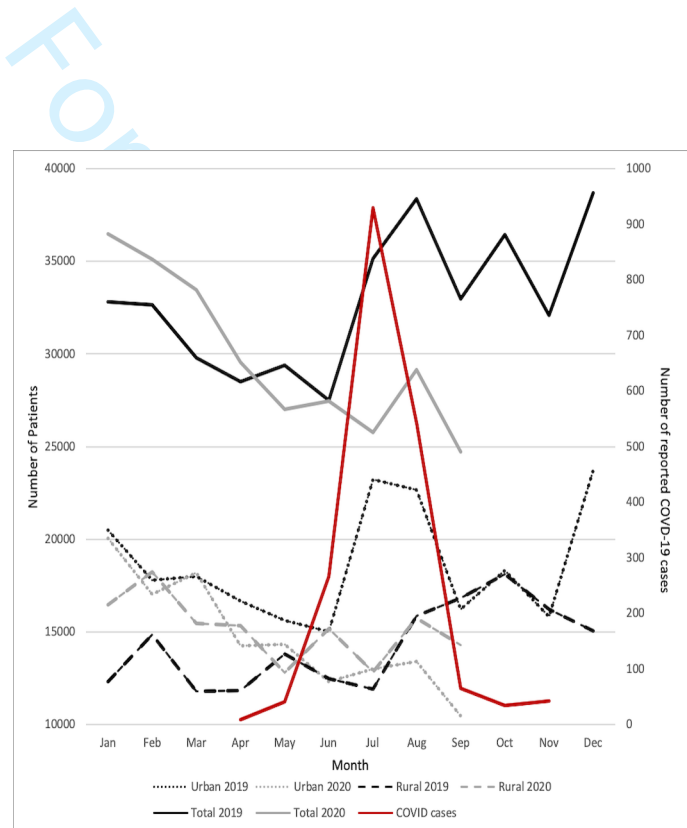
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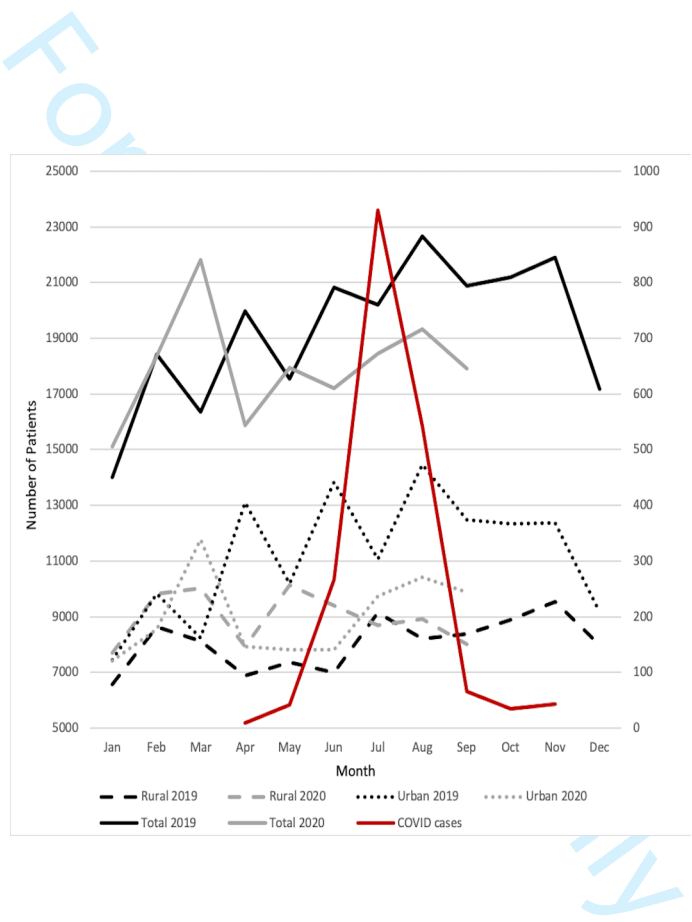
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HEALTH FACILITY CHARACTERISTICS

Health facility name	Health facility Location	number of healthcare workers		Number of auxiliary staff	Population of catchment area
		Number of nurses	Number of clinicians		
Mpemba	Rural	7	2	19	20,619
Dziwe	Rural	5	3	32	18,886
Chabvala	Rural	3	2	25	13,746
Chileka SDA	Rural	3	2	26	17,240
Lundu	Rural	5	3	26	27,164
Namikoko	Rural	3	2	19	9,675
Makata	Rural	2	2	27	36,213
Kadidi	Rural	4	4	21	20,414
Gateway	Urban	15	10	43	No records available
Mbayani	Urban	6	2	49	74,102
Chirimba	Urban	6	5	45	61,093
Ndirande	Urban	31	11	80	131,353
Malabada	Rural	6	3	42	No records available
Chikowa	Rural	6	6	36	36,174
Chileka	Rural	19	7	62	30,803
Mdeka	Rural	8	3	37	33,406
Lirangwe	Rural	9	3	40	28,896
Madziabango	Rural	6	2	33	9,901
South Lunzu	Urban	21	11	25	89,963
Pensulo	Rural	4	1	29	16,245
Mitsidi	Rural	5	2	40	No records available
Zingwangwa	Urban	21	9	71	141,123
Limbe	Urban	21	11	95	77,108
Ameca	Rural	6	3	20	No records available
Light House	Urban	0	1	10	No records available
Bangwe	Urban	21	10	98	203,022
Makhetha	Urban	7	3	37	62,919
Mpingo	Rural	3	0	16	9,780
Chimembe	Rural	5	2	16	20,088
Soche Maternity	Rural	3	2	33	15,948
Chilomoni	Urban	21	8	55	76,030

Summary of COVID preparedness from 31 health facilities across Blantyre District (Urban vs Rural) from August – October 2020

		Urban			Rural		
		August	September	October	August	September	October
Staff training		August	September	October	August	September	October
All frontline workers	Percentage trained in COVID-19	41.10%	67.10%	80.70%	63.10%	73.80%	84.70%
Hand washing		August	September	October	August	September	October
HWF at entrance	Percentage of facilities	33.33%	33.3%	25.0%	36.8%	37%	42.1%
HWF at OPD	Percentage of facilities	67%	33.3%	41.7%	68.4%	74%	78.9%
HWF HIV	Percentage of facilities	8%	16.67%	8.33%	31.58%	26%	31.58%
HWF at EPI	Percentage of facilities	8%	0.00%	0.00%	26.32%	11%	5.26%
HWF at Maternity / antenatal	Percentage of facilities	17%	8.33%	33.33%	73.68%	68%	47%
HWF at toilets	Percentage of facilities	0%	0.00%	0.00%	10.53%	0%	0%
HWF in consultation room	Percentage of facilities	25%	33.33%	8.33%	36.84%	26%	11%
No. HWF per facility	Average number per facility	1.58	1.25	1.27	2.14	2.22	2.11
HWF with soap and water	Percentage with	31.58%	28.57%	28.57%	46.00%	44.44%	33.33%
HWF with water only	Percentage with	68.42%	64.29%	71.43%	52.00%	55.56%	66.67%
Hand sanitiser	Number with access (from 31)	2	1	0	1	1	0
Temperature checks		August	September	October	August	September	October
Thermometer available	Number with access (from 31)	1	4	2	8	4	2
Checks at entrance	Number of the 31 health facilities	0	1	0	0	0	0
Checks at waiting area	Number of the 31 health facilities	0	0	0	0	0	1
Checks in consultation room	Number of the 31 health facilities	1	3	0	7	4	0
Masks		August	September	October	August	September	October
Surgical masks available	Percentage of facilities with available	91.67%	100.00%	83.33%	84.21%	100.00%	89.47%
N95 masks available	Percentage of facilities with available	16.67%	25.00%	66.67%	52.63%	42.11%	42.11%

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<i>Mask wearing</i>							
Health workers (non nursing)	Always wearing	41.67%	50.00%	8.33%	15.79%	47.37%	26.32%
	Sometimes wearing	58.33%	50.00%	83.33%	42.11%	47.37%	57.89%
	Not wearing	0.00%	0.00%	8.33%	42.11%	5.26%	15.79%
Nurses	Always wearing	27.27%	50.00%	25.00%	26.32%	42.11%	26.32%
	Sometimes wearing	63.64%	16.67%	66.67%	31.58%	36.84%	47.37%
	Not wearing	9.09%	33.33%	8.33%	42.11%	21.05%	26.32%
Auxiliary staff	Always wearing	16.67%	50.00%	0.00%	5.26%	36.84%	21.05%
	Sometimes wearing	50.00%	41.67%	25.00%	47.37%	31.58%	63.16%
	Not wearing	33.33%	8.33%	75.00%	47.37%	31.58%	15.79%
Patients	Always wearing	0.00%	33.33%	0.00%	0.00%	5.26%	5.26%
	Sometimes wearing	41.67%	66.67%	91.67%	21.05%	57.89%	57.89%
	Not wearing	58.33%	0.00%	8.33%	78.95%	36.84%	36.84%
Guardians	Always wearing	0.00%	41.67%	0.00%	0.00%	5.26%	5.26%
	Sometimes wearing	8.33%	41.67%	91.67%	5.26%	57.89%	57.89%
	Not wearing	91.67%	16.67%	8.33%	94.74%	36.84%	36.84%
<i>Mask type</i>							
Health workers (general)	Surgical	74.43%	80.00%	84.62%	76.92%	66.67%	94.12%
	N95	28.57%	13.33%	15.38%	23.08%	22.22%	5.88%
	Cloth	0.00%	6.67%	0.00%	0.00%	11.11%	0.00%
Nurses	Surgical	76.92%	88.89%	91.67%	84.62%	78.95%	93.33%
	N95	23.08%	11.11%	8.33%	15.38%	21.05%	6.67%
	Cloth	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Auxiliary staff	Surgical	77.78%	83.33%	75.00%	84.62%	86.67%	100.00%
	N95	22.22%	8.33%	8.33%	15.38%	13.33%	0.00%
	Cloth	0.00%	8.33%	16.67%	0.00%	0.00%	0.00%
Patients	Surgical	42.86%	40.91%	35.00%	80.00%	42.86%	38.10%
	N95	0.00%	4.55%	10.00%	0.00%	0.00%	4.76%
	Cloth	57.14%	54.55%	55.00%	20.00%	57.14%	57.14%

Guardians	Surgical	50.00%	50.00%	40.00%	50.00%	42.86%	36.84%
	N95	0.00%	0.00%	5.00%	0.00%	4.76%	5.26%
	Cloth	50.00%	50.00%	55.00%	50.00%	52.38%	57.89%
Waste management		August	September	October	August	September	October
Pit	Number of the 31 health facilities	6	4	2	6	1	5
Incinerator	Number of the 31 health facilities	6	13	10	6	8	9
Open burning	Number of the 31 health facilities	0	3	0	0	2	5
Physical distancing		August	September	October	August	September	October
Physical distancing on arrival	Number of the 31 health facilities	5	6	3	4	8	3
	Word of mouth	50%	66.67%	25.00%	40.00%	75.00%	66.67%
	Chairs spaced	38%	16.67%	0.00%	60.00%	0.00%	0.00%
Physical distancing in waiting area	Floor markings	13%	16.67%	0.00%	0.00%	25.00%	33.33%
	Number of the 31 health facilities	7	9	6	6	9	7
	Word of mouth	45.46%	33.33%	42.67%	28.57%	50.00%	55.56%
Physical distancing in consultation area	Chairs spaced	27.27%	16.67%	8.33%	74.44%	25.00%	0.00%
	Floor markings	27.27%	41.67%	33.33%	0.00%	25.00%	44.44%
	Number of the 31 health facilities	9	6	5	7	11	9
Physical distancing in wards	Word of mouth	54.55%	25.00%	0.00%	50.00%	26.67%	20.00%
	Chairs spaced	45.46%	50.00%	41.67%	50.00%	73.33%	70.00%
	Floor markings	0.00%	0.00%	0.00%	0.00%	0.00%	10.00%
Physical distancing in wards	Number of the 31 health facilities	1	0	0	1	2	1
	Word of mouth	100.00%	0.0%	0.0%	33.33%	0.00%	0%
	Chairs spaced	0.00%	0.0%	0.0%	66.67%	100.00%	100%
	Floor markings	0.00%	0.0%	0.0%	0.00%	0.00%	0%
Case management		August	September	October	August	September	October
Isolation room	Number of the 31 health facilities	1	2	2	2	2	2
Presence of suspected cases	Number of the 31 health facilities	8	8	8	8	7	11

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		11.11%	0.00%	11.11%	16.67%	8.70%	10.53%
Action to take when case is available	Give a mask	11.11%	0.00%	11.11%	16.67%	8.70%	10.53%
	Isolation	33.33%	16.67%	44%	32.14%	30.43%	31.58%
	Call covid-19 team at DHO	33.33%	50.00%	33%	39.58%	34.78%	31.58%
	Call hotline number	0.00%	16.67%	0%	10.53%	13.04%	5.26%
	Other	22.22%	16.67%	11%	16.67%	13.04%	21.05%

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Appendix 7: Health Centre Assessment Questionnaire

District: _____ Date: _____

Dispensary/Health centre Name: _____

Facility ID NO: _____

GPS Coordinates: _____

Observations

No	Question	Responses
1	What is the distance (in kilometres) from the "district hospital" to this health facility?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Kilometres
2	Type of road reaching the health facility	<input type="checkbox"/> Dirty small road <input type="checkbox"/> Improved large road (paved)
3	Is there cell phone coverage at the health facility?	<input type="checkbox"/> Yes <input type="checkbox"/> No
4	Visible Hand washing facility at the health facility	<input type="checkbox"/> None <input type="checkbox"/> Yes with Soap and water <input type="checkbox"/> Yes with no soap
5	Temperature Check	<input type="checkbox"/> Yes present and working <input type="checkbox"/> Thermometer present but not working <input type="checkbox"/> Thermometer present but not used <input type="checkbox"/> Not present
6	Type of masks HCW wearing	<input type="checkbox"/> Surgical Masks <input type="checkbox"/> N95 <input type="checkbox"/> Home made
7	Do they have COVID -19 leaflets (any other sensitisation messages) available	Yes/No
8	How are gloves, masks waste being disposed	BIN PIT Open Space

9	Observe if there are adhering to physical distance between a. Patient to patient b. Patient to attendant/health care worker c. Health care worker to health care worker	Yes/No
10	Staff wearing face masks /face shield	Nurses Yes /NO or some ----- Medical assistants Yes/No or some ----- HSA's Yes/No or some----- Cleners Yes /No or some----- Pharmacy Yes /NO or some ----- Security Patients assistants Ground labourers
11	Water source at the health facility	
12	Hand washing points	
13	Latrines att the facility	
14	Isolation space	

Collect monthly Total Number of Patients attended at the facility;

No	2019	Number of patients	2020	Number of patients
1	January		January	
2	February		February	
3	March		March	
4	April		April	
5	May		May	
6	June		June	
7	July		July	
8	August		August	
9	September		September	

10	October		October	
11	November		November	
12	December		December	

SECTION A: Human Resource

Ask for Number of total health workers at the health facility according tto cadre		Total Number	Number present today
1.	Clinical Officers		
2.	Nurses/midwives		
3.	Patients Attendants/		
4.	Health surveillance assistants		
5	Hospital Attendant/Maid/Cleaners		
6	Security officers		
7	Medical Assistants		
8	Data clerk		
9	Pharmacy Assistant		
10	Ground Labourers		
11	Counsellors		

Training

Number of total health workers at the health facility who were trained in COVID-19

Cadre	Number Trained	When were they trained	Who trained them	What areas were they trained
Clinical Officers			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)

Nurses/midwives			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management
Patients Attendants/			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Health surveillance assistants			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Hospital Attendant/maid/Cleaners			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Security officers			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Medical Assistants			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Data clerk			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Pharmacy Assistant			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)

Ground Labourers			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Counsellors			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)

Does the facility has a working shift schedule for different cadres

Cadre	Yes/No	How many per shift
Clinical Officers		
Nurses/midwives		
Patients Attendants/		
Health surveillance assistants		
maid/Cleaners		
Security officers		
Medical Assistants		
Data clerk		
Pharmacy Assistant		
Counsellors		
Ground Labourers		

SECTION B : Disease Control

Question	Options	How many (Qty) This should refer to in-Stock?

<p>Do you have the following Supplies;</p> <p>Soap Hand sanitizer Buckets Masks.</p> <ol style="list-style-type: none"> 1. N95 2. Surgical Masks <p>Maternity Aprons Plastic Aprons Face Shields Gloves Gumboots</p>	<p>Is it available (Yes/No)</p>	<hr/>
<p>Do you do health talks about COVID-19</p>		<hr/>
<p>If yes how frequent</p>	<p>Daily Once a Week More than once a week Other (Specify)</p>	<hr/>
<p>If yes how is the health talk delivered</p>	<p>During morning sessions During consultation As we are waiting Using Mass Media (e.g. TV)</p>	<hr/>
<p>How do you do contact tracing</p>		<hr/>
<p>In the last month did you have patients you could not treat because your health facility run out of supplies</p>		<hr/>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	If yes, which supplies were out of stock Soap Sanitizer Washing facilities Masks. 1. N95 2. Surgical Masks Maternity Aprons Plastic Aprons Face Shields Gloves Gumboots		<hr/>
18 19 20	When you run out of stock of supplies, how long does it take for stock to be re-supplied.		<hr/>
21 22 23 24	When are you expecting the other supplies?		<hr/>
25 26 27 28	What further questions do you ask a suspected case	<hr/>	
29 30 31 32 33 34 35	Then what do you do when you find a suspect	Give a mask Isolation Call the COVID-19 team at DHO Call HOTLINE Number Other (Specify)	
36 37 38	What is the hotline number for COVID 19		
39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	Do you have a contact person for COVID19 at facility level? If yes, what is their name and phone number?	Name: Number :	

<p>Which services do you provide as a facility;</p>	<ul style="list-style-type: none"> - OPD (include malaria etc) - General Counseling - Family Planning - Sti Services - Ante-Natal, Delivery And Post-Natal Care Services - Prevention Of Mother To Child Transmission Of Hiv (Pmtct) - Treatment Of Sexual Abuse (Including Pep) - Post Abortion Care (Pac) - ART Services - HTC - Cancer Screening Other: 	
<p>In the last three months, which services were you not able to provide</p>	<ul style="list-style-type: none"> - OPD (include malaria etc) - General Counseling - Family Planning - Sti Services - Ante-Natal, Delivery And Post-Natal Care Services - Prevention Of Mother To Child Transmission Of Hiv (Pmtct) - Treatment Of Sexual Abuse (Including Pep) - Post Abortion Care (Pac) - ART Services - HTC - Cancer Screening Other: 	

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Which service are you currently providing	<ul style="list-style-type: none"> - Opd - General Counseling - Family Planning - Sti Services - Ante-Natal, Delivery And Post-Natal Care Services - Prevention Of Mother To Child Transmission Of Hiv (Pmtct) - Treatment Of Sexual Abuse (Including Pep) - Post Abortion Care (Pac) - Art Services - Htc - Cancer Screening Other: _____ 	
What are the usual source of electricity at this health facility.	<input type="checkbox"/> ESCOM <input type="checkbox"/> Functioning generator <input type="checkbox"/> Solar <input type="checkbox"/> Other (please specify) <input type="checkbox"/> No reliable source of electricity	
When the usual source of electricity is not available what supplemental source do you have? Please select only one answer	<input type="checkbox"/> Generator <input type="checkbox"/> IPS (rechargeable battery) <input type="checkbox"/> Solar <input type="checkbox"/> No supplemental source <input type="checkbox"/> Other (specify)	
What are the main sources of water at the health facility	<input checked="" type="checkbox"/> Tap <input checked="" type="checkbox"/> Borehole <input type="checkbox"/> Well must be fetched from elsewhere	
Do you have latrines at the facility? If Yes, How are they distributed?	<input type="checkbox"/> At least 2 latrines (at least one each for men and women) <input type="checkbox"/> 1 latrine <input type="checkbox"/> No latrines	

Impact of COVID-19 on health centre service delivery in urban and rural Malawi

Topic guides: In-depth Interviews (front-line health workers)

Due to the iterative nature of qualitative research, the interviews that we conduct with participants will be open-ended and iterative, limiting the extent to which the content and direction of interviews can be fully anticipated. However, the topic guide provides a guide to the themes and questions that will be discussed with front-line staff at health care clinics. We will refine and update the topic guides as new themes will be discussed with each group of participants, which will be refined in response to new themes and findings that emerge.

First round

Demographics

Role at the clinic:

Age:

Birth place:

Highest qualification:

Length of time in post:

Length of time working in health care:

Theme 1: Experiences of delivering care

- Can you tell me about your day to day work? (explore how many patients they normally see at the clinic, what are the most frequent illnesses they treat, any challenges with stockouts)
- If you think back over the two months, have you seen any changes at the clinic? (probe around the number of patients coming to the clinic, incorporating new practices into their work including new screening practices, length of day, changes in the illnesses they are seeing and any differences in stockouts)
- Looking forward what do you think is likely to change in the coming months in relation to delivering care to patients?

Theme 2: Provision of support

- Have you been provided with any specific support to work during COVID? (if they say yes, probe around what this is, and whether it has had any impact on day to day work practices)

Theme 3: Risk perception and COVID-19

- What do you think are the biggest risks in your life? (probe around inside and outside of work)
- If you look back two months to now, how do you feel about coming to work? (is there anything you feel more worried about? Anything you feel less worried about?)
- What do you know about COVID-19? (probe around how it is transmitted, whether they see any specific groups at risk, what practices people can put in place to avoid becoming infected)
- Do you see yourself as at risk of COVID-19? (if they do, where to they see this risk is coming from, does it link to any specific procedures)
- If they do see themselves at risk of COVID-19 are they doing anything to protect themselves?

Second round

Theme 1: Experiences of delivering care

- If you think back during the first wave of COVID, have you seen any changes at the clinic?
 - Explore whether the number of patients coming to the clinic has increased or reduced (probe what influences people to or not come)
- If at all, what is the impact of the second wave of COVID on health service delivery?
 - Probe whether health service delivery has been reduced or not, what changes have brought in reduction in service delivery or what has caused an increase in service delivery)
 - Probe on what services have been affected in the second wave and why?
 - Probe whether there have been changes in the way patients are managed, what have brought in changes in patient management

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- Explore whether there have been new practices incorporated into their work (including screening practices, changes in the ways patients are managed)

Theme 2: Infrastructural support for COVID response

WASH

- What type of hand washing facilities do you have in place at the moment at the HF
 - Buckets with taps:
 - Quantity (being used and in storage)
 - Location (multiple areas)
 - Piped water to permanent sinks:
 - Quantity (functioning)
 - Location
 - None
 - Other
- Has anything changed in terms of hand washing facilities since the first wave for example: now have piped water supply, piped water not working so using buckets?
 - Have any of these changes led to specific challenges at the clinic?
 - Have any of these changes led to improvements or benefits to the clinic?
- If you are using or have movable systems such as buckets with taps were they:
 - At the HF before COVID was an issue
 - Provided during the first wave of COVID and now not available – if no why not?
 - Provided during the first wave of COVID and still being used
 - Provided during the first wave of COVID and not being used – if not why not?
 - Not provided – why (already have piped supply, not known etc)
 - Do you have some of the buckets for handwashing stored in the storage room (if yes, probe for reasons).
- Do you have any soap available for hand washing?
 - Had during first wave but not now – why?
 - Yes have it available and being used now – why is it available now?
 - Yes have it available but not being used
- Who is the soap made available to:
 - Everyone
 - Staff only – if this is the case why?
 - Where is the soap from (personal, purchase, supplied etc)
 - Is the soap available all the time (if no, probe for reasons)
- Is the soap available even when the facility is closed for the patient guardians or support staff (e.g. security guards)
- Do they think that washing hands with water only is the same as washing hands with soap – in general and specifically related to COVID
- Do you have access to hand sanitiser at all?
 - Where is it from (personal purchase, supplied, etc)
 - Is the sanitizer available all the time (if no, probe for reasons)
 - Who has access to it? (clinical staff, all frontline workers, everyone)
 - Do you think hand sanitiser is the same, more or less effective than hand washing with soap? Why?

Client management

- Are there any checks on patients as they arrive at the clinic – what are they, what happens if someone fails the checks (e.g. temperature, clinical symptoms etc)
- What happens when there is suspected case of COVID?
- Is there any system of physical distancing at the facility? (arrival, waiting area)
 - What is it and how effective do you think it is?

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- What are the challenges?
- If there is no distancing why is it not done?
- Are thermometers available to check the clients?
 - What type of thermometers are they?
 - Where at the facility is the temperature check conducted?

Masks

- Does the facility have masks available for frontline workers?
 - What type - explore for multiple types and whether they are different for different cadre of staff i.e. health workers, patient attendants or security guards
 - Are people using them – explore who is using what, why using and why not using
 - Are clients/patients arriving wearing masks? What type? What happens if they are not?
 - For those using masks, are they using them properly (i.e. cover nose and mouth).

Theme 3: Risk perceptions and COVID-19

Perceived danger about COVID-19

- What are your perceptions on COVID-19? (What do they think might happen to you or your family should you be infected? Are you concerned about disease complications? Are you worried about loss of income or job because of illness due to COVID-19?)
- Have you changed any aspects of your work practice due to COVID-19?
- Have you ever missed work because of illness or testing COVID positive?
- Have you considered missing work because of fear of being exposed? (If they were COVID positive, what did that mean to them?)
- If you think back during the first wave of COVID, how do you feel about coming to work?
 - Is there anything you feel more worried about than before?
 - Anything you feel less worried about than before?
- What do you think are the patients' or people in the wider community's perceptions on COVID-19?
 - Have you seen an increase in fear from patients coming to the clinic? (probing around rumours about COVID?)
 - Have patients asked any questions around COVID-19 during their time at the clinic? If so what kinds of questions are they asking?
 - Are people in the wider community asking you about COVID-19, are you hearing any rumours around fear of getting infected?
 - Have you seen changes from the first and second wave?

Perceptions of the vaccine

- Have you accessed the vaccine?
 - If yes probe around whether this has impacted on feelings about going to work or work practice?
- Have you heard any rumours around the vaccine?
 - If yes can you describe what they relate to?
 - Who are you hearing these rumours from – patients, family members?
 - Do you think the rumours have impacted on people attending the clinic?
 - Is there anything you think can be done to address the rumours (only ask this if they report hearing rumours)

Third round

For this round of interviews we will be focusing on the in-charges of the 8 facilities we have sampled. Reviewing the transcripts we will ensure we follow up on any unanswered questions and target the guide to each in-charge (or clinician)

- How has your clinical practice changed with COVID-19? [probe around commitment to practicing safety (e.g. use of PPE), interaction with patients]
 - Looking to the future are there things you will continue to do?

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Topic guides: In-depth Interviews (front-line health workers)

- How have practices and procedures in the clinic changed? (probe around strategies for preventing overcrowding of patients e.g. opening the clinic earlier, alternative methods of delivering services e.g. women administering contraceptives themselves)
 - o Looking to the future do you think these are likely to continue?
- How has the clinic been implementing the health communication about COVID-19?
 - o What communication strategies the clinic used? (probe around community engagement and the role of chiefs/churches in disseminating COVID-19 information)
 - o If any, what challenges they encountered with communication?
- What has been the impact of the health communication?
 - o How has the communication shaped people's behaviours and practices?
- What do you think will be the long-term impacts of the health communication about COVID-19?
 - o Looking to the future how do you think people will react should the virus resurface?

Fourth round

Changes in clinic responses to COVID-19

- Can you tell me if there have been any new developments at the clinic in terms of responding to the COVID-19 situation? (Probe whether clinic attendance, handwashing, use of PPEs/masks, social distancing has changed. What led to the change? What's the impact of the change?)

Health workers' job satisfaction and motivation during COVID-19

- What do you think about your current working conditions? (What motivates you or discourages you to work during this time? If at all, does it affect your behaviour towards your work? If yes, in what way?)
- Do you get allowances on your job? If yes or no, how does it impact on your behaviour towards your work?)

Psychosocial impacts of COVID-19 on health workers and coping mechanisms

Perceived danger about COVID-19

- What are your perceptions on COVID-19? (What do they think might happen to you or your family should you be infected? Are you concerned about disease complications? Are you worried about loss of income or job because of illness due to COVID-19?)
- If at all, does feeling at risk impact your behaviour towards your work? If yes, in what way?
- Have you ever missed work because of illness or testing COVID positive, or considered missing work because of fear of being exposed? (If they were COVID positive, what did that mean to them?)
- What do you think are the patients' or people's perceptions on COVID-19? (Do they feel at risk? If yes, in what way do they think they might get infected? Or who do they think might infect them? What are the consequences of them being infected? If no, why do they feel in this way?)

Social stigma and self-stigma about COVID-19

- How does the perception of being at risk of COVID-19 make you feel? (Are you concerned about infecting other people? Do you feel you might infect others if you have the virus? If at all, does this affect how you interact with other people both at and outside of work (families, patients)?)
- Based on your personal experiences, how do people perceive health workers with regards to COVID-19? (What reactions do you get from the public when it comes to COVID-19? Any changes in how people interact with you or other health workers in the community or at the clinic? How does this make you feel? [Probing in this one around whether they have experienced any abuse or anger from the community more broadly])

Social support for health workers during COVID-19

- Are you receiving any support to deal with the negative impacts of COVID-19? (If yes, what kind of support, where does the support come from?)

Is there any support you would like to receive regarding dealing with the negative impacts of COVID-19?

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Topic guides: In-depth Interviews (front-line health workers)

Fifth round

Focusing on the in-charges of the 8 facilities we have sampled, following up on any unanswered questions, and targeting the guide to each in-charge.

Theme 1: Impacts of COVID-19 on healthcare practices

- How has your clinical practice changed with COVID-19? [probe around commitment to practicing safety (e.g. use of PPE), interaction with patients]
 - o Looking to the future are there things you will continue to do?
- How have practices and procedures in the clinic changed? (probe around strategies for preventing overcrowding of patients e.g. opening the clinic earlier, alternative methods of delivering services e.g. women administering contraceptives themselves)
 - o Looking to the future do you think these are likely to continue?

Theme 2: Public health communication and long-term impacts

- How has the clinic been implementing the health communication about COVID-19?
 - o What communication strategies the clinic used? (probe around community engagement and the role of chiefs/churches in disseminating COVID-19 information)
 - o If any, what challenges they encountered with communication?
- What has been the impact of the health communication?
 - o How has the communication shaped people's behaviours and practices?
- What do you think will be the long-term impacts of the health communication about COVID-19?
 - o Looking to the future how do you think people will react should the virus resurface?

Theme 2: Gender differences in COVID-19 vaccine uptake

- Why are we seeing more men than women uptake? (explain that previous interviews showed this)
- Has this changed during the second vaccine?
- Access and challenges?

Theme 3: Uptake of COVID-19 vaccine among healthcare providers

- What is COVID vaccine uptake like amongst health centre staff?
- Have there been any challenges?

Impact of COVID on health service provision

- What is causing an increase in the uptake of family planning services? (Explain that previous interviews showed this)
- Has something changed?
- Why is there a drop in uptake of TB services? Has something changed?

Covid19 study: Coding strategy (NVIVO extract)

Nodes

Name	Description
1. Knowledge on COVID-19	Frontline workers knowledge on COVID-19: cause or risk factors; transmission; prevention or treatment; vulnerable groups; etc.
COVID-19 preparedness and response	
<ul style="list-style-type: none"> Prevention measures 	<ul style="list-style-type: none"> Restricting movement Emphasis on the need for people to stay in door Social distancing E.g. marking the floor/seat, or letting in only a number of clients at a time, or seeing patients in an open space rather than in a confined space of a consultation room Using PPEs Eg masks, aprons, gloves etc, including mandatory masking in public spaces Hand washing Washing hands mainly with soap and water, sanitizer irregularly provided Suggestions on COVID preparedness and response Improving supplies through engagement with corporate stakeholders Holding community outreach covid services to facilitate wide screening and case isolation Enforcing mandatory public use of masks Motivating hospital staff COVID communication and messaging Strategies for communicating COVID-19 information: through chiefs or church leaders; public health talks during service provision; radio or TV; etc.
2. COVID-19 prevention barriers	
<ul style="list-style-type: none"> Behavioral barriers Conditions at work 	<ul style="list-style-type: none"> Behavioral barriers Noncompliant behaviours: distrust (COVID as a hoax); misconceptions (linking COVID to weather); spiritualism (associating COVID with satanism); lack of adherence (mask causing breathing discomfort, resumption of public activities, decline in cases); sharing masks (lack of money to buy); etc. Conditions at work Issues affecting staff: lacking COVID training; not receiving compensation or risk allowance;

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Name		Description
	<ul style="list-style-type: none"> • Underlying health system challenges 	increased workload Limits in resources: drug stockouts; early shortage of working materials; lack of hospital equipment; shortage of funding; shortage of space; staffing deficiencies; etc.
3. Case management		Explanation about management of COVID suspect or confirmed cases
	<ul style="list-style-type: none"> • Communication between DHO and facility 	How the facility communicated with isolation centre or main district hospital regarding COVID suspects or cases
	<ul style="list-style-type: none"> • Isolation/quarantine 	Referring cases to the isolation centre, or advising patients to self isolate at home
	<ul style="list-style-type: none"> • Guidelines on case management 	
	<ul style="list-style-type: none"> • Number of suspect cases 	
4. COVID -19 support		Supply of work materials (masks/PPEs/sanitary facilities, hospital equipment, financial support) from government, companies, and non-governmental organisations
	<ul style="list-style-type: none"> • Impact of support 	Better case management, safety of health workers, improved hospital supplies
5. Impacts of COVID-19		
<ul style="list-style-type: none"> • Impacts on health seeking 		Decrease in clinic attendance (e.g., due to fear of COVID-19)
<ul style="list-style-type: none"> • Impacts on service provision 	<ul style="list-style-type: none"> • Suspending service 	Temporarily stopping some services e.g., TB and HIV screening services
	<ul style="list-style-type: none"> • Increased waiting hours 	Increased workload coupled with a shortage of staff making patients stay longer
	<ul style="list-style-type: none"> • Adapting strategies for delivering care 	E.g., clients administering contraceptives on their own; community outreach clinics; extending ART/TB prescription duration; reducing clinic time patients visiting on appointments; working in shifts; suspending services; etc.

Name		Description
<ul style="list-style-type: none"> • Impacts on staff or patients 	<ul style="list-style-type: none"> • Economic impacts 	Economic impacts: cost of managing COVID-19 illness; loss of income because absence from work/business due to COVID illness; etc.
	<ul style="list-style-type: none"> • Physiological impacts 	Physical health impacts: abuse from patients; fatigue from increased workloads; illness from COVID
	<ul style="list-style-type: none"> • Psychological impacts 	Anxiety about catching COVID due to frequent contact with patients; stress from increased workloads; helplessness (difficulties managing the need to work for income and the risk of COVID at work); concern for family (fear of infecting family members); sacrifice versus moral obligation (feeling compelled to work despite seeing themselves at risk because they promised to serve people); stigma/discrimination (unable to interact with others because of fear of being treated differently)
	<ul style="list-style-type: none"> • Psychosocial support systems for negative impacts 	Counselling, social networks (seeking moral support from families, neighbors/friends, etc.), ombudsman (for support on verbal/physical abuse from patients/community members)
6. COVID-19 vaccine provision and public reaction	<ul style="list-style-type: none"> • Early hesitancy 	Distrust: misconceptions and spiritual beliefs causing reluctance to vaccinate Vaccine safety concerns: fear of side effects; rumors of people becoming animals once vaccinated
	<ul style="list-style-type: none"> • Public becoming willing over time 	Continuous awareness campaigns (in conjunction with local leaders) helping to improve public behaviours about COVID-19 vaccine; limited evidence of negative side effects also encouraging people to vaccinate
	<ul style="list-style-type: none"> • Vaccine and gender 	How men and women are responding to COVID-19 vaccine; more men getting vaccinated than women
7. Demographics	<ul style="list-style-type: none"> • Daily routines • Years in service • Education 	What the frontline worker's work involve on daily basis
		How long they have been working in this position
		Their level of education

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Name		Description
	<ul style="list-style-type: none">• Age	

For peer review only

Apr 20, 2022

Research Checklist

#1	Title Concise description of the nature and topic of the study identifying the study as qualitative or indicating the approach (e.g. ethnography, grounded theory) or data collection methods (e.g. interview, focus group) is recommended.	Page 1
#2	Abstract Summary of the key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results and conclusions.	Page 2
#3	Introduction Problem formulation Description and significance of the problem / phenomenon studied: review of relevant theory and empirical work; problem statement.	Pages 4, 5
#4	Purpose or research question Purpose of the study and specific objectives or questions.	Page 5
#5	Methods Qualitative approach and research paradigm Qualitative approach (e.g. ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g. postpositivist, constructivist / interpretivist) is also recommended; rationale. The rationale should briefly discuss the justification for choosing that theory, approach, method or technique rather than other options available; the assumptions and limitations implicit in those choices and how those choices influence study conclusions and transferability. As appropriate the rationale for several items might be discussed together.	Pages 5-9
#6	Researcher characteristics and reflexivity	

	Researchers' characteristics that may influence the research, including personal attributes, qualifications / experience, relationship with participants, assumptions and / or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results and / or transferability.	
#7	Context Setting / site and salient contextual factors; rationale.	Page 5-6
#8	Sampling strategy How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g. sampling saturation); rationale.	Pages 6, 7
#9	Ethical issues pertaining to human subjects Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues.	Page 8
#10	Data collection methods Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources / methods, and modification of procedures in response to evolving study findings; rationale.	Pages 6, 7
#11	Data collection instruments and technologies Description of instruments (e.g. interview guides, questionnaires) and devices (e.g. audio recorders) used for data collection; if / how the instruments(s) changed over the course of the study.	Page 6,7
#12	Units of study Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results).	Pages 6,7

#13	<p>Data processing</p> <p>Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymisation / deidentification of excerpts.</p>	Page 9
#14	<p>Data analysis</p> <p>Process by which inferences, themes, etc. were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale.</p>	Page 9
#15	<p>Techniques to enhance trustworthiness</p> <p>Techniques to enhance trustworthiness and credibility of data analysis (e.g. member checking, audit trail, triangulation); rationale.</p>	Page 9
#16	<p>Results/findings</p> <p>Syntheses and interpretation</p> <p>Main findings (e.g. interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory.</p>	Pages 10-22
#17	<p>Links to empirical data</p> <p>Evidence (e.g. quotes, field notes, text excerpts, photographs) to substantiate analytic findings.</p>	Pages 10-22
#18	<p>Discussion</p> <p>Intergration with prior work, implications, transferability and contribution(s) to the field</p> <p>Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of</p>	Pages 22-25

	earlier scholarship; discussion of scope of application / generalizability; identification of unique contributions(s) to scholarship in a discipline or field.	
#19	Study strength and Limitations Trustworthiness and limitations of findings.	Page 25
#20	Other Conflicts of interest Potential sources of influence of perceived influence on study conduct and conclusions; how these were managed.	Page 27
#21	Funding Sources of funding and other support; role of funders in data collection, interpretation and reporting.	Page 26
#22	Author contributions Role of each other in the study and their contributions	Page 26

BMJ Open

Preparedness for and impact of COVID-19 on primary health care delivery in urban and rural Malawi: a mixed methods study

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3 1 **Title: Preparedness for and impact of COVID-19 on primary health care delivery in urban**
4 **and rural Malawi: a mixed methods study**

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3 21 **Abstract**

4 22 **Objective** Across Africa, the impact of COVID-19 continues to be acutely felt. This includes
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6 23 Malawi, where a key component of health service delivery to mitigate against COVID-19 are
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8 24 the primary health care facilities, strategically placed throughout districts to offer primary
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10 25 and maternal health care. These facilities have limited infrastructure and capacity but are
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12 26 the most accessible and play a crucial role in responding to the COVID-19 pandemic. This
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14 27 study assessed health facility preparedness for COVID-19 and the impact of the pandemic
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16 28 on health service delivery and frontline workers.

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19 30 **Setting** Primary and maternal health care in Blantyre District, Malawi.
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23 32 **Participants** We conducted regular visits to 31 health care facilities and a series of telephone-
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25 33 based qualitative interviews with frontline workers (n=81 with 38 participants) between August
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27 34 2020 and May 2021.
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30 36 **Results** Despite significant financial and infrastructural constraints health centres continued to
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32 37 remain open. The majority of frontline health workers received training and access to
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34 38 preventative COVID-19 materials. Nevertheless, we found disruptions to key services and a
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36 39 reduction in clients attending facilities. Key barriers to implementing COVID-19 prevention
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38 40 measures included periodic shortages of resources (soap, hand sanitizer, water, masks, staff).
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40 41 Frontline workers reported challenges in managing physical distancing and in handling
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42 42 suspected COVID-19 cases. We found discrepancies between reported behaviour and practice,
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43 43 particularly with consistent use of masks, despite being provided. Frontline workers felt COVID-
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44 44 19 had negatively impacted their lives. They experienced fatigue and stress due to heavy
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46 45 workloads, stigma in the community, and worries about becoming infected with and
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48 46 transmitting COVID-19.
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52 48 **Conclusion** Resource (human and material) inadequacy shaped the health facility capacity for
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54 49 support and response to COVID-19, and frontline workers may require psychosocial support to
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56 50 manage the impacts of the COVID-19 pandemic.
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3 53 **Summary box**

4 54 **Study strengths and limitations**

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6 55 • Using a mixed method approach allowed us to capture data in real time from across
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8 56 the district and gain an in-depth understanding of the findings.
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10 57 • Qualitative interviews allowed participants to express their lived realities through
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12 58 conducting interviews at different time points, we were able to capture changes in
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14 59 risk perception across the pandemic.
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16 60 • Quantitative structured data collection tools enabled data to be captured through
17
18 61 direct observations at each health care facility allowing for triangulation of findings
19
20 62 captured through the qualitative interviews.
21
22 63 • Collecting data from health care facility registers was challenging and required
23
24 64 efforts to compare registers to centralised health management information records
25
26 65 which due to staff shortages were not always consistent.
27
28 66 • We only interviewed frontline workers, meaning that findings around patient
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30 67 behaviour were filtered through frontline workers perspectives.
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69 Introduction

70 Since COVID-19 was identified in Wuhan, China in late 2019, this highly infectious
71 respiratory disease has spread across the world causing a complex global health crisis. The
72 devastating impact of the pandemic has been felt both within and beyond the health sector
73 (1). Research has demonstrated the extreme pressure on health workers to both treat
74 patients with COVID-19, and also to maintain essential services (2). In low-and-middle
75 income contexts, where health systems are often fragile and care-seeking pathways for
76 patients more challenging, the ramifications of the pandemic are being felt in complex ways
77 (3).

78
79 The global response to the pandemic has seen development and roll-out of vaccines to
80 prevent severe disease and hospitalisation at an unprecedented speed. However, the global
81 distribution of vaccines has seen significant inequalities with low-income countries,
82 particularly those in sub-Saharan African having some of the lowest vaccine coverage (4).

83
84 Prior to COVID-19, sub-Saharan African health systems have often been under-resourced
85 and faced critical shortages of health care-workers. Recent studies have demonstrated that
86 water, sanitation, and hygiene (WASH) infrastructure, a crucial component of good hygiene
87 and infection control, is significantly constrained in the region (5). Only half of health
88 facilities have basic access to water, and even less to soap or alcohol based hand sanitizer
89 (6–8). During the COVID-19 pandemic, the situation has been further exacerbated by global
90 shortages in access to Personal Protective Equipment (PPE) increasing the risk to health care
91 workers and patients (9,10). Psychosocial well-being of health care workers across the globe
92 has been detrimentally impacted both by overwhelming workloads and providing patient
93 care with inadequate PPE (11,12).

94
95 Disruptions to health services have had both a direct and indirect impact on mortality, as
96 care for all patients is affected (13). Recent work from the World Health Organization
97 (WHO) analysed data on attendance for five key essential services (outpatient and inpatient
98 admission, skilled birth attendance, treatment of confirmed malaria cases and provision of
99 the combination pentavalent vaccine) from 14 countries in Africa, and found a reduction of

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3 100 50% in May, June and July 2020 (14). This work speaks to the importance of capturing the
4 101 impacts of COVID-19 on health service delivery in a wide range of contexts.
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7
8 103 In April 2020, responding to the first confirmed cases of COVID-19 in Malawi, the
9
10 104 government closed international borders, suspended all international flights, closed
11
12 105 educational institutions, banned large gatherings and mandated face coverings (15). Legal
13
14 106 injunctions prevented the implementation of any other restrictions of movement (16). In
15
16 107 Sub-Saharan Africa, there was significantly lower recorded deaths and cases than initial
17
18 108 models projected (17,18). However, testing capacity has been extremely limited meaning
19
20 109 that an accurate picture of transmission has been challenging. Reflecting wider regional
21
22 110 trends Malawi recorded lower than predicted deaths and hospitalisations. In May 2020,
23
24 111 initial modelling work projected up to 435,000 hospitalisations with up to 50,000 deaths in
25
26 112 the first year of the pandemic. However, the first wave (March-September 2020) saw 185
27
28 113 deaths with 6,049 and cases recorded (19). Subsequent immunological work has found that
29
30 114 by July 2021 there was high seropositive (Blantyre, 81.7%; Mzuzu, 71.0%) suggesting a
31
32 115 higher rate of cases than was reported in official statistics (20). Recent work in Malawi, has
33
34 116 found that the COVID-19 pandemic impacted on TB case notification (21).
35

36 117
37 118 Primary health care facilities are central to Malawi's health service and provide a range of
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39 119 services including outpatient department (OPD), family planning (FP), maternal and child
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41 120 health (MCH), expanded programme of immunisation (EPI), tuberculosis (TB) testing and
42
43 121 treatment, HIV testing, counselling and treatment, and cancer screening. The outpatient
44
45 122 facilities are one of the most important entry points into the health system and where most
46
47 123 suspected COVID-19 cases will present. Any changes to service delivery in these facilities is
48
49 124 likely to have significant impacts on long term health outcomes. This study was guided by
50
51 125 two research objectives: (1) to assess preparedness for the pandemic in health facilities in
52
53 126 Blantyre District; (2) to understand front-line workers' experiences of providing care during
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55 127 COVID-19

56 128 **Methods**

57 129 ***Study context***

58 130 The Malawian health system is structured around three levels, tertiary (large referral
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60 131 hospitals situated in major urban centres), secondary (district hospital) and primary (health

1
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3 132 facilities, community, and home-based services). Funding for the health sector is heavily
4 133 dependent on international donors (22). Health services are provided by government,
5 134 private and faith-based organisations; government services are the only ones provided
6 135 without fees and recent estimates suggest they provide approximately 60% of services
7
8 136 accessed (23,24). Despite policies being well-designed, key challenges faced in the health
9
10 137 sector include chronic underfunding, shortage of staff and fragmentation of services (24).
11
12 138 The District Health Office is mandated to provide management and oversight of primary
13
14 139 health care facilities (25). This study was situated in Blantyre district in the Southern region,
15
16 140 which is serviced by 31 government and faith based primary health care facilities (n=14
17
18 141 urban; n=17 rural)(see supplementary 1 for further characteristics of the facilities). The
19
20 142 district has a total population of 1.25 million including Blantyre city (64%), the second
21
22 143 largest city in Malawi. The study ran from April 2020 – August 2021. This encompassed the
23
24 144 first and second waves of the COVID-19 pandemic in Malawi and the national rollout of the
25
26 145 preventative vaccine.
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29 30 147 **Study Design**

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32 148 To understand the impact of COVID-19 on primary health care provision we used a mixed
33
34 149 method approach. Combining qualitative and quantitative research methods allowed us to
35
36 150 capture data from across the district and gain a deeper understanding of the findings
37
38 151 through qualitative interviews. All data collection tools were developed in consultation with
39
40 152 the Blantyre District Health Office and were reviewed regularly through feedback loops to
41
42 153 help inform service delivery improvements. Field work was conducted in two phases:

43 154 Phase 1: July – November 2020

44
45 155 For this phase we aligned qualitative and quantitative approaches to understand the impact
46
47 156 of the first wave of the pandemic. Quantitative structured data collection tools were
48
49 157 selected to enable real time data to be captured through direct observations at each health
50
51 158 care facility. Tools focused on the key components of the National COVID-19 Preparedness
52
53 159 and Response Plan (26), reporting on preparedness proxies (e.g. hand washing facilities,
54
55 160 soap, thermometers), and observed behaviour of frontline workers (inclusive of health care
56
57 161 workers and auxiliary staff) and clients (e.g. mask wearing, physical distancing)(see
58
59 162 supplementary 2). Qualitative interviews were selected because they allowed frontline
60
163 workers to express their lived realities and explore a range of themes flexibly (27).

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3 164 Conducting interviews at different time points allowed us to capture health workers
4 165 changing perceptions and experiences across the dynamic period of the pandemic. To
5 166 reduce the risk of COVID-19 transmission with prolonged contact with participants we
6 167 conducted qualitative interviews over the telephone.

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8
9 168 Phase 2: April - August 2021

10 169 Following the second wave of the pandemic and the national roll out of the COVID-19
11 170 vaccine, we conducted a second phase of qualitative interviews. These interviews sought to
12 171 understand the perception of, and response to, the vaccine within primary health care
13 172 clinics.

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20 174 **Data collection**

21 175 *Quantitative methods*

22 176 Quantitative assessments were only conducted during the first phase of the study (July –
23 177 Nov 2020). Working in all 31 rural and urban health facilities in Blantyre District, we
24 178 collected structured data at three-time points (August, September, and October 2020).
25 179 Experienced researchers administered a questionnaire with the clinician responsible for
26 180 managing the health facility or their representative. All quantitative data were collected
27 181 using a pre-programmed questionnaire on KoboCollect (<https://www.kobotoolbox.org>)(see
28 182 supplementary 3). The questions included data on patient management, physical distancing,
29 183 water, sanitation and hygiene (WASH) provision and practices, the presence and use of
30 184 personal protective equipment (PPE) and patient attendance at routine health services. The
31 185 team photographed clinic registers (without any identifying patient data) for OPD, EPI, TB,
32 186 FP, HIV and cancer screening services; this data was collected from January 2019 to
33 187 September 2020 to allow for comparison of patient numbers pre-COVID.

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48 189 Following analysis of each round of data collection, “score cards” were generated for each
49 190 health facility. The score cards summarised how the health care facilities were
50 191 implementing COVID-19 preventative measures, including training of frontline staff and
51 192 WASH materials. This included the location and presence of hand washing facilities
52 193 (including soap and water), stock and use of PPE including face masks and thermometers,
53 194 waste management, and case management of suspected COVID-19 cases. These scorecards
54 195 were then provided to the District Health Office team through monthly feedback loops, to

196 provide guidance on which health care facilities had managed to adapt their practices, and
197 which facilities required further support.

198

199 *Qualitative research*

200 Qualitative assessments were undertaken across both phases of the study. Following the
201 generation of the scorecards from initial quantitative data collection, eight health care
202 facilities were purposively sampled to be included in the qualitative component. In the
203 sample, we included both rural (n=4) and urban facilities (n=4). In these health care
204 facilities, we conducted a total of 81 interviews with 38 participants, all frontline workers. In
205 Table 1, we provide a breakdown of the participants included in each round of the
206 interviews and the number conducted at each time point. Semi-structured qualitative
207 interviews were conducted over the telephone and guided by a discussion guide (see
208 supplementary 4). These interviews happened at five-time points (July-August, September,
209 October-November 2020, and April-May and August 2021) to allow us to capture the
210 dynamic nature of the pandemic and the rollout of the vaccine programme.

211

212 For each round of the interviews, we used a purposive sampling approach which aimed to
213 sample a wide range of frontline workers including those employed in support and
214 operations at the health facilities. In July/August, we included auxiliary staff (guards, ground
215 staff, patient attendants and cleaners) recruiting up to four participants in each health care
216 facility. In September 2020, due to time and resource constraints, we repeated interviews
217 with 2 participants per healthcare facility, this sample included both a health worker and an
218 auxiliary worker. In October/November 2020, we conducted a third set of interviews with
219 the healthcare facility in-charges, those who manage the clinic (or their representative),
220 these interviews focused more on broader changes to care provision. Between April and
221 August 2021, we undertook a second phase of interviews with in-charges (or their
222 representative). Key themes included experiences delivering care during the COVID-19
223 pandemic. Participants were asked during the interviews to reflect on the pandemic
224 including preparedness of clinics and training on COVID-19, changes in the provision of care
225 as well as perceived changes in patient behaviour. Finally, the impact of working during the
226 pandemic on frontline workers' well-being and lives. The second phase of interviews
227 explored the rollout of the COVID-19 vaccination programme and its impacts on patient

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3 228 attendance. We took a pragmatic approach to sampling, constrained by conducting
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5 229 fieldwork during the pandemic and financial limitations and did not seek to achieve data
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7 230 saturation. However, we did generate a significant of data through the 81 interviews from a
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9 231 range of participants which was triangulated with quantitative data and structured
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11 232 observations.
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14 234 **Data analysis**

15 235 Quantitative discrete data related to COVID preparedness within the facility was
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17 236 downloaded from KoboCollect (<https://www.kobotoolbox.org>) as a .csv file, cleaned and
18
19 237 analysed using Microsoft Excel V16 (Microsoft Corporation, Redmond, WA). Continuous
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21 238 data related to the department and attendance from health records were abstracted from
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23 239 photographs to Microsoft Excel V16 (Microsoft Corporation, Redmond, WA) for comparative
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25 240 analysis between 2019 and 2020 attendance across specific services. All data were analysed
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27 241 for Blantyre as a whole, and as a comparison between urban and rural facilities.

28 242 For the qualitative data we used thematic content analysis (28)(see supplementary 5 for
29
30 243 coding strategy). All transcripts were transcribed and imported into NVIVO 12 (QSR,
31
32 244 International) to facilitate data management and analysis. Initial themes were identified and
33
34 245 key gaps were included in subsequent rounds of data collection. The study team (drawing
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36 246 together the quantitative and qualitative researchers) held weekly debriefing sessions to
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38 247 allow for discussion of findings from each week's data collection. Any new avenues of
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40 248 inquiry were incorporated into the data collection. Halfway through the study, we
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42 249 presented initial findings to the District Health Office to gain feedback and participant
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44 250 checking.
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46 251

47 252 **Ethical approval**

48 253 Ethical approval was granted from the National Health Science Research Committee
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50 254 (#20/06/2534). For the qualitative interviews, the participant information sheet and consent
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52 255 form were shared on WhatsApp before the interview to allow participants to review the
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54 256 information. Before the research began, the information was reviewed again, and oral
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56 257 consent was taken from the participants. No data collected from the clinic, including clinic
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58 258 registers contained patient's personal information.
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60 259

260 ***Patient and Public Involvement***

261 This study was developed in partnership with the Blantyre District Health Office (DHO),
262 specifically the team leading the COVID-19 preparedness and response for primary health
263 care within Blantyre District. Halfway through the project we presented our initial findings
264 to the District Health COVID-19 Task Force during their weekly meetings for direct feedback,
265 incorporating their suggestions into the qualitative data collection.

267 **Results**

268 We present the qualitative and quantitative results concurrently around three themes: (1)
269 implementation of COVID response policies and practices; (2) impacts of COVID on health
270 service provision: and (3) the well-being of frontline workers. Table 2 illustrates a summary
271 of quantitative measures implemented in the healthcare facilities across the three-month
272 monitoring period. A breakdown of urban versus rural coverage is available as
273 supplementary material (S1) although no significant differences were noted.

275 **Implementation of COVID-19 response policies and practices**

276 We found that clinics remained open throughout the pandemic. The District Health Office
277 (DHO) team were quick to implement training and provide new protocols to be followed to
278 reduce patient numbers. Over the initial three-month period of the pandemic there was a
279 steady increase in the number of facilities which had over 90% of frontline staff trained
280 (Month 1: 35%; Month 2: 48%; Month 3: 70%). However, infrastructure and resource
281 limitations meant implementing COVID-19 prevention measures, such as good hand hygiene
282 and social distancing was challenging. Limitations included lack of access to reliable running
283 water, over-crowded waiting areas and small consulting rooms. The provision of PPE was
284 limited particularly during the early part of the pandemic.

286 **WASH**

287 There was an average of two moveable hand washing facilities (HWF) (e.g. buckets with
288 taps) available per facility. Despite this provision the uptake and use was low with only 33%
289 adequately set up and used during the visits (Table 2). The limited use of HWF was
290 attributed by health workers to lack of time and support to manage and refill these buckets.
291 HWF access and use appeared to drop off as the three months progressed (Table 2), in line

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3 292 with the reduced number of positive COVID-19 cases (Figure 1). It was difficult for the health
4
5 293 care facilities to channel clients through one entrance to ensure hand washing on arrival,
6
7 294 due to the open design of the facility. The location of HWF varied from clinic to clinic, and
8
9 295 there was little consistency in the provision and location of HWFs over the three-month
10
11 296 period in each facility. The highest concentration of consistent provision (i.e. available all
12
13 297 three months) was found at OPD service areas (Month 1: 71%; Month 2: 58.1%; Month 3:
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15 298 54.8%). A relatively small proportion of HWFs were found with no soap or water available
16
17 299 over the three-month period (5.2%; 8.7%; 18.6%). This may be attributed to the fact that
18
19 300 77% of facilities had a tapped water supply within the facility compound, with only two
20
21 301 having to access water from a borehole in the community outside the facility. Intermittent
22
23 302 water cuts severely affected the ability of people in the facility spaces to implement good
24
25 303 handwashing. Staff at one facility reported having no access to potable water, which left
26
27 304 them relying on hand sanitiser, a scarce resource (Table 2). In this situation there was
28
29 305 insufficient sanitiser to share with patients, which meant patients were unable to wash their
30
31 306 hands during visits to the health facilities.

30
31 307 ...we are facing a challenge of water, which is making it difficult for us to wash our
32
33 308 hands. We just depend on hand sanitisers. We can't share them with the patients
34
35 309 because there isn't enough. **[Health Surveillance Assistant, IDI20, August 2020]**

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37 310
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39 311 Of concern, was the low provision of soap at available hand washing facilities throughout
40
41 312 the study period, with this reducing to under 15% by October (Table 2); this was attributed
42
43 313 to several factors including stockouts, theft by clients, and lack of understanding by both
44
45 314 health workers and patients of the importance of soap in the reduction of COVID-19
46
47 315 transmission. Clients were more likely to follow social norms in washing hands with water
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49 316 only. In the absence of water and soap, particularly in consultation rooms, it was concerning
50
51 317 to note low access to hand sanitiser for frontline workers, as a means of protecting both
52
53 318 themselves and clients from transmission between consultations. During health care facility
54
55 319 visits, there were times when the HWFs were only put out when the research team began
56
57 320 the assessment, indicating that there may have been some reflexive bias in observed
58
59 321 practices. The team also noted that HWFs were often empty of water at the time of client
60
322 arrival and were only filled once patients were asked to collect water from communal water
323 points.

324

325 *Client screening and isolation*

326 Access to and use of thermometers for temperature checks was inconsistent with only 25%
327 of facilities having thermometers available at any given time (Table 2). Indication of fever
328 was established by visual assessment of patients during consultation, and no pre-
329 consultation checks were conducted to isolate potential cases from others in the waiting
330 areas. Sixty-one percent of the health care facilities had reported a suspected COVID-19
331 case by October 2020, with the main response being to provide the patient with a mask,
332 isolate where possible, and call the COVID-19 response team led by the DHO office for
333 advice and action.

334

335 *PPE*

336 The provision of PPE to health care facilities, particularly surgical masks, for frontline
337 workers was high (Table 2), although in early visits and interviews healthcare workers
338 reported shortages of PPE such as gloves, aprons, and masks. Of the PPE available, a small
339 amount initially supplied had expired and staff were reluctant to use it. As one medical
340 assistant commented:

341 We didn't have PPE. The PPE we were given had expired, so we were forced to move
342 consultations outside. Yes, for example the date of the face masks that we had at the
343 hospital had expired a long time ago **[Medical Assistant, IDI04, July 2020]**.

344

345 However, supply improved in the later stages of the data collection, with healthcare
346 workers reporting more stable stock. For example, one Pharmacy Assistant reflected:

347 Previously, it was hard to work because we didn't have enough personal protective
348 equipment and as you know we reached a point of starting strikes. But as of now we
349 have the PPEs" **[Pharmacy Assistant IDI06, August 2020]**.

350

351 Despite availability, we observed intermittent mask use. During the qualitative interviews,
352 frontline workers reported adhering to the mask wearing regulations, however even in
353 facilities where masks were available (83.9 – 100% of facilities in August 2020) the
354 quantitative team observed far less uptake than was reported, with less than 52% of health
355 and frontline workers wearing masks during periods of observation (Table 2). To understand

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2
3 356 this, qualitative interviews conducted in September 2020, explored why frontline workers
4 357 may not wear masks. We asked this question in the third person to ensure that frontline
5 358 workers did not feel we were accusing them. The most common reason provided during
6 359 these interviews was that masks were uncomfortable and impacted health:

10 360 Some of the health workers that are not wearing a mask complain that the mask
11 361 gives them a headache, others say the reason why they don't wear a mask is
12 362 because they want free circulation of oxygen when breathing **[Clinical Officer, IDI13,**
13 363 **September 2020]**

17 364
19 365 Mask wearing (primarily cloth) by patients and guardians (family members taking care of
20 366 patients) was seen to increase from August 2020 (Patients not wearing: 74.2%; Guardians
21 367 not wearing: 96.8%) to September 2020 (Patients not wearing: 19.4%; Guardians not
22 368 wearing: 22.6%) with a slight decline again in October 2020 (Table 2). Across the dataset,
23 369 frontline workers reported some patients were reluctant to wear masks. They attributed
24 370 this behaviour to the uncomfortableness in wearing a mask.

28 371 Some people [patients] have been complaining that they suffocate when breathing
29 372 through a mask and other people don't even know how to properly wear the masks.
30 373 So those could be some of the reasons. **[Clinical Officer, IDI09, September 2020]**

34 374
35 375 Disposal of PPE was relatively consistent, with 77% of facilities burning materials in either an
36 376 incinerator or open fire. Although, seven facilities were still disposing of PPE and clinical
37 377 waste in an open pit which may expose others to infection and did not follow good clinical
38 378 practice.

39 379 40 380 *Physical distancing*

41 381 Up to 58% of health facilities attempted to implement some level of physical distancing
42 382 (Table 2), which reduced as the months progressed, and reported cases of COVID-19
43 383 declined. Physical distancing was particularly challenging upon arrival of patients, although
44 384 efforts were made to support distancing in the waiting and consultation areas through
45 385 directives from a frontline worker, spacing chairs or marking benches (Table 2). However,
46 386 during facility visits, clients were crowding with little maintenance of physical distance.
47 387 Frontline workers felt patients failed to physically distance from each other in the queues

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3 388 because they wanted to be seen rapidly. This behaviour is likely to be shaped in part by long
4 389 waiting periods commonly reported in primary health facilities in Malawi.

5
6 390 As you know people are very difficult to deal with, they just maintain it for a short
7
8 391 period of time then they get closer to each other again, because they all want to
9
10 392 receive treatment quickly. **[Security guard, IDI02, July 2020]**

11 393

12
13 394 *Behavioural barriers for implementing COVID-19 prevention*

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15 395 In addition to the limitations associated with infrastructure and consumables, we also
16
17 396 considered how behaviour of patients evolved throughout this period of the pandemic
18
19 397 shaping the ways people behaved at the health centre. At the start of the pandemic, health
20
21 398 workers reported patients feeling fearful, distrustful, and questioning whether COVID-19
22
23 399 was a hoax as well as making links to satanism. They felt this shaped treatment seeking
24
25 400 practices with patients staying away from the facilities (a point we return to in the next
26
27 401 theme) particularly in the early stages of the pandemic when there was a great deal of
28
29 402 uncertainty and fears patients may end up in isolation facilities. However, for those patients
30
31 403 who did attend the facilities, health workers felt they were initially cautious, but as time
32
33 404 went on, they saw a change in behaviour with less adherence to preventative measures. As
34
35 405 noted below:

36 406 People think that COVID-19 has vanished. I don't know where they're getting that
37
38 407 information from. They have stopped wearing masks and they are no longer washing
39
40 408 their hands on their own as before. So, I would say people are reckless now and are
41
42 409 back to their normal life **[Clinical Officer, IDI09 October 2020]**

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44
45 411 Although not all health workers agreed with this, some reported patients were more
46
47 412 cautious about prevention and cooperative when it came to mask wearing and hand
48
49 413 washing for instance:

50 414 Yes, there have been some changes. People are now wearing masks and they are
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52 415 also washing their hands. People are observing social distance. **[Clinical officer,**
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54 416 **IDI04, October 2020]**

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3 418 Healthcare workers believed the change in patient behaviours was helped by the
4 419 government mandating mask wearing in public spaces. Some health facilities refused to
5 420 treat patients who were not wearing masks which meant patients modified their behaviour:

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8 421 People [...] now obey all the measures that have been put in place at the facility such
9 422 as wearing a face mask, [which] is mandatory either at the facility or when travelling.
10 423 It has brought a great change because when we send them back, they inform others
11 424 in their community. And now people prepare when coming to the hospital because
12 425 they are afraid of being sent back without treatment [...] [**Ground labourer, IDI01,**
13 426 **August 2020**]

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21 428 However, some frontline workers felt such punitive measures had unintended
22 429 consequences. They reported that once patients started to be turned away, mask sharing
23 430 became far more common undermining prevention efforts:

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26 431 We have however stopped sending them back because people were borrowing mask
27 432 from each other which is a big problem. So now we just inform the village chiefs to
28 433 inform their people to stop being reckless [**Clinical officer, IDI09, August 2020**]

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33 435 Frontline workers felt public behaviour changed as community and religious leaders began
34 436 to spread public health messages that dispelled rumours and encouraged people to use a
35 437 mask:

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39 438 The number of people that are wearing masks has now increased a lot [From April
40 439 2020]. The change has resulted from the meeting we had at the hospital here with
41 440 the village chiefs, where we explained to them that everyone should comply with the
42 441 preventive measures being implemented at the hospital when coming to the
43 442 hospital. Church leaders have also been encouraging people to wear masks. So our
44 443 village chiefs and church leaders have also played a major part. [**Nurse, IDI12,**
45 444 **August 2020**]

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53 446 By September 2020, frontline workers reported rumours about COVID-19 vaccines being
54 447 developed in the Global North that could cause harm to Malawians, which persisted when
55 448 vaccines became available. Rumours linked serious vaccine side effects including death,
56 449 blood clots, losing fertility, or causing people to turn into animals. As noted here:

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4 451 Some people were saying that the vaccine is associated with 666 and some were
5 saying that the vaccine is causing blood clotting, and some were saying that if you
6 452 receive the vaccine you may turn into some animal. **[Health Surveillance Assistant,
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10 454 IDI15, Sept 2020]**

11 455 I have heard rumours that getting the vaccine will shorten your life span. Some say
12 that the vaccine will make you infertile. Others have been saying that the vaccine
13 456 causes blood clot. These rumours have been circulating through social media,
14 457 patients, and ordinary members of the public. **[Medical Assistant, IDI01, May 2021]**

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20 460 As the vaccines were rolled out in March and April 2021, health workers reported
21 widespread reluctance of both health workers and the wider community to vaccinate.
22 461 Safety concerns and trust issues between the public and health care facilities administering
23 462 the COVID-19 vaccine were reported, with rural facilities most affected. This impacted the
24 463 provision of services such as of injectable contraceptives, which women felt were COVID-19
25 464 vaccine in disguise.

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28 466 What I have observed is that people are still finding it hard to understand this
29 467 disease. And because of the COVID-19 vaccine people have been refusing to receive
30 468 injection treatments, fearing they [health workers] might inject them with the
31 469 COVID-19 vaccine. The turn up of patients coming for other services such as family
32 470 planning services has decreased, and I would say that trust between health workers
33 471 and the villagers when it comes to injections has declined. **[Clinical officer, IDI05,
34 472 May 2021]**

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44 474 However, over time, health workers did report changes in attitudes with people becoming
45 475 more trusting and accepting towards the COVID-19 vaccine. This was linked to evidence of
46 476 limited side effects through those that had vaccinated first. Additionally, working jointly
47 477 with influential people such as chiefs and church leaders also made communities more
48 478 receptive of the public health education that health workers were giving to encourage
49 479 vaccine uptake.

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3 480 People were encouraged to vaccinate after seeing that health workers and other
4 481 government officials received the vaccine, and nothing happened to them. **[Nurse,**
5 482 **IDI14, May 2021.**
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8 483
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10 484 We are working hand in hand with community leaders such as chiefs, and health
11 485 advisory committees and churches, so that people get enough messages on COVID-
12 486 19, and now they understand and accept. The health advisory committees act as a
13 487 bridge between the health workers and the communities. **[Medical Assistant, IDI01,**
14 488 **May 2021]**
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19 489
20
21 490 In terms of gender, health workers reported more men than women getting vaccinated:

22 491 'Who showed up more to vaccinate?' 'All the people I found there were men.
23 492 (Medical assistant IDI26, August 2020).

24 493 Health workers linked this to some workplaces (including government offices) requiring all
25 494 their staff to be vaccinated. This may reflect the fact less women are employed in these
26 495 roles.

27 496 The number of people coming for the vaccine is increasing. We are hearing that
28 497 some companies are demanding that their employees vaccinate if they want to keep
29 498 their job. Some government companies are doing the same. That's perhaps why
30 499 people are vaccinating more than before. **[Clinical officer, IDI06, May 2021]**
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32 500

33 501 **Impact of COVID-19 on routine health services**

34 502 Frontline workers felt that the COVID-19 pandemic had negatively impacted provision of
35 503 healthcare services. They cited cancellation of routine services such as screening for
36 504 cervical cancer and HIV viral load as two of the most significant impacts.

37 505 It is very challenging. Actually, the entire system came to a halt because we are all
38 506 focused on COVID-19. **[DHO representative, IDI August 2020]**
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40 507

41 508 [...] recently some services have been stopped due to COVID-19, [e.g.] growth
42 509 monitoring services, cervical cancer screening and [HIV] viral load services. **[Clinical**
43 510 **Officer, IDI13, August 2020]**
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3 512 We found a reduction in the number of patients attending outpatient services from April
4 513 onwards, which corresponds with the first confirmed cases of COVID-19 in Blantyre District
5 514 (Figure 1). However, the facilities did not suspend all services, rather adapted strategies for
6 515 providing healthcare. For instance, people with HIV or TB normally received a three-month
7 516 dosage but were getting prescriptions for six months. As one District Health Office
8 517 representative narrated the reason for the modification was to reduce in-person
9 518 consultations and decongest the clinics.

15 519 Review clinics for HIV and TB patients have been extended, so instead of giving them
16 520 medical supplies for 3 months we are giving them medicine supplies of 6 months so
17 521 that we should try to reduce congestion and minimize time of contact with these
18 522 patients. **[DHO representative IDI August 2020]**

23 523

24 524 Patients' attendance reduced for TB services (Figure 2) could therefore reflect the extended
25 525 period for which clients received drugs as opposed to reduced attendance and should be
26 526 assessed over a more prolonged period to determine if service delivery was affected.

28 527 We also found modifications in the way child vaccination was offered. Rather than following
29 528 the immunisation calendar, mothers were grouped and assigned new vaccination dates.

33 529 Those [in need of vaccination] have been divided into several groups and each group
34 530 is told to come on their own specific day. **[Hospital attendant, IDI18, August 2020]**

37 531

39 532 Despite these efforts, and overall reduction in immunisation was seen in attendance
40 533 records, particularly in relation to facilities located in urban areas. This may reflect the
41 534 higher perceived risk of COVID-19 in urban contexts (Figure 3).

44 535 Similarly, delivery of reproductive health services was altered, with women accessing family
45 536 planning given instructions to self-administer the injection at home. However, this strategy
46 537 raised important questions about disposal and safety of used syringes and needles in the
47 538 community.

52 539 And when it comes to family planning; women are being trained to inject themselves
53 540 at home so when they come here, we just give them all the required materials.

55 541 **[Clinical officer, IDI21, August 2020]**

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3 543 Adaptation of existing services may explain some of the reduction in access to family
4 544 planning services as cases of COVID-19 were seen to increase (Figure 4). The pandemic
5
6 545 interrupted the way daily facility data was being recorded. Data entry clerks, the staff
7
8 546 responsible for completing daily registers, were not included in the risk allowance provided
9
10 547 by the government. This led to long absences by this cadre from some of the facilities.

11
12 548 Our department is still not receiving the risk allowances [...] data officers were not
13
14 549 working due to the same issue, but they have just accepted the situation and have
15
16 550 resumed their work. **[Ground labour, IDI14, September 2020]**

17 551

18
19 552 As part of managing the risk of exposure, health workers reduced their days and the amount
20
21 553 of time spent at the health care facility, alternating between the different weeks.

22
23 554 Consequently, facilities closed earlier than normal, and this further impacted on patients
24
25 555 travelling long distances to access care:

26
27 556 The other thing is that we are told to work for a limited time which is less time than
28
29 557 before, but that is challenging for the patients that can't make it to the hospital on
30
31 558 time **[Hospital attendant, IDI04, August 2020]**

32 559

33
34 560 It is difficult to assess the impact the lack of data clerks may have had on the records
35
36 561 maintained within health care facilities and reported here.

37 562

38
39 563 *Improved work practices*

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41 564 Health workers also reflected on the positive lessons drawn from responding to COVID-19,
42
43 565 reflecting that prevention measures had shaped their work practices in ways that could be
44
45 566 useful for preventing other diseases in future:

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47 567 It has encouraged us to observe hygiene; previously we used to wash our hands only
48
49 568 when we wanted to eat but now, we wash our hands regularly, after meeting each
50
51 569 patient. We also wear PPE such as masks, aprons and gloves which we never used to
52
53 570 do before COVID-19. We now observe social distancing. Social distancing protects us
54
55 571 from a lot of other diseases such as TB and others that transmit through droplets.

56
57 572 We will use masks even when COVID-19 is over. **[Medical assistant, IDI01,**
58
59 573 **November 2020]**

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3 575 **The impact of COVID-19 on frontline workers**

4 576 Frontline workers reported severe impacts on their well-being from working during the
5
6 577 pandemic. They faced constant anxiety about the risk of exposure, which appeared to be
7
8 578 two-fold. For non-clinicians, frontline workers articulated their concerns around regular
9
10 579 contact with clinicians who were seeing the patients:

11 580 I have worries because of the way things are right now [...] I work at the clinic and
12
13 581 sometimes I come into contact with the doctors and that worries me because you
14
15 582 wonder if all the patients that were in contact with the doctors have the disease.

16
17 583 **[Ground labourer, IDI03, September 2020]**
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19 584

20
21 585 Secondly, they saw themselves as potentially exposing others to the same risk they were
22
23 586 experiencing, and felt particularly concerned for their family members about this:

24 587 I feel worried that I may infect my little child and my whole family should I be
25
26 588 infected because it takes time for a person to notice if they have COVID-19. **[Clinical**
27
28 589 **Officer, IDI04, September 2020]**
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30 590

31
32 591 *Stress and helplessness*

33 592 There was a deep sense of helplessness among frontline workers about continuing to work
34
35 593 during the pandemic. Some frontline workers narrated their desire for a break from work
36
37 594 but felt powerless to act. Their lack of agency stemmed from a sense of social responsibility
38
39 595 to work but also the need to provide for their families. For most frontline workers they
40
41 596 continued to work because they could not afford to stop:

42
43 597 I cannot quit my job despite having so many worries because the job is what gives
44
45 598 me money for food. People are just going to work because they want to earn some
46
47 599 money for food, but everybody is worried. **[Medical Assistant, IDI16, September**
48
49 600 **2020]**

50 601

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52 602 Some frontline workers also drew inspiration to continue to work from the principles of
53
54 603 humanitarianism and sacrifice. Responding to 'What motivates you to continue working
55
56 604 despite the situation?' one said, 'The desire to assist people.' This demonstrates that facility
57
58 605 workers felt an ethical duty to serve their communities despite the perceived risk:
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3 606 There is no way I can say we will stop going to work due to COVID-19, because that's
4 607 our job, assisting people. So, there is no way the hospital would be closed because of
5
6 608 the pandemic. **[Nurse, IDI10, August 2020]**
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9
10 610 During July and August 2020, the Ministry of Health required all health workers to be tested
11 611 for COVID-19. This led to a significant proportion of health care workers being diagnosed.
12
13 612 The requirement for these health workers to self-isolate placed pressure and stress on staff
14 613 in health care facilities who still needed to deliver services.

15
16
17 614 We are working more than before the start of COVID-19 [...] because if say three
18 615 workers test positive to the virus, they go on quarantine, leaving behind more work
19 616 for their colleagues. **[Clinical officer, IDI21, September 2020]**
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22 617

23
24 618 *Wider community stigma*

25
26 619 Across the dataset, we found consistent testimonies of frontline workers experiencing
27 620 stigma within the wider community because they were perceived to be the ones spreading
28 621 the virus. This may have been a result of the mass testing programme initiated by the
29 622 government. In this quote, one front-line worker shared his experience of being ostracized
30 623 by bus operators and fellow passengers simply because they were from the health service.

31
32 624 We fail to board a minibus when going to work because people say we will infect
33 625 them with the disease on the bus. [...] this other day I was in my work uniform
34 626 standing at the bus stop waiting to catch a minibus, but none of the buses stopped
35 627 and other people at the bus stop started accusing me that I was the reason why the
36 628 buses were not stopping." **[Ground labourer, IDI14, August 2020]**
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45 629

46 630 To mitigate this situation the district health officer reported providing health workers with
47 631 additional buses allowing them to get to work. Although only health workers were provided
48 632 access to the buses with other frontline workers left to find their own way to work.

49
50
51 633 They reported [the discrimination on public transport] to the head office and the
52 634 office hired staff buses which were carrying only health workers. But after
53 635 sometime, the buses stopped carrying them. **[Clinical officer, IDI13, September**
54 636 **2020]**
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3 638 Tension between health workers at the healthcare facility was also reported. Fear of
4 639 infection led to mistrust between health workers, particularly for those who were diagnosed
5
6 640 having COVID-19.

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8 641 Some health workers diagnosed with COVID-19 were being ignored by fellow health
9
10 642 workers, saying they will infect them, and that was affecting them psychologically.

11 643 **[Clinical officer, IDI21, September 2020]**

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13 644

14 15 645 **Discussion**

16
17 646 This mixed methods study took place during the COVID-19 pandemic, capturing real-time
18
19 647 data around how primary health care facilities (a critical access point for patients) prepared
20
21 648 for, and then responded to the pandemic. Exploring in-depth with a range of frontline
22
23 649 workers how the COVID-19 pandemic affected their work practices and lives more broadly.
24
25 650 Initial modelling predicted that Malawi would have a high rate of hospitalizations (up to
26
27 651 435,000) and deaths (with up to 50,000 deaths), but this did not materialise at the time of
28
29 652 this study (17). As a low-income country, the COVID-19 pandemic and response took place
30
31 653 in the context of severe resource constraints in terms of both health service delivery and
32
33 654 infection prevention and control infrastructure. Our research found that despite this
34
35 655 challenging context, primary healthcare facilities remained open, and patients continued to
36
37 656 seek care, albeit in lower numbers. Notable we did not find significant differences between
38
39 657 rural and urban facilities across either the availability and use of preventative measures, or
40
41 658 the uptake of routine services. The DHO led the rapid roll out of COVID-19 related training
42
43 659 to frontline health workers, implementing key COVID-19 preventative measures but this was
44
45 660 inhibited both by the absence of materials and limited infrastructure. Nevertheless, across
46
47 661 the interviews it was evident that the training improved awareness and understanding of
48
49 662 health workers in relation to COVID-19 prevention and management of suspected cases.
50
51 663 The numbers of people attending health care facilities was radically reduced, particularly
52
53 664 during the first peak with some key services suspended. Frontline workers reported that
54
55 665 patients were fearful and distrusting of the health system, particularly at the start of the
56
57 666 pandemic. From October, there were concerns around the safety of the COVID-19 vaccine.
58
59 667 Once vaccines were rolled-out health workers perceived that there was an impact on uptake
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668 of vaccines and fear from patients when they did present. Health care workers reported a
669
670 gendered difference, with more men presenting for vaccination.

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3 670

4 671 Although pragmatic guidance was published for low and middle income countries (29), case
5
6 672 management of suspected COVID-19 cases at health care facilities was challenging, with
7
8 673 limited staff available for patient consultations. The layout of health care facilities made
9
10 674 managing patients, and reducing over-crowding while maintaining high hygiene standards
11
12 675 throughout the clinic difficult. This was compounded by inadequate resourcing (including a
13
14 676 lack of thermometers and access to isolation rooms). There was heavy reliance on the
15
16 677 centralised team from the District Health Office to respond and handle all suspected cases,
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18 678 which overburdened this team.

19 679

20
21 680 In some health care facilities, an authoritarian approach to increase patient's adherence to
22
23 681 mask wearing had a detrimental impact on prevention measures. We found that despite
24
25 682 frontline health workers reported stress and anxiety of contracting COVID-19, the uptake of
26
27 683 preventative measures including mask wearing was low, suggesting a complex relationship
28
29 684 between knowledge and behaviour. Frontline workers reported significant stigmatisation
30
31 685 and increased stress during work that impacted their lives.

32 686

33
34 687 The fear, stress and anxiety reported by frontline workers in our study reflects trends across
35
36 688 the globe. Studies undertaken in a wide range of high-, middle-, and low-income contexts
37
38 689 speak to devastating impact COVID-19 had on health care workers' psychosocial well-being
39
40 690 (30,31). In sub-Saharan Africa, where health systems are more fragile, referral pathways are
41
42 691 more complex and access to PPE challenging; all contributed further stress to health care
43
44 692 workers. By including a wider cadre of staff including guards and patient attendants, we
45
46 693 demonstrated that the psychosocial impact was not limited to frontline health care workers.
47
48 694 Our work speaks to the urgent need to provide psychosocial support for all frontline and
49
50 695 auxiliary workers.

51 696

52 697 Our findings on the reductions in patient attendance and the disruptions to routine health
53
54 698 services reflect wider global trends. In Malawi, the pandemic has also seen increases in
55
56 699 teenage pregnancies, as well as reductions in TB case detection (21,32,33). This has both
57
58 700 immediate and future impacts on patient outcomes from preventable and treatable
59
60 701 diseases leading to wider implications for wider economic and social development.

702

703 Malawi currently has vaccine coverage of 5.6% one of the lowest in the world (34). In
704 Malawi, men are generally more likely to be employed than women (35), meaning
705 mandatory workplace vaccination may have made men more likely to access the vaccine
706 than women. Women's hesitancy to vaccinate was also centred around rumours related to
707 both fertility and complications associated with contraceptives.

708

709 The importance of hand hygiene in the prevention of communicable diseases, including
710 respiratory infections cannot be overemphasized, particularly with regard to COVID-19 and
711 wider IPC interventions (36–38). Prior to this pandemic, WASH campaigns were emphasising
712 the importance of hand washing with soap after toilet use and during consultations in
713 healthcare facilities (39–41). However, opportunities for hand washing in this setting were
714 rarely found, with reasons cited as lack of hand washing facilities, access to water, and the
715 need for constant maintenance (39–41). Nevertheless, our results indicate that despite the
716 provision of the necessary hand washing facilities and regular access to water, few health
717 facilities made adequate hand washing stations with soap or sanitisers available at either
718 toilets or other areas of the health care setting. Where they were available, their presence
719 was intermittent meaning that adherence to recommended hand hygiene practice (hand
720 washing with soap or use of hand sanitizer) was limited by patients, HCWs and auxiliary
721 staff. By failing to utilise the handwashing facilities available to them (i.e., keeping provided
722 buckets and soap in storage) health facility staff are indicating that they are either
723 overburdened, or do not understand the value of hand washing with soap in COVID-19
724 prevention and IPC practices. This was a missed opportunity to promote effective hand
725 washing with soap to the community members utilising the health care facilities, as lack of
726 proper hand hygiene in the healthcare facilities has been found to reflect inadequate
727 handwashing at the household level (42,43), as WASH norms are shared in community
728 settings (44). Research has demonstrated that the availability of WASH infrastructure (e.g.
729 hand washing facility with soap) in accessible locations motivates behaviour performance,
730 acts as a cue for action and enhances social norms (45). As such it is imperative that hand
731 washing facilities are made accessible to all staff and patients to promote their effective
732 use, and where possible supported with supervision, nudges and appropriate behaviour

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3 733 change techniques to improve hand hygiene in healthcare settings both for the short and
4 734 long term (46–48).

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7
8 736 Overall clinical waste management was found to be well managed in the majority of health
9 care facilities, with incineration of used masks being undertaken on a regular basis.

10 737
11 738 However, as found in previous reports in Blantyre, some masks were disposed of into open

12 739 pits which were potentially exposing community members to infection (49). A consistent

13 740 and context appropriate response to clinical waste management is needed for all health

14 741 care facilities to reduce the risk of infection transmission while taking into consideration the

15 742 environmental impacts of disposal in the long term (49).

16 743

17 744 Despite the limited resource in these settings, the findings of our study indicate an effective

18 745 cross sectoral approach over the ten month period of the pandemic, enabling the rapid

19 746 deployment of materials to support preventative measures (e.g. masks, HWF) and

20 747 vaccination, alongside structured guidance and training. However, we also expose the

21 748 limitations of providing these resources and expecting their immediate implementation and

22 749 sustained practice, where basic IPC practices were not already in place. Policy and

23 750 programming should take advantage of the tipping point created by the pandemic to ensure

24 751 long term sustained support and resource to these instrumental primary health care

25 752 facilities, to facilitate the maintenance of effective IPC practices for not only COVID-19 but

26 753 other communicable diseases as well.

27 754

28 755 **Limitations**

29 756 Our study has several limitations. As we were collecting data during the pandemic, we

30 757 limited the time the study team was in the health care facilities. Qualitative interviews were

31 758 conducted over the phone, which may have made it more challenging for the interviewer to

32 759 build rapport with participants and inhibited their responses. The study focused on frontline

33 760 workers, and we did not conduct interviews with patients, this means that findings around

34 761 patient behaviour was filtered through frontline workers perspectives. Due to time and

35 762 resource constraints, we only interviewed frontline workers at two time points, and only

36 763 interviewed HC facilities in-charges for the last two time point. The views of HC facilities in

37 764 charge may not be the same as frontline workers' experiences. Collecting data from health

1
2
3 765 care facility registers was challenging and required efforts to compare registers to
4 766 centralised health management information records to ensure they were consistent. Longer
5
6 767 term attendance data comparisons are also recommended to assess the impacts on key
7
8 768 services.
9

10 769

11 770 **Conclusion**

12
13 771 Health care facilities in the Blantyre district were initially unprepared to respond to the
14
15 772 COVID-19 pandemic. However, despite significant resource limitations, the health care
16
17 773 facilities were able to adapt their procedures to remain open and deliver the majority of key
18
19 774 services. Although efforts were made to supply health care facilities with resources for
20
21 775 COVID-19 prevention, there were limitations to their implementation (e.g. hand washing
22
23 776 facility use with soap, mask wearing, etc). Complex factors seem to shape staff behaviours
24
25 777 and knowledge did not always translate into practice. Providing additional supervision,
26
27 778 support and training may lead to sustained adherence to preventative measures in the long
28
29 779 term. Our study also speaks to the need to provide psychosocial support for all those
30
31 780 working on the frontline in health facilities.
32

33 781

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36
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38
39 785 number SFC/AN/18/2020.
40

41 786

42 787 **Author Contribution statement**

43
44 788 Mackwellings Phiri led collection and analysis of qualitative data and paper writing. Mindy
45
46 789 Penulo and Chawanangwa Mahebere Chirambo led collection of quantitative data and
47
48 790 provided paper review support. Kondwani Chidziwisano led analysis of quantitative data and
49
50 791 helped with paper writing. Khumbo Kalua, Gift Kawalazira, Zuziwe Gundah, and Penjani
51
52 792 Chunda led the study and provided paper review support. Eleanor MacPherson and Tracy
53
54 793 Morse designed and led the study and supported paper writing.
55

56 794

57 795 **Declaration of competing interest**

58
59 796 The authors declare that there is no conflict of interest.
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4 798 **Data sharing**

6 799 The data supporting results of this study are available on request from the Department of
7
8 800 Civil and Environmental Engineering, University of Strathclyde
9
10 801 (tracy.thomson@strath.ac.uk). For the qualitative research, we can provide second order
11
12 802 summaries of transcripts to ensure anonymity of participants.

13 803

15 804 **Figure 1**

17 805 Outpatient service attendance 2019 versus 2020 with the number of positive confirmed
18
19 806 cases of COVID-19 in Blantyre District (n=27 health facilities)

21 807

22 808 **Figure 2**

24 809 TB service attendance 2019 versus 2020 with the number of positive confirmed cases of
25
26 810 COVID-19 in Blantyre District (n=27 health facilities)

28 811

30 812 **Figure 3**

31 813 Child health (including immunisation) service attendance 2019 versus 2020 with the number
32
33 814 of positive confirmed cases of COVID-19 in Blantyre District (n=27 health facilities)

35 815

37 816 **Figure 4**

39 817 Family planning service attendance 2019 versus 2020 with the number of positive confirmed
40
41 818 cases of COVID-19 in Blantyre District (n=27 health facilities)

43 819

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Table 1: Summary of Qualitative Sampling

Health Facility	Location	Phase 1			Phase 2	
		July-August 2020	September 2020	November 2020	April-May 2021	August 2021
001clk	Rural	<ul style="list-style-type: none"> Hospital Attendant (IDI04) Medical Assistant (Clinic in charge) (IDI01) Security Guard (IDI02) Ground Labourer (IDI03) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI01) Ground Labourer (IDI03) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI01) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI01) Nurse (IDI28) Clinician (IDI29) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI01)
002mpm	Rural	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI08) Pharmacy Assistant (IDI06) Ground Labourer (IDI14) Health Surveillance Assistant (IDI15) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI08) Ground Labourer (IDI14) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI08) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI08) Nurse (IDI30) Health Surveillance Assistant (IDI15) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI08)
003mdk	Rural	<ul style="list-style-type: none"> Security Guard (IDI10) Clinical Officer (Clinic in charge) (IDI23) 	<ul style="list-style-type: none"> Security Guard (IDI10) Clinical Officer (Clinic in charge) (IDI23) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI23) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI23) Nurse (IDI31) Health Surveillance Assistant (IDI15) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI23)
004nmk	Rural	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI26) Hospital attendant (IDI25) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI26) Hospital attendant (IDI25) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI26) 	<ul style="list-style-type: none"> Medical Assistant (Clinic in charge) (IDI26) Nurse (IDI27) Health Surveillance Assistant (IDI15) 	<ul style="list-style-type: none"> Nurse (IDI27)
005nrd	Urban	<ul style="list-style-type: none"> Hospital Attendant (IDI18) Security Guard (IDI2) Nurse (Clinic in charge) (IDI11) 	<ul style="list-style-type: none"> Hospital attendant (IDI18) Nurse (Clinic in charge) (IDI11) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI11) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI11) Health Surveillance Assistant (IDI15) 	<ul style="list-style-type: none"> Nurse (Clinic in-charge) (IDI11)

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		<ul style="list-style-type: none"> Data Clerk (IDI07) 			<ul style="list-style-type: none"> Nurse (IDI35) 	
006gty	Urban	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI19) Ground Labourer (IDI09) Nurse (IDI13) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI19) Ground Labourer (IDI09) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI19) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in-charge) (IDI19) Nurse (IDI13) Health Surveillance Assistant (IDI36) 	<ul style="list-style-type: none"> Nurse (IDI13)
007slz	Urban	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI12) Hospital Attendant (IDI17) Security Guard (IDI16) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI12) Hospital attendant (IDI17) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI12) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI12) Clinical Officer (IDI37) Nurse (IDI38) 	<ul style="list-style-type: none"> Nurse (Clinic in charge) (IDI12)
008bng	Urban	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI21) Clinician (IDI24) Health Surveillance Assistant (IDI20) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI21) Health Surveillance Assistant (IDI20) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI21) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in-charge) (IDI21) Clinician (IDI24) Health Surveillance Assistant (IDI20) 	<ul style="list-style-type: none"> Clinical Officer (Clinic in charge) (IDI21)

Table 2: Summary of COVID preparedness from 31 health facilities across Blantyre District from August – October 2020.

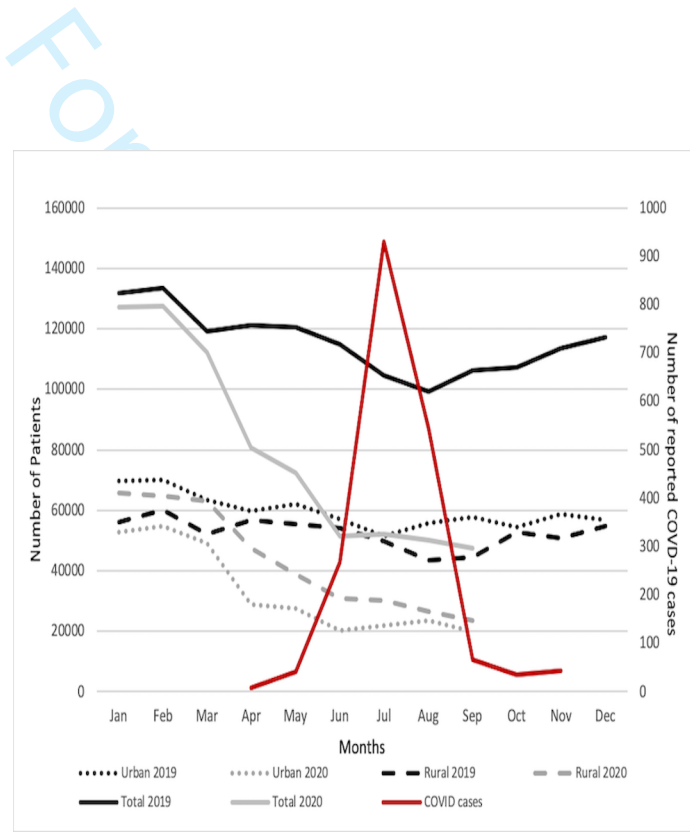
Staff training		August	September	October
	Percentage trained in COVID-			
All frontline workers	19	51.6%	69.68%	80.4%
Hand washing		August	September	October
HWF at entrance	Percentage of facilities	32.3%	32.3%	32.3%
HWF at OPD	Percentage of facilities	71.0%	58.1%	54.8%
HWF HIV	Percentage of facilities	25.81%	22.58%	19.35%
HWF at EPI	Percentage of facilities	19.35%	6.45%	3.23%
HWF at Maternity / antenatal	Percentage of facilities	32.26%	32.26%	29.03%
HWF at toilets	Percentage of facilities	3.23%	0.00%	0.00%
HWF in consultation room	Percentage of facilities	32.26%	25.81%	9.68%
No. HWF per facility	Average number per facility	2.4	2.1	1.7
HWF with soap and water	Percentage with	32.0	29.5	14.9
HWF with water only	Percentage with	61.8	51.8	66.5
Hand sanitiser	Number with access (from 31)	3.0	2.0	0.0
Temperature checks		August	September	October
Thermometer available	Number with access (from 31)	9.0	8.0	4.0
Checks at entrance	Number of the 31 health facilities	0.0	1.0	0.0
Checks at waiting area	Number of the 31 health facilities	0.0	0.0	1.0
Checks in consultation room	Number of the 31 health facilities	8.0	7.0	0.0
Masks		August	September	October
Surgical masks available	Percentage of facilities with available	83.87%	100.00%	90.32%
N95 masks available	Percentage of facilities with available	38.71%	38.71%	35.48%
<i>Mask wearing</i>				
Health workers (non nursing)	Always wearing	25.8%	51.6%	19.4%
	Sometimes wearing	48.4%	45.2%	64.5%
	Not wearing	25.8%	3.2%	16.1%
Nurses	Always wearing	29.0%	51.6%	22.6%
	Sometimes wearing	38.7%	29.0%	54.8%
	Not wearing	32.3%	19.4%	22.6%
Auxiliary staff	Always wearing	6.5%	41.9%	12.9%
	Sometimes wearing	48.4%	35.5%	67.7%
	Not wearing	45.2%	22.6%	19.4%
Patients	Always wearing	0.0%	16.1%	3.2%
	Sometimes wearing	25.8%	64.5%	67.7%
	Not wearing	74.2%	19.4%	29.0%

Guardians	Always wearing	0.0%	19.4%	3.2%
	Sometimes wearing	3.2%	58.1%	67.7%
	Not wearing	96.8%	22.6%	29.0%
Mask type				
Health workers (general)	Surgical	68.97%	76.9%	92.9%
	N95	27.59%	15.4%	7.1%
	Cloth	3.45%	7.7%	0.0%
Nurses	Surgical	80.8%	85.2%	96.0%
	N95	19.2%	14.8%	4.0%
	Cloth	0.0%	0.0%	0.0%
Auxiliary staff	Surgical	81.8%	85.2%	88.9%
	N95	18.2%	11.1%	3.7%
	Cloth	0.0%	3.7%	7.4%
Patients	Surgical	53.3%	41.0%	35.9%
	N95	0.0%	2.6%	7.7%
	Cloth	46.7%	56.4%	56.4%
Guardians	Surgical	50.0%	44.4%	36.8%
	N95	0.0%	2.8%	5.3%
	Cloth	50.0%	52.8%	57.9%
Waste management				
Pit	Number of the 31 health facilities	9	5	7
Incinerator	Number of the 31 health facilities	19	21	19
Open burning	Number of the 31 health facilities	3	5	5
Physical distancing		August	September	October
Physical distancing on arrival	Number of the 31 health facilities	9	14	6
	Word of mouth	54%	69.2%	100%
	Chairs spaced	38%	15.4%	0%
	Floor markings	8%	15.4%	0%
Physical distancing in waiting area	Number of the 31 health facilities	13	18	13
	Word of mouth	41%	45.0%	52.9%
	Chairs spaced	41%	30.0%	41.2%
	Floor markings	18%	25.0%	5.9%
Physical distancing in consultation area	Number of the 31 health facilities	16	17	14
	Word of mouth	50%	33.3%	0.0%
	Chairs spaced	50%	66.7%	91.7%
	Floor markings	0%	0.0%	8.3%
Physical distancing in wards	Number of the 31 health facilities	6	2	1
	Word of mouth	37.50%	0.0%	0.0%
	Chairs spaced	62.50%	100.0%	100.0%
	Floor markings	0%	0.0%	0.0%

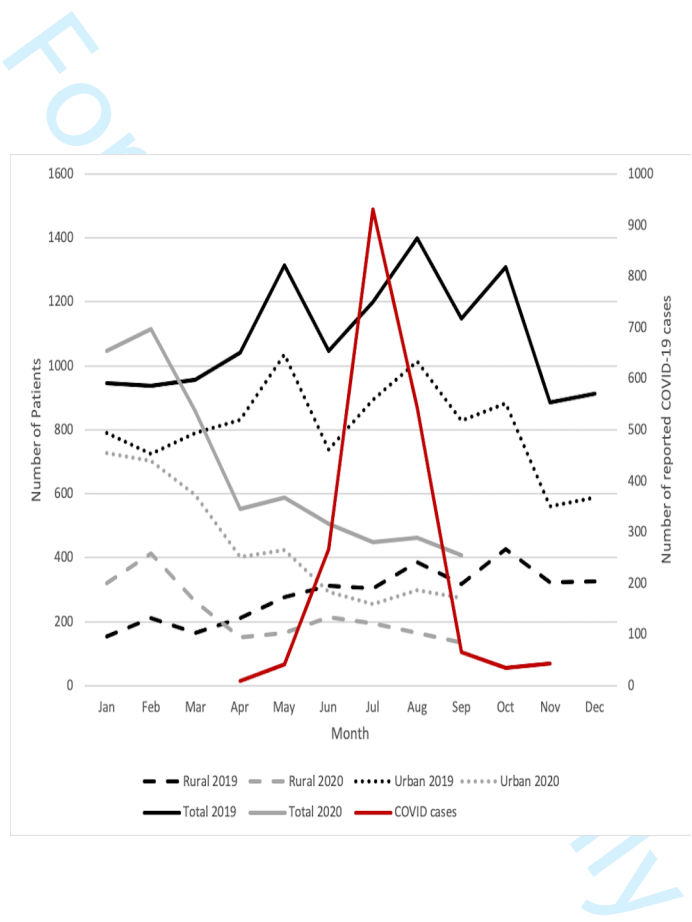
Case management		August	September	October
Isolation room	Number of the 31 health facilities	3	4	4
Presence of suspected cases	Number of the 31 health facilities	12	15	19
Action to take when case is available	Give a mask	11.11%	17.24%	17.07%
	Isolation	37.04%	31.03%	29%
	Call covid-19 team at DHO	40.74%	44.83%	29%
	Call hotline number	3.70%	0.00%	0%
	Other	7.41%	6.90%	24%

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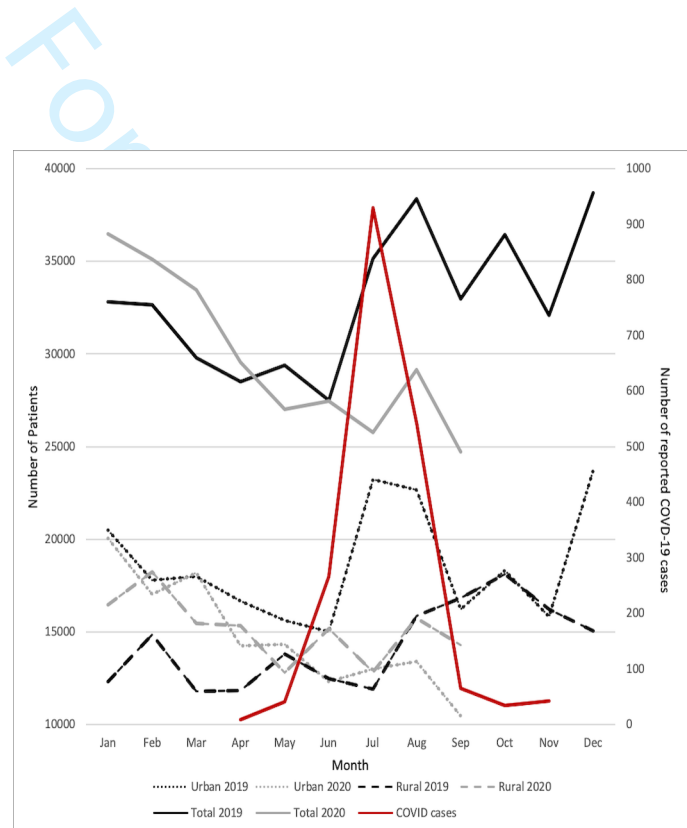
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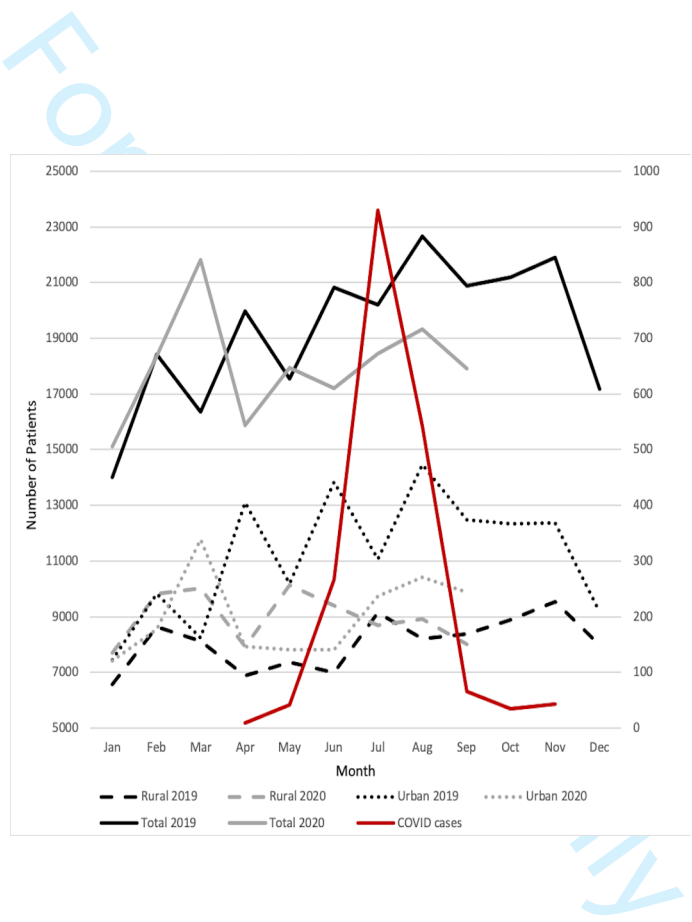
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HEALTH FACILITY CHARACTERISTICS

Health facility name	Health facility Location	number of healthcare workers		Number of auxiliary staff	Population of catchment area
		Number of nurses	Number of clinicians		
Mpemba	Rural	7	2	19	20,619
Dziwe	Rural	5	3	32	18,886
Chabvala	Rural	3	2	25	13,746
Chileka SDA	Rural	3	2	26	17,240
Lundu	Rural	5	3	26	27,164
Namikoko	Rural	3	2	19	9,675
Makata	Rural	2	2	27	36,213
Kadidi	Rural	4	4	21	20,414
Gateway	Urban	15	10	43	No records available
Mbayani	Urban	6	2	49	74,102
Chirimba	Urban	6	5	45	61,093
Ndirande	Urban	31	11	80	131,353
Malabada	Rural	6	3	42	No records available
Chikowa	Rural	6	6	36	36,174
Chileka	Rural	19	7	62	30,803
Mdeka	Rural	8	3	37	33,406
Lirangwe	Rural	9	3	40	28,896
Madziabango	Rural	6	2	33	9,901
South Lunzu	Urban	21	11	25	89,963
Pensulo	Rural	4	1	29	16,245
Mitsidi	Rural	5	2	40	No records available
Zingwangwa	Urban	21	9	71	141,123
Limbe	Urban	21	11	95	77,108
Ameca	Rural	6	3	20	No records available
Light House	Urban	0	1	10	No records available
Bangwe	Urban	21	10	98	203,022
Makhetha	Urban	7	3	37	62,919
Mpingo	Rural	3	0	16	9,780
Chimembe	Rural	5	2	16	20,088
Soche Maternity	Rural	3	2	33	15,948
Chilomoni	Urban	21	8	55	76,030

Summary of COVID preparedness from 31 health facilities across Blantyre District (Urban vs Rural) from August – October 2020

		Urban			Rural		
		August	September	October	August	September	October
Staff training		August	September	October	August	September	October
All frontline workers	Percentage trained in COVID-19	41.10%	67.10%	80.70%	63.10%	73.80%	84.70%
Hand washing		August	September	October	August	September	October
HWF at entrance	Percentage of facilities	33.33%	33.3%	25.0%	36.8%	37%	42.1%
HWF at OPD	Percentage of facilities	67%	33.3%	41.7%	68.4%	74%	78.9%
HWF HIV	Percentage of facilities	8%	16.67%	8.33%	31.58%	26%	31.58%
HWF at EPI	Percentage of facilities	8%	0.00%	0.00%	26.32%	11%	5.26%
HWF at Maternity / antenatal	Percentage of facilities	17%	8.33%	33.33%	73.68%	68%	47%
HWF at toilets	Percentage of facilities	0%	0.00%	0.00%	10.53%	0%	0%
HWF in consultation room	Percentage of facilities	25%	33.33%	8.33%	36.84%	26%	11%
No. HWF per facility	Average number per facility	1.58	1.25	1.27	2.14	2.22	2.11
HWF with soap and water	Percentage with	31.58%	28.57%	28.57%	46.00%	44.44%	33.33%
HWF with water only	Percentage with	68.42%	64.29%	71.43%	52.00%	55.56%	66.67%
Hand sanitiser	Number with access (from 31)	2	1	0	1	1	0
Temperature checks		August	September	October	August	September	October
Thermometer available	Number with access (from 31)	1	4	2	8	4	2
Checks at entrance	Number of the 31 health facilities	0	1	0	0	0	0
Checks at waiting area	Number of the 31 health facilities	0	0	0	0	0	1
Checks in consultation room	Number of the 31 health facilities	1	3	0	7	4	0
Masks		August	September	October	August	September	October
Surgical masks available	Percentage of facilities with available	91.67%	100.00%	83.33%	84.21%	100.00%	89.47%
N95 masks available	Percentage of facilities with available	16.67%	25.00%	66.67%	52.63%	42.11%	42.11%

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<i>Mask wearing</i>							
Health workers (non nursing)	Always wearing	41.67%	50.00%	8.33%	15.79%	47.37%	26.32%
	Sometimes wearing	58.33%	50.00%	83.33%	42.11%	47.37%	57.89%
	Not wearing	0.00%	0.00%	8.33%	42.11%	5.26%	15.79%
Nurses	Always wearing	27.27%	50.00%	25.00%	26.32%	42.11%	26.32%
	Sometimes wearing	63.64%	16.67%	66.67%	31.58%	36.84%	47.37%
	Not wearing	9.09%	33.33%	8.33%	42.11%	21.05%	26.32%
Auxiliary staff	Always wearing	16.67%	50.00%	0.00%	5.26%	36.84%	21.05%
	Sometimes wearing	50.00%	41.67%	25.00%	47.37%	31.58%	63.16%
	Not wearing	33.33%	8.33%	75.00%	47.37%	31.58%	15.79%
Patients	Always wearing	0.00%	33.33%	0.00%	0.00%	5.26%	5.26%
	Sometimes wearing	41.67%	66.67%	91.67%	21.05%	57.89%	57.89%
	Not wearing	58.33%	0.00%	8.33%	78.95%	36.84%	36.84%
Guardians	Always wearing	0.00%	41.67%	0.00%	0.00%	5.26%	5.26%
	Sometimes wearing	8.33%	41.67%	91.67%	5.26%	57.89%	57.89%
	Not wearing	91.67%	16.67%	8.33%	94.74%	36.84%	36.84%
<i>Mask type</i>							
Health workers (general)	Surgical	74.43%	80.00%	84.62%	76.92%	66.67%	94.12%
	N95	28.57%	13.33%	15.38%	23.08%	22.22%	5.88%
	Cloth	0.00%	6.67%	0.00%	0.00%	11.11%	0.00%
Nurses	Surgical	76.92%	88.89%	91.67%	84.62%	78.95%	93.33%
	N95	23.08%	11.11%	8.33%	15.38%	21.05%	6.67%
	Cloth	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Auxiliary staff	Surgical	77.78%	83.33%	75.00%	84.62%	86.67%	100.00%
	N95	22.22%	8.33%	8.33%	15.38%	13.33%	0.00%
	Cloth	0.00%	8.33%	16.67%	0.00%	0.00%	0.00%
Patients	Surgical	42.86%	40.91%	35.00%	80.00%	42.86%	38.10%
	N95	0.00%	4.55%	10.00%	0.00%	0.00%	4.76%
	Cloth	57.14%	54.55%	55.00%	20.00%	57.14%	57.14%

Guardians	Surgical	50.00%	50.00%	40.00%	50.00%	42.86%	36.84%
	N95	0.00%	0.00%	5.00%	0.00%	4.76%	5.26%
	Cloth	50.00%	50.00%	55.00%	50.00%	52.38%	57.89%
Waste management		August	September	October	August	September	October
Pit	Number of the 31 health facilities	6	4	2	6	1	5
Incinerator	Number of the 31 health facilities	6	13	10	6	8	9
Open burning	Number of the 31 health facilities	0	3	0	0	2	5
Physical distancing		August	September	October	August	September	October
Physical distancing on arrival	Number of the 31 health facilities	5	6	3	4	8	3
	Word of mouth	50%	66.67%	25.00%	40.00%	75.00%	66.67%
	Chairs spaced	38%	16.67%	0.00%	60.00%	0.00%	0.00%
Physical distancing in waiting area	Floor markings	13%	16.67%	0.00%	0.00%	25.00%	33.33%
	Number of the 31 health facilities	7	9	6	6	9	7
	Word of mouth	45.46%	33.33%	42.67%	28.57%	50.00%	55.56%
Physical distancing in consultation area	Chairs spaced	27.27%	16.67%	8.33%	74.44%	25.00%	0.00%
	Floor markings	27.27%	41.67%	33.33%	0.00%	25.00%	44.44%
	Number of the 31 health facilities	9	6	5	7	11	9
Physical distancing in wards	Word of mouth	54.55%	25.00%	0.00%	50.00%	26.67%	20.00%
	Chairs spaced	45.46%	50.00%	41.67%	50.00%	73.33%	70.00%
	Floor markings	0.00%	0.00%	0.00%	0.00%	0.00%	10.00%
Physical distancing in wards	Number of the 31 health facilities	1	0	0	1	2	1
	Word of mouth	100.00%	0.0%	0.0%	33.33%	0.00%	0%
	Chairs spaced	0.00%	0.0%	0.0%	66.67%	100.00%	100%
	Floor markings	0.00%	0.0%	0.0%	0.00%	0.00%	0%
Case management		August	September	October	August	September	October
Isolation room	Number of the 31 health facilities	1	2	2	2	2	2
Presence of suspected cases	Number of the 31 health facilities	8	8	8	8	7	11

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Appendix 7: Health Centre Assessment Questionnaire

District: _____ Date: _____

Dispensary/Health centre Name: _____

Facility ID NO: _____

GPS Coordinates: _____

Observations

No	Question	Responses
1	What is the distance (in kilometres) from the "district hospital" to this health facility?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Kilometres
2	Type of road reaching the health facility	<input type="checkbox"/> Dirty small road <input type="checkbox"/> Improved large road (paved)
3	Is there cell phone coverage at the health facility?	<input type="checkbox"/> Yes <input type="checkbox"/> No
4	Visible Hand washing facility at the health facility	<input type="checkbox"/> None <input type="checkbox"/> Yes with Soap and water <input type="checkbox"/> Yes with no soap
5	Temperature Check	<input type="checkbox"/> Yes present and working <input type="checkbox"/> Thermometer present but not working <input type="checkbox"/> Thermometer present but not used <input type="checkbox"/> Not present
6	Type of masks HCW wearing	<input type="checkbox"/> Surgical Masks <input type="checkbox"/> N95 <input type="checkbox"/> Home made
7	Do they have COVID -19 leaflets (any other sensitisation messages) available	Yes/No
8	How are gloves, masks waste being disposed	BIN PIT Open Space

9	Observe if there are adhering to physical distance between a. Patient to patient b. Patient to attendant/health care worker c. Health care worker to health care worker	Yes/No
10	Staff wearing face masks /face shield	Nurses Yes /NO or some ----- Medical assistants Yes/No or some ----- HSA's Yes/No or some----- Cleners Yes /No or some----- Pharmacy Yes /NO or some ----- Security Patients assistants Ground labourers
11	Water source at the health facility	
12	Hand washing points	
13	Latrines att the facility	
14	Isolation space	

Collect monthly Total Number of Patients attended at the facility;

No	2019	Number of patients	2020	Number of patients
1	January		January	
2	February		February	
3	March		March	
4	April		April	
5	May		May	
6	June		June	
7	July		July	
8	August		August	
9	September		September	

10	October		October	
11	November		November	
12	December		December	

SECTION A: Human Resource

Ask for Number of total health workers at the health facility according tto cadre		Total Number	Number present today
1.	Clinical Officers		
2.	Nurses/midwives		
3.	Patients Attendants/		
4.	Health surveillance assistants		
5	Hospital Attendant/Maid/Cleaners		
6	Security officers		
7	Medical Assistants		
8	Data clerk		
9	Pharmacy Assistant		
10	Ground Labourers		
11	Counsellors		

Training

Number of total health workers at the health facility who were trained in COVID-19

Cadre	Number Trained	When were they trained	Who trained them	What areas were they trained
Clinical Officers			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)

Nurses/midwives			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management
Patients Attendants/			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Health surveillance assistants			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Hospital Attendant/maid/Cleaners			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Security officers			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Medical Assistants			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Data clerk			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Pharmacy Assistant			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)

Ground Labourers			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)
Counsellors			Government NGO Other (<i>Specify</i>)	Case Identification & Tracing Case Management Other (<i>Specify</i>)

Does the facility has a working shift schedule for different cadres

Cadre	Yes/No	How many per shift
Clinical Officers		
Nurses/midwives		
Patients Attendants/		
Health surveillance assistants		
maid/Cleaners		
Security officers		
Medical Assistants		
Data clerk		
Pharmacy Assistant		
Counsellors		
Ground Labourers		

SECTION B : Disease Control

Question	Options	How many (Qty) This should refer to in-Stock?

<p>Do you have the following Supplies;</p> <p>Soap Hand sanitizer Buckets Masks.</p> <ol style="list-style-type: none"> 1. N95 2. Surgical Masks <p>Maternity Aprons Plastic Aprons Face Shields Gloves Gumboots</p>	<p>Is it available (Yes/No)</p>	<hr/>
<p>Do you do health talks about COVID-19</p>		<hr/>
<p>If yes how frequent</p>	<p>Daily Once a Week More than once a week Other (Specify)</p>	<hr/>
<p>If yes how is the health talk delivered</p>	<p>During morning sessions During consultation As we are waiting Using Mass Media (e.g. TV)</p>	<hr/>
<p>How do you do contact tracing</p>		<hr/>
<p>In the last month did you have patients you could not treat because your health facility run out of supplies</p>		<hr/>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	If yes, which supplies were out of stock Soap Sanitizer Washing facilities Masks. 1. N95 2. Surgical Masks Maternity Aprons Plastic Aprons Face Shields Gloves Gumboots		<hr/>
18 19 20	When you run out of stock of supplies, how long does it take for stock to be re-supplied.		<hr/>
21 22 23 24	When are you expecting the other supplies?		<hr/>
25 26 27 28	What further questions do you ask a suspected case	<hr/>	
29 30 31 32 33 34 35	Then what do you do when you find a suspect	Give a mask Isolation Call the COVID-19 team at DHO Call HOTLINE Number Other (Specify)	
36 37 38	What is the hotline number for COVID 19		
39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	Do you have a contact person for COVID19 at facility level? If yes, what is their name and phone number?	Name: Number :	

<p>Which services do you provide as a facility;</p>	<ul style="list-style-type: none"> - OPD (include malaria etc) - General Counseling - Family Planning - Sti Services - Ante-Natal, Delivery And Post-Natal Care Services - Prevention Of Mother To Child Transmission Of Hiv (Pmtct) - Treatment Of Sexual Abuse (Including Pep) - Post Abortion Care (Pac) - ART Services - HTC - Cancer Screening Other: 	
<p>In the last three months, which services were you not able to provide</p>	<ul style="list-style-type: none"> - OPD (include malaria etc) - General Counseling - Family Planning - Sti Services - Ante-Natal, Delivery And Post-Natal Care Services - Prevention Of Mother To Child Transmission Of Hiv (Pmtct) - Treatment Of Sexual Abuse (Including Pep) - Post Abortion Care (Pac) - ART Services - HTC - Cancer Screening Other: 	

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Which service are you currently providing	<ul style="list-style-type: none"> - Opd - General Counseling - Family Planning - Sti Services - Ante-Natal, Delivery And Post-Natal Care Services - Prevention Of Mother To Child Transmission Of Hiv (Pmtct) - Treatment Of Sexual Abuse (Including Pep) - Post Abortion Care (Pac) - Art Services - Htc - Cancer Screening Other: 	
What are the usual source of electricity at this health facility.	<input type="checkbox"/> ESCOM <input type="checkbox"/> Functioning generator <input type="checkbox"/> Solar <input type="checkbox"/> Other (please specify) <input type="checkbox"/> No reliable source of electricity	
When the usual source of electricity is not available what supplemental source do you have? Please select only one answer	<input type="checkbox"/> Generator <input type="checkbox"/> IPS (rechargeable battery) <input type="checkbox"/> Solar <input type="checkbox"/> No supplemental source <input type="checkbox"/> Other (specify)	
What are the main sources of water at the health facility	<input checked="" type="checkbox"/> Tap <input checked="" type="checkbox"/> Borehole <input type="checkbox"/> Well must be fetched from elsewhere	
Do you have latrines at the facility? If Yes, How are they distributed?	<input type="checkbox"/> At least 2 latrines (at least one each for men and women) <input type="checkbox"/> 1 latrine <input type="checkbox"/> No latrines	

Impact of COVID-19 on health centre service delivery in urban and rural Malawi

Topic guides: In-depth Interviews (front-line health workers)

Due to the iterative nature of qualitative research, the interviews that we conduct with participants will be open-ended and iterative, limiting the extent to which the content and direction of interviews can be fully anticipated. However, the topic guide provides a guide to the themes and questions that will be discussed with front-line staff at health care clinics. We will refine and update the topic guides as new themes will be discussed with each group of participants, which will be refined in response to new themes and findings that emerge.

First round

Demographics

Role at the clinic:

Age:

Birth place:

Highest qualification:

Length of time in post:

Length of time working in health care:

Theme 1: Experiences of delivering care

- Can you tell me about your day to day work? (explore how many patients they normally see at the clinic, what are the most frequent illnesses they treat, any challenges with stockouts)
- If you think back over the two months, have you seen any changes at the clinic? (probe around the number of patients coming to the clinic, incorporating new practices into their work including new screening practices, length of day, changes in the illnesses they are seeing and any differences in stockouts)
- Looking forward what do you think is likely to change in the coming months in relation to delivering care to patients?

Theme 2: Provision of support

- Have you been provided with any specific support to work during COVID? (if they say yes, probe around what this is, and whether it has had any impact on day to day work practices)

Theme 3: Risk perception and COVID-19

- What do you think are the biggest risks in your life? (probe around inside and outside of work)
- If you look back two months to now, how do you feel about coming to work? (is there anything you feel more worried about? Anything you feel less worried about?)
- What do you know about COVID-19? (probe around how it is transmitted, whether they see any specific groups at risk, what practices people can put in place to avoid becoming infected)
- Do you see yourself as at risk of COVID-19? (if they do, where to they see this risk is coming from, does it link to any specific procedures)
- If they do see themselves at risk of COVID-19 are they doing anything to protect themselves?

Second round

Theme 1: Experiences of delivering care

- If you think back during the first wave of COVID, have you seen any changes at the clinic?
 - Explore whether the number of patients coming to the clinic has increased or reduced (probe what influences people to or not come)
- If at all, what is the impact of the second wave of COVID on health service delivery?
 - Probe whether health service delivery has been reduced or not, what changes have brought in reduction in service delivery or what has caused an increase in service delivery)
 - Probe on what services have been affected in the second wave and why?
 - Probe whether there have been changes in the way patients are managed, what have brought in changes in patient management

Impact of COVID-19 on health centre service delivery in urban and rural Malawi

Topic guides: In-depth Interviews (front-line health workers)

- Explore whether there have been new practices incorporated into their work (including screening practices, changes in the ways patients are managed)

Theme 2: Infrastructural support for COVID response

WASH

- What type of hand washing facilities do you have in place at the moment at the HF
 - Buckets with taps:
 - Quantity (being used and in storage)
 - Location (multiple areas)
 - Piped water to permanent sinks:
 - Quantity (functioning)
 - Location
 - None
 - Other
- Has anything changed in terms of hand washing facilities since the first wave for example: now have piped water supply, piped water not working so using buckets?
 - Have any of these changes led to specific challenges at the clinic?
 - Have any of these changes led to improvements or benefits to the clinic?
- If you are using or have movable systems such as buckets with taps were they:
 - At the HF before COVID was an issue
 - Provided during the first wave of COVID and now not available – if no why not?
 - Provided during the first wave of COVID and still being used
 - Provided during the first wave of COVID and not being used – if not why not?
 - Not provided – why (already have piped supply, not known etc)
 - Do you have some of the buckets for handwashing stored in the storage room (if yes, probe for reasons).
- Do you have any soap available for hand washing?
 - Had during first wave but not now – why?
 - Yes have it available and being used now – why is it available now?
 - Yes have it available but not being used
- Who is the soap made available to:
 - Everyone
 - Staff only – if this is the case why?
 - Where is the soap from (personal, purchase, supplied etc)
 - Is the soap available all the time (if no, probe for reasons)
- Is the soap available even when the facility is closed for the patient guardians or support staff (e.g. security guards)
- Do they think that washing hands with water only is the same as washing hands with soap – in general and specifically related to COVID
- Do you have access to hand sanitiser at all?
 - Where is it from (personal purchase, supplied, etc)
 - Is the sanitizer available all the time (if no, probe for reasons)
 - Who has access to it? (clinical staff, all frontline workers, everyone)
 - Do you think hand sanitiser is the same, more or less effective than hand washing with soap? Why?

Client management

- Are there any checks on patients as they arrive at the clinic – what are they, what happens if someone fails the checks (e.g. temperature, clinical symptoms etc)
- What happens when there is suspected case of COVID?
- Is there any system of physical distancing at the facility? (arrival, waiting area)
 - What is it and how effective do you think it is?

Impact of COVID-19 on health centre service delivery in urban and rural Malawi

Topic guides: In-depth Interviews (front-line health workers)

- What are the challenges?
- If there is no distancing why is it not done?
- Are thermometers available to check the clients?
 - What type of thermometers are they?
 - Where at the facility is the temperature check conducted?

Masks

- Does the facility have masks available for frontline workers?
 - What type - explore for multiple types and whether they are different for different cadre of staff i.e. health workers, patient attendants or security guards
 - Are people using them – explore who is using what, why using and why not using
 - Are clients/patients arriving wearing masks? What type? What happens if they are not?
 - For those using masks, are they using them properly (i.e. cover nose and mouth).

Theme 3: Risk perceptions and COVID-19

Perceived danger about COVID-19

- What are your perceptions on COVID-19? (What do they think might happen to you or your family should you be infected? Are you concerned about disease complications? Are you worried about loss of income or job because of illness due to COVID-19?)
- Have you changed any aspects of your work practice due to COVID-19?
- Have you ever missed work because of illness or testing COVID positive?
- Have you considered missing work because of fear of being exposed? (If they were COVID positive, what did that mean to them?)
- If you think back during the first wave of COVID, how do you feel about coming to work?
 - Is there anything you feel more worried about than before?
 - Anything you feel less worried about than before?
- What do you think are the patients' or people in the wider community's perceptions on COVID-19?
 - Have you seen an increase in fear from patients coming to the clinic? (probing around rumours about COVID?)
 - Have patients asked any questions around COVID-19 during their time at the clinic? If so what kinds of questions are they asking?
 - Are people in the wider community asking you about COVID-19, are you hearing any rumours around fear of getting infected?
 - Have you seen changes from the first and second wave?

Perceptions of the vaccine

- Have you accessed the vaccine?
 - If yes probe around whether this has impacted on feelings about going to work or work practice?
- Have you heard any rumours around the vaccine?
 - If yes can you describe what they relate to?
 - Who are you hearing these rumours from – patients, family members?
 - Do you think the rumours have impacted on people attending the clinic?
 - Is there anything you think can be done to address the rumours (only ask this if they report hearing rumours)

Third round

For this round of interviews we will be focusing on the in-charges of the 8 facilities we have sampled. Reviewing the transcripts we will ensure we follow up on any unanswered questions and target the guide to each in-charge (or clinician)

- How has your clinical practice changed with COVID-19? [probe around commitment to practicing safety (e.g. use of PPE), interaction with patients]
 - Looking to the future are there things you will continue to do?

Impact of COVID-19 on health centre service delivery in urban and rural Malawi

Topic guides: In-depth Interviews (front-line health workers)

- How have practices and procedures in the clinic changed? (probe around strategies for preventing overcrowding of patients e.g. opening the clinic earlier, alternative methods of delivering services e.g. women administering contraceptives themselves)
 - o Looking to the future do you think these are likely to continue?
- How has the clinic been implementing the health communication about COVID-19?
 - o What communication strategies the clinic used? (probe around community engagement and the role of chiefs/churches in disseminating COVID-19 information)
 - o If any, what challenges they encountered with communication?
- What has been the impact of the health communication?
 - o How has the communication shaped people's behaviours and practices?
- What do you think will be the long-term impacts of the health communication about COVID-19?
 - o Looking to the future how do you think people will react should the virus resurface?

Fourth round

Changes in clinic responses to COVID-19

- Can you tell me if there have been any new developments at the clinic in terms of responding to the COVID-19 situation? (Probe whether clinic attendance, handwashing, use of PPEs/masks, social distancing has changed. What led to the change? What's the impact of the change?)

Health workers' job satisfaction and motivation during COVID-19

- What do you think about your current working conditions? (What motivates you or discourages you to work during this time? If at all, does it affect your behaviour towards your work? If yes, in what way?)
- Do you get allowances on your job? If yes or no, how does it impact on your behaviour towards your work?)

Psychosocial impacts of COVID-19 on health workers and coping mechanisms

Perceived danger about COVID-19

- What are your perceptions on COVID-19? (What do they think might happen to you or your family should you be infected? Are you concerned about disease complications? Are you worried about loss of income or job because of illness due to COVID-19?)
- If at all, does feeling at risk impact your behaviour towards your work? If yes, in what way?
- Have you ever missed work because of illness or testing COVID positive, or considered missing work because of fear of being exposed? (If they were COVID positive, what did that mean to them?)
- What do you think are the patients' or people's perceptions on COVID-19? (Do they feel at risk? If yes, in what way do they think they might get infected? Or who do they think might infect them? What are the consequences of them being infected? If no, why do they feel in this way?)

Social stigma and self-stigma about COVID-19

- How does the perception of being at risk of COVID-19 make you feel? (Are you concerned about infecting other people? Do you feel you might infect others if you have the virus? If at all, does this affect how you interact with other people both at and outside of work (families, patients)?)
- Based on your personal experiences, how do people perceive health workers with regards to COVID-19? (What reactions do you get from the public when it comes to COVID-19? Any changes in how people interact with you or other health workers in the community or at the clinic? How does this make you feel? [Probing in this one around whether they have experienced any abuse or anger from the community more broadly])

Social support for health workers during COVID-19

- Are you receiving any support to deal with the negative impacts of COVID-19? (If yes, what kind of support, where does the support come from?)

Is there any support you would like to receive regarding dealing with the negative impacts of COVID-19?

Impact of COVID-19 on health centre service delivery in urban and rural Malawi

Topic guides: In-depth Interviews (front-line health workers)

Fifth round

Focusing on the in-charges of the 8 facilities we have sampled, following up on any unanswered questions, and targeting the guide to each in-charge.

Theme 1: Impacts of COVID-19 on healthcare practices

- How has your clinical practice changed with COVID-19? [probe around commitment to practicing safety (e.g. use of PPE), interaction with patients]
 - o Looking to the future are there things you will continue to do?
- How have practices and procedures in the clinic changed? (probe around strategies for preventing overcrowding of patients e.g. opening the clinic earlier, alternative methods of delivering services e.g. women administering contraceptives themselves)
 - o Looking to the future do you think these are likely to continue?

Theme 2: Public health communication and long-term impacts

- How has the clinic been implementing the health communication about COVID-19?
 - o What communication strategies the clinic used? (probe around community engagement and the role of chiefs/churches in disseminating COVID-19 information)
 - o If any, what challenges they encountered with communication?
- What has been the impact of the health communication?
 - o How has the communication shaped people's behaviours and practices?
- What do you think will be the long-term impacts of the health communication about COVID-19?
 - o Looking to the future how do you think people will react should the virus resurface?

Theme 2: Gender differences in COVID-19 vaccine uptake

- Why are we seeing more men than women uptake? (explain that previous interviews showed this)
- Has this changed during the second vaccine?
- Access and challenges?

Theme 3: Uptake of COVID-19 vaccine among healthcare providers

- What is COVID vaccine uptake like amongst health centre staff?
- Have there been any challenges?

Impact of COVID on health service provision

- What is causing an increase in the uptake of family planning services? (Explain that previous interviews showed this)
- Has something changed?
- Why is there a drop in uptake of TB services? Has something changed?

Covid19 study: Coding strategy (NVIVO extract)

Nodes

Name	Description
1. Knowledge on COVID-19	Frontline workers knowledge on COVID-19: cause or risk factors; transmission; prevention or treatment; vulnerable groups; etc.
COVID-19 preparedness and response	
<ul style="list-style-type: none"> Prevention measures 	<ul style="list-style-type: none"> Restricting movement Emphasis on the need for people to stay in door Social distancing E.g. marking the floor/seat, or letting in only a number of clients at a time, or seeing patients in an open space rather than in a confined space of a consultation room Using PPEs Eg masks, aprons, gloves etc, including mandatory masking in public spaces Hand washing Washing hands mainly with soap and water, sanitizer irregularly provided Suggestions on COVID preparedness and response Improving supplies through engagement with corporate stakeholders Holding community outreach covid services to facilitate wide screening and case isolation Enforcing mandatory public use of masks Motivating hospital staff COVID communication and messaging Strategies for communicating COVID-19 information: through chiefs or church leaders; public health talks during service provision; radio or TV; etc.
2. COVID-19 prevention barriers	
<ul style="list-style-type: none"> Behavioral barriers Conditions at work 	<ul style="list-style-type: none"> Behavioral barriers Noncompliant behaviours: distrust (COVID as a hoax); misconceptions (linking COVID to weather); spiritualism (associating COVID with satanism); lack of adherence (mask causing breathing discomfort, resumption of public activities, decline in cases); sharing masks (lack of money to buy); etc. Conditions at work Issues affecting staff: lacking COVID training; not receiving compensation or risk allowance;

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Name		Description
	<ul style="list-style-type: none"> • Underlying health system challenges 	increased workload Limits in resources: drug stockouts; early shortage of working materials; lack of hospital equipment; shortage of funding; shortage of space; staffing deficiencies; etc.
3. Case management		Explanation about management of COVID suspect or confirmed cases
	<ul style="list-style-type: none"> • Communication between DHO and facility 	How the facility communicated with isolation centre or main district hospital regarding COVID suspects or cases
	<ul style="list-style-type: none"> • Isolation/quarantine 	Referring cases to the isolation centre, or advising patients to self isolate at home
	<ul style="list-style-type: none"> • Guidelines on case management 	
	<ul style="list-style-type: none"> • Number of suspect cases 	
4. COVID -19 support		Supply of work materials (masks/PPEs/sanitary facilities, hospital equipment, financial support) from government, companies, and non-governmental organisations
	<ul style="list-style-type: none"> • Impact of support 	Better case management, safety of health workers, improved hospital supplies
5. Impacts of COVID-19		
<ul style="list-style-type: none"> • Impacts on health seeking 		Decrease in clinic attendance (e.g., due to fear of COVID-19)
<ul style="list-style-type: none"> • Impacts on service provision 	<ul style="list-style-type: none"> • Suspending service 	Temporarily stopping some services e.g., TB and HIV screening services
	<ul style="list-style-type: none"> • Increased waiting hours 	Increased workload coupled with a shortage of staff making patients stay longer
	<ul style="list-style-type: none"> • Adapting strategies for delivering care 	E.g., clients administering contraceptives on their own; community outreach clinics; extending ART/TB prescription duration; reducing clinic time patients visiting on appointments; working in shifts; suspending services; etc.

Name		Description
<ul style="list-style-type: none"> • Impacts on staff or patients 	<ul style="list-style-type: none"> • Economic impacts 	Economic impacts: cost of managing COVID-19 illness; loss of income because absence from work/business due to COVID illness; etc.
	<ul style="list-style-type: none"> • Physiological impacts 	Physical health impacts: abuse from patients; fatigue from increased workloads; illness from COVID
	<ul style="list-style-type: none"> • Psychological impacts 	Anxiety about catching COVID due to frequent contact with patients; stress from increased workloads; helplessness (difficulties managing the need to work for income and the risk of COVID at work); concern for family (fear of infecting family members); sacrifice versus moral obligation (feeling compelled to work despite seeing themselves at risk because they promised to serve people); stigma/discrimination (unable to interact with others because of fear of being treated differently)
	<ul style="list-style-type: none"> • Psychosocial support systems for negative impacts 	Counselling, social networks (seeking moral support from families, neighbors/friends, etc.), ombudsman (for support on verbal/physical abuse from patients/community members)
6. COVID-19 vaccine provision and public reaction	<ul style="list-style-type: none"> • Early hesitancy 	Distrust: misconceptions and spiritual beliefs causing reluctance to vaccinate Vaccine safety concerns: fear of side effects; rumors of people becoming animals once vaccinated
	<ul style="list-style-type: none"> • Public becoming willing over time 	Continuous awareness campaigns (in conjunction with local leaders) helping to improve public behaviours about COVID-19 vaccine; limited evidence of negative side effects also encouraging people to vaccinate
	<ul style="list-style-type: none"> • Vaccine and gender 	How men and women are responding to COVID-19 vaccine; more men getting vaccinated than women
7. Demographics	<ul style="list-style-type: none"> • Daily routines • Years in service • Education 	What the frontline worker's work involve on daily basis
		How long they have been working in this position
		Their level of education

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Name		Description
	<ul style="list-style-type: none">• Age	

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Research Checklist

#1	Title Concise description of the nature and topic of the study identifying the study as qualitative or indicating the approach (e.g. ethnography, grounded theory) or data collection methods (e.g. interview, focus group) is recommended.	Page 1
#2	Abstract Summary of the key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results and conclusions.	Page 2
#3	Introduction Problem formulation Description and significance of the problem / phenomenon studied: review of relevant theory and empirical work; problem statement.	Pages 4, 5
#4	Purpose or research question Purpose of the study and specific objectives or questions.	Page 5
#5	Methods Qualitative approach and research paradigm Qualitative approach (e.g. ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g. postpositivist, constructivist / interpretivist) is also recommended; rationale. The rationale should briefly discuss the justification for choosing that theory, approach, method or technique rather than other options available; the assumptions and limitations implicit in those choices and how those choices influence study conclusions and transferability. As appropriate the rationale for several items might be discussed together.	Pages 5-9
#6	Researcher characteristics and reflexivity	

	<p>Researchers' characteristics that may influence the research, including personal attributes, qualifications / experience, relationship with participants, assumptions and / or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results and / or transferability.</p>	
#7	<p>Context</p> <p>Setting / site and salient contextual factors; rationale.</p>	<p>Page 5-6</p>
#8	<p>Sampling strategy</p> <p>How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g. sampling saturation); rationale.</p>	<p>Pages 6, 7</p>
#9	<p>Ethical issues pertaining to human subjects</p> <p>Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues.</p>	<p>Page 8</p>
#10	<p>Data collection methods</p> <p>Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources / methods, and modification of procedures in response to evolving study findings; rationale.</p>	<p>Pages 6, 7</p>
#11	<p>Data collection instruments and technologies</p> <p>Description of instruments (e.g. interview guides, questionnaires) and devices (e.g. audio recorders) used for data collection; if / how the instruments(s) changed over the course of the study.</p>	<p>Page 6,7</p>
#12	<p>Units of study</p> <p>Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results).</p>	<p>Pages 6,7</p>

#13	<p>Data processing</p> <p>Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymisation / deidentification of excerpts.</p>	Page 9
#14	<p>Data analysis</p> <p>Process by which inferences, themes, etc. were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale.</p>	Page 9
#15	<p>Techniques to enhance trustworthiness</p> <p>Techniques to enhance trustworthiness and credibility of data analysis (e.g. member checking, audit trail, triangulation); rationale.</p>	Page 9
#16	<p>Results/findings</p> <p>Syntheses and interpretation</p> <p>Main findings (e.g. interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory.</p>	Pages 10-22
#17	<p>Links to empirical data</p> <p>Evidence (e.g. quotes, field notes, text excerpts, photographs) to substantiate analytic findings.</p>	Pages 10-22
#18	<p>Discussion</p> <p>Intergration with prior work, implications, transferability and contribution(s) to the field</p> <p>Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of</p>	Pages 22-25

	earlier scholarship; discussion of scope of application / generalizability; identification of unique contributions(s) to scholarship in a discipline or field.	
#19	Study strength and Limitations Trustworthiness and limitations of findings.	Page 25
#20	Other Conflicts of interest Potential sources of influence of perceived influence on study conduct and conclusions; how these were managed.	Page 27
#21	Funding Sources of funding and other support; role of funders in data collection, interpretation and reporting.	Page 26
#22	Author contributions Role of each other in the study and their contributions	Page 26