Impact on Essential Health Services

Background paper 8

The Independent Panel for Pandemic Preparedness and Response

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The Independent Panel FOR PANDEMIC PREPAREDNESS & RESPONSE

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This paper has been prepared by the Secretariat to the Independent Panel for Pandemic Preparedness and Response as background for the Panel. The views expressed herein do not necessarily represent the views of the Panel.

Summary

As countries around the world grappled with an influx of COVID-19 patients over the past year, availability and use of essential health services faltered. Health systems strained to respond to the pandemic while protecting both staff and patients from infection, sometimes lacking basic supplies including personal protective equipment and masks. Those in need of services shied away from facilities fearing contagion or were hindered by pandemic-imposed movement restrictions.

As a result, in addition to direct morbidity and mortality caused by COVID-19, the pandemic is potentially exacerbating other health conditions in ways that could increase the burden of the disease over the coming years.

To address disruptions to essential services during future heath emergencies, health system planners should invest in, better prepare, and better protect health workforces. Also, they should build evidence for and devise health systems/service delivery adaptations to ensure availability of essential services and improve system resiliency during health emergencies.

Governments should develop more targeted epidemic prevention interventions and earlier responses to minimize large scale health system disruptions.

Reshaping health system investments will require leadership, incentives, and strategic funds at the national, regional, and global levels. Progress will require new measures of health system resilience and pandemic preparedness and a strong global mechanism with clear goals and financing.

Key findings include the following:

- 90% of 105 countries responding to a WHO survey confirmed some disruption in essential services during the pandemic concentrated in outpatient, prevention/screening, and community-based services.
- Essential immunization, noncommunicable disease diagnosis and treatment, family planning and contraception, mental health treatment, antenatal care, and cancer diagnosis experienced the most immediate impact.
- Campaign-based immunization and malaria services initially were disrupted but experienced a rapid recovery while facility-based services remained affected longer.
- Disruptions were caused by patient hesitancy in seeking care, cancellation of elective services to shift resources to pandemic response, and lockdown policies. Lack of protective equipment and staff shortages also contributed.
- Disruptions occurred in countries at all income levels with high-income countries experiencing gaps related to canceled or postponed elective care including for diabetes and oncology. The elderly suffered the most impact, especially those in long-term care facilities.
- Health workers have borne an outsized percentage of global COVID-19 cases and are suffering severe mental health consequences and burnout, circumstances that could exacerbate nursing shortfalls into the future.

1. Introduction

The COVID-19 pandemic has led to disruptions in essential health services in countries around the world with discontinuation occurring on both the demand and supply side. Factors include cancelation of elective and preventive procedures, personnel and supply shortages, and reductions in care-seeking driven by fear of contagion and pandemic-related movement restrictions. This paper reviews the impact of COVID-19 on essential health services and health systems, including on human resources for health, and recommends strategies for improving continuity of care during health emergencies.

1.1 Key questions and structure of the paper

The following questions guided this review:

1. What estimations do we have in terms of how essential health services will be/have been affected by the COVID-19 pandemic?
2. What morbidity, mortality, and health systems impacts are expected in the medium to longer-term because of service disruption?
3. What measures have been taken to mitigate foreseen negative impacts?
4. What are the lessons learned or success stories to inform future pandemic preparedness and response?

1.2 Methods

All World Health Organization (WHO) member countries, regardless of income level, and all phases of the COVID-19 response (from March 2020 to present) were considered. Two sources of secondary data were reviewed: (1) publicly available peer-reviewed and gray literature identified via PubMed and Google, and (2) documentation from international organizations supporting the response.

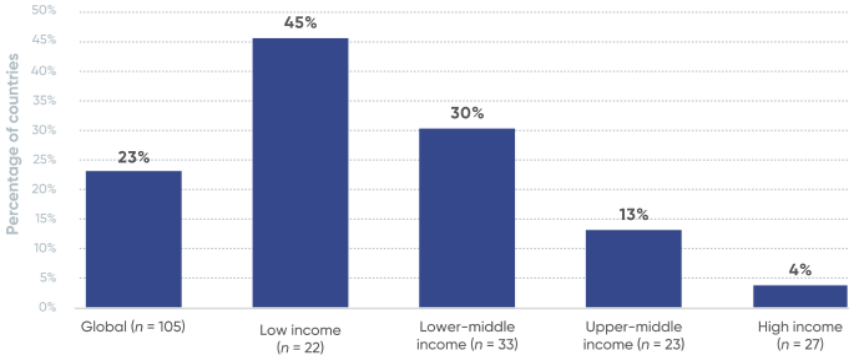
To supplement secondary data, four focus group discussions were held in in March 2021 with 24 health workers from 17 high- and middle-income countries, in collaboration with International Council of Nurses (ICN) and World Health Professions Alliance (WHPA). Participants included front-line providers caring for COVID-19 patients and health workers maintaining essential services during the pandemic. A full report on the focus group discussions is available in Annex 2.

This paper benefits from the contribution of data and references from international organizations, including WHO, UNICEF, Global Fund, Gavi, Global Financing Facility (GFF), Center for Global Development (CGD), PATH, and IHME. Also, ICN and WPHA coordinated the focus group discussions with health workers. We appreciate all the support provided by these organizations and individuals.

2. Disruptions

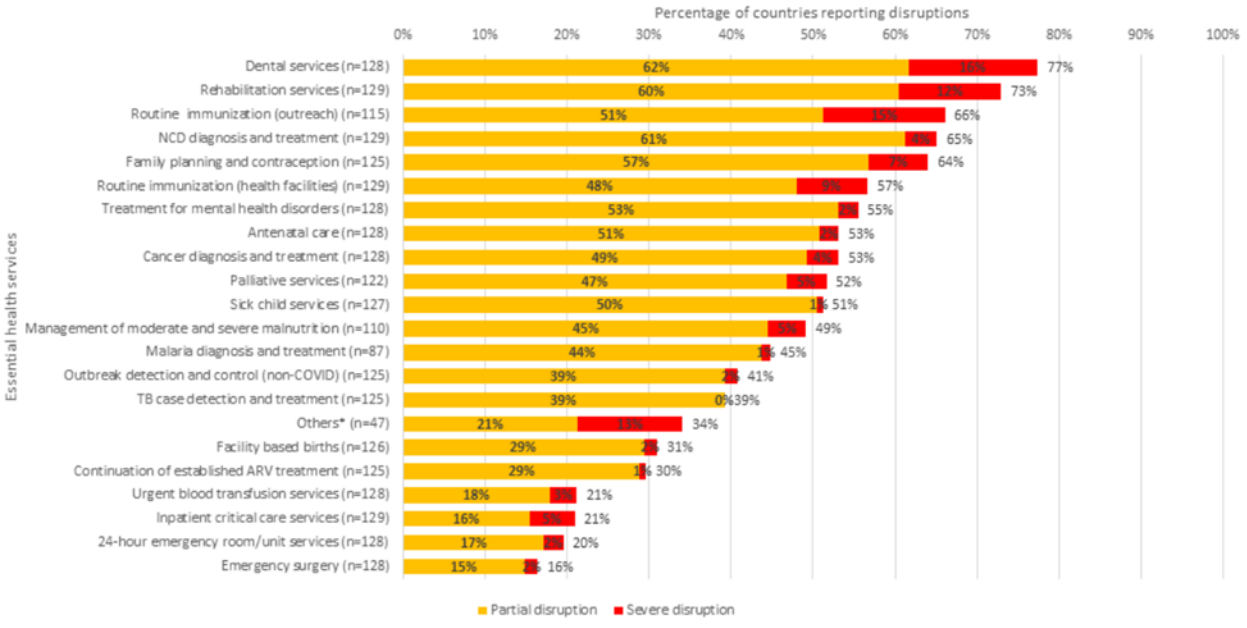
2.1 Essential health services

Figure 1. % of countries reporting partial disruption in a minimum of 75% of services (n=105) (WHO 2020a)



According to a May 2020 WHO survey, 90% of countries reported some disruption in essential health services (n=105) since the beginning of the SARS-CoV-2 pandemic. More disruption was reported from low- and middle-income countries (LMICs) compared to high-income countries (HICs) (Figure 1) (WHO 2020a). The average number of services disrupted was 44% (11/25) (WHO 2020a) (Figure 2). The Western Pacific region and European region were the least impacted (median ~22% disruption and median ~35% disruption respectively), and the Eastern Mediterranean the most impacted (median ~75% disruption) (WHO, 2020a). The Africa and Southeast Asia regions had the widest range of responses, from 0% to 100% of services impacted (median of 60% and ~65% services disrupted respectively) (WHO, 2020a). Outreach, preventive, and screening services were the most affected, while emergency services, critical inpatient care, and deliveries were less so (Figure 2) (WHO 2020a). Fifty-three percent of countries reported limiting access to inpatient and/or outpatient care, 47% limited community-based care, and 26% limited mobile clinics (WHO 2020a). Fewer countries limited access to prehospital emergency services (12%) or emergency unit services (8%) (WHO 2020a).

Figure 2. Service Disruption self-reported by WHO Member Countries (WHO 2020b)

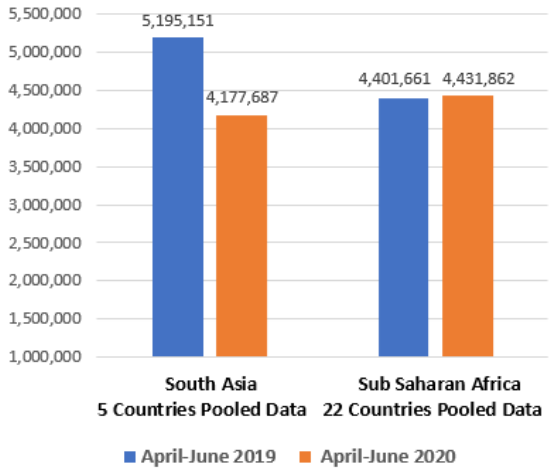


Countries reported both demand and supply side disruptions. On the demand side, patients not presenting to outpatient care (76% of countries) was cited most frequently, followed by perceptions of hindered access due to lockdowns (48%), and perceptions of financing difficulties (33%) (WHO, 2020a). On the supply side, cancellation of elective care led service interruptions (66%), followed by clinical staff redeployment to support COVID-19 (49%), insufficient personal protective equipment (44%), closure of screening services (41%), closure of disease-specific outpatient consultation clinics (35%) or outpatient services (31%), and reduced stock of products (30%) (WHO, 2020a).

2.2 Deep-dive: low- and middle-income country impacts

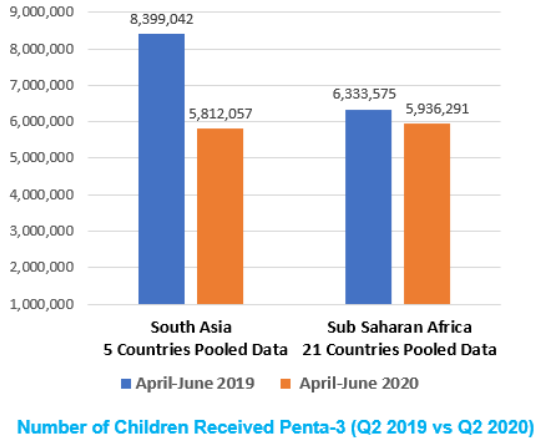
***Maternal, newborn, child health services (MNCH)*:** South Asia and Latin America experienced large reductions in institutional deliveries from April to June 2020, while Sub-Saharan Africa saw little change, according to pooled health management information systems (HMIS) data[1] (Figure 3) (Gupta and Pearson, 2020a)[2]. Routine MNCH services and child outpatient consultations have declined. A wide degree of variation has been seen across countries (UNICEF, 2020; GFF, 2020), from a 34% decrease in institutional delivery in Bangladesh to an increase of +5 in Uganda in Q3 2020 (UNICEF, 2020).

Figure 3. Institutional delivery (Gupta & Pearson 2020)



***Immunizations*:** Analysis of pooled HMIS data identified large drop- offs for Penta-3 vaccination in South Asia and Latin America from April to June 2020 compared to 2019 data (Gupta and Pearson, 2020a), with less decline in sub-Saharan Africa (Figure 4). According to internal August 2020 feedback, nearly 75% of Gavi-supported countries reported moderate to high reduction in demand for routine vaccination (RI), more than 50% reported high or moderate disruption to fixed vaccination sites, and approximatley 50% reported high to moderate disruption to outreach sites. As of March 2021, service disruption at fixed sites had reduced slightly, but it increased at outreach (Gavi, 2021), with no self-reported change in demand since August 2020(Gavi, 2021).

Figure 4. Penta-3 comparison (Gupta and Pearson 2020)



A May 2020 WHO survey on immunization indicated that levels of demand distruption was the most severe in the Africa region (89%), followed by the Americas (75%), and Eastern Mediterranean (73%) (WHO, 2020h). Thirty-nine percent of countries self-reported a decline in routine immunization (RI) coverage compared to 2019

[1] Pooled data can be indicative of broad trends but also reflects differences in data collection across countries. Health management information system data is of variable quality due to differential reporting. These findings should be considered as hypothesis generating for macro-level trends but are not a definitive assessment of disruption in any particular country.

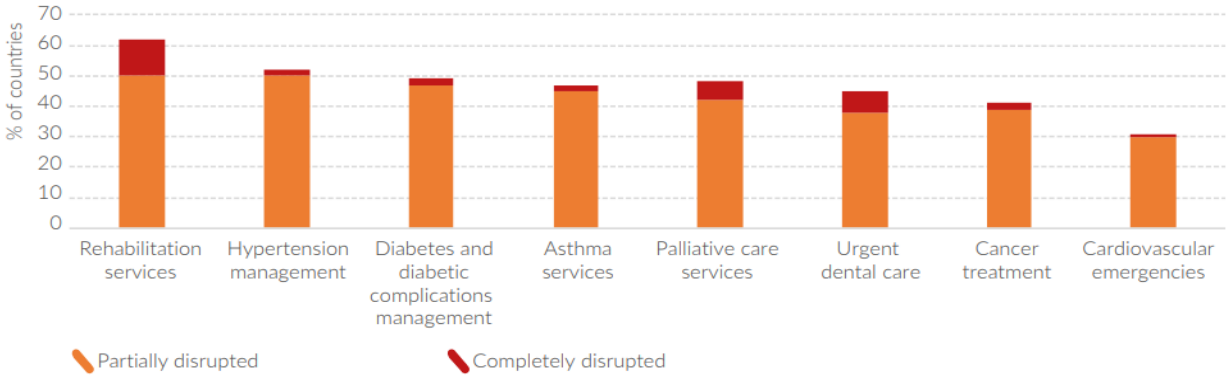
[2] Original data from Q2 is taken from this report. The current figure represents updated data provided directly by UNICEF on 12 April 2021.

levels (Gavi, 2020). This drop has been attribued to lack of transporation resulting from movement restrictions, social distancing, reduced outreach, and concerns of contracting COVID-19 (Gavi, 2020). Lockdowns, diversion of staff/resources, lack of personal protection equipment (PPE), and fear among health care workers also have impacted vaccination sites (Gavi, 2020).

***Reproductive health and family planning (RHFP)*:** Fifty-six percent of countries surveyed by WHO indicated partial disruption of family planning and contraception services, and 7% of countries reported a severe disruption in the early phase of the pandemic (WHO, 2020a). Similarly, from April to June 2020, 28% of countries receiving UNFPA assistance (n=46) reported that family planning services and distribution of DMPA-SC injectables were disrupted (UNFPA, 2020).

Non-communicable diseases (NCDs): In a May 2020 WHO member survey on NCDs, 75% of countries reported disruptions to at least one of the eight NCD conditions (Figure 5), with rehabilitation the most impacted (WHO, 2020e).

Figure 5. % countries reporting disruption to NCD tracer conditions (n=163) (WHO, 2020e)



The largest reason for disruption of NCD services was a decline in inpatient volume due to cancellation of elective care (WHO, 2020e). Cancellation of population screening programs, lockdowns, staffing impacts, closure of outpatient facilities, and lack of PPE also were reported (WHO, 2020e). Transportation, PPE, staffing, and stock-outs were more common challenges in LMICs (WHO, 2020e).

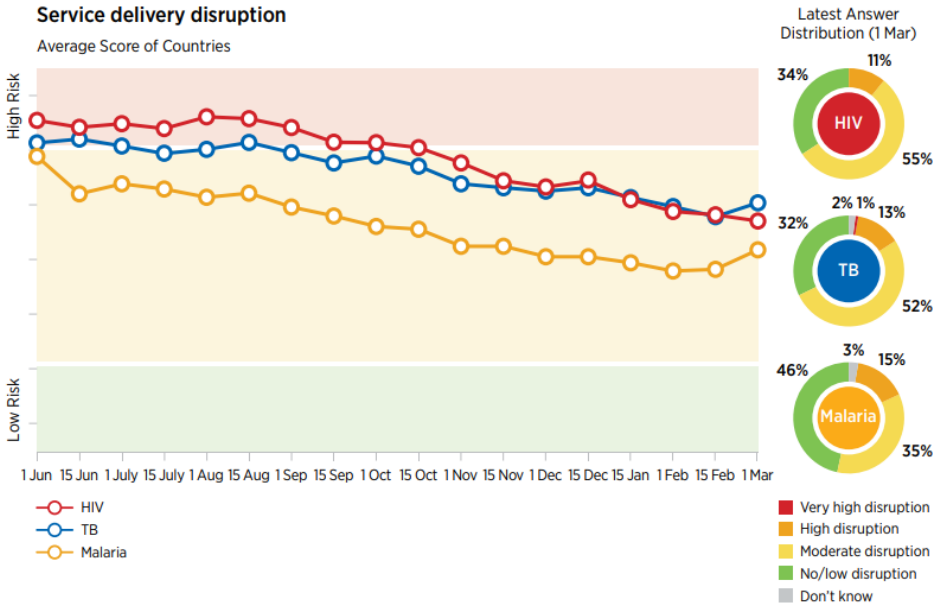
***Mental and neurological services (MNS)*:** A June to August 2020 WHO survey indicated that 60% of 130 countries surveyed self-reported partial or complete disruption of community-based and/or home outreach MNS services, and 70% self-reported closure of MNS day care services (WHO, 2020c). HICs reported the greatest percentage of services partially closed (60% on average), compared with ~40% of services disrupted in middle-income countries, and 15% in low-income countries (WHO, 2020c). However, LMICs reported a higher percentage of overall service disruptions compared to high-income countries (WHO, 2020c).

Self-reported causes for disruption across countries included a decrease in outpatient utilization due to non-presentation (62.3%), travel restrictions hindering access to facilities (53.8%), cancellation of elective care (46.9%), directed closure of outpatient services or disease-specific consultation clinics (33.8% and 33.1% respectively), MNS clinical staff redeployed for COVID-19 relief (31.5%), and insufficient staff to provide services (31.5%) (WHO, 2020c).

***HIV, TB, and malaria*:** HIV services were the most impacted, with 16% of countries surveyed by the Global Fund self-reporting significant disruptions into December 2020 (Figure 7) (The Global Fund & Unite to Fight, 2020). UNAIDs reported "large, sustained" decreases in HIV testing in 56 countries by April 2020, with some countries rebounding to pre-COVID-19 levels and other countries remaining impacted (Low-Beer, 2020). UNAIDS identified little disruption in treatment among persons currently living with HIV but declines in new ART patients (Low-Beer, 2020).

In the first phase of the pandemic, 69% of countries (n=184) indicated a reduced number of outpatient visits for persons with TB from April to May 2020, including 93% of the highest burden countries (WHO, 2020g). There was a decrease in the monthly notification of TB in 14 high-burden countries in the early phase of the pandemic, with signs of recovery in most countries by June 2020 (WHO, 2020g). Malaria diagnosis and treatment was moderately or severely disrupted in 44% of countries, and planned insecticide treated bed net campaigns were moderately or severely disrupted in 58% of countries (WHO, 2020a). As of March 2021, 14% of countries are still reporting serious disruptions in TB services, and 15% are reporting serious disruptions in malaria services (The Global Fund & Unite to Fight, 2021) (Figure 6).

Figure 6. Self-reported disruptions (The Global Fund & Unite to Fight, 2021)



***Neglected tropical diseases (NTDs)*:** Disruptions in services for NTDs include suspension of population treatment, contact tracing, delays in diagnosis, discontinuity in surveillance, procurement and supply chain concerns with medicines and consumables, and reassignment of personnel to support COVID-19 response (WHO, 2020f).

2.3 Deep dive: high-income country impacts

***Essential services*:** Country-specific data from HICs identified reductions in primary, secondary, and tertiary care services, primarily impacting treatment for non-communicable diseases[3] (Table 1). Many countries enacted ordinances postponing 'elective' care, which applied to a wide range of services including cardiac, diabetes, dental, and oncology care.

[3] Data for HICs is more fragmented than for LMICS. Hypotheses for this fragmentation include a lack of international organizations collecting multi-country data and lower response rates to global surveys.

Table 1. Highlights of service impacts from HICs

Country	Examples
Italy	10-30% reduction in oncology services and a 48% reduction in admissions for cardiac patients during the emergency phase of the COVID-19 pandemic (Di Bidino & Cicchetti, 2020). Reorganization of hospital services was the rationale (Di Bidino & Cicchetti, 2020).
United Kingdom	Oncology referrals and chemotherapy treatment declined an average of 70.4% and 41.5% respectively from March – April 2021 (Lai et al., 2020). 42% of outpatient services and 50% of inpatient services were cancelled by the National Health Service during the early phase of the response (Benzeval et al., 2020). Leading conditions with services cancelled included arthritis, diabetes, obesity, high blood pressure, and cancer (Benzeval et al., 2020). 20% of general practitioner visits were cancelled by patients (Benzeval et al., 2020).
Spain	"A significant decrease in the number of diagnostic procedures (–56%), coronary therapy (–48%), structural therapeutics (–81%), and within ST-Elevation Myocardial Infarction (–40%)"; (Rodríguez-Leor et al., 2020). Fear of contracting COVID-19 was the rationale for non-presentation of patients (Rodríguez-Leor et al., 2020).
United States	Anecdotally, declines in heart attack admissions have occurred in the United States (Krumholz, 2020). Routine childhood vaccinations declined in the United States in March 2020 (Santoli et al., 2020). Preventive cancer screenings declined in the early days of the pandemic. There was a 94% decrease in breast and cervical cancer screenings, and 86% decrease in colon cancer screening (Mast & del Rio, 2020). Screenings remained approximately 30% lower as of June 2020 (Mast & del Rio, 2020).

Elderly care and long-term care facilities: Long-term care facilities are a weak point in HIC health systems in terms of both funding and regulation. The WHO has highlighted a dearth of data, evidence, and planning for the persons living in long-term care facilities during the COVID-19 pandemic (World Health Organization, 2020d). The limited evidence available highlights disproportionate impacts of the pandemic on the elderly in HICs, particularly those living in long-term care facilities (Box 1).

Box 1. Long-term care in the U.S.
In the United States, lack of funding, weak regulation, and marginalization of long-term care led to drastic consequences (Werner et al., 2020). Less than 1% of the population lives in long-term care facilities, but nursing home residents comprise 5.2% of cases and 38% of total COVID-19 deaths (126,773 deaths as of 31 December 2020) (*The Long-Term Care COVID Tracker | The COVID Tracking Project*, 2020).

In addition to an increased risk of death from COVID-19, the pandemic has drawn attention to the vulnerability of nursing home residents resulting from lack of data exchange and integration between nursing homes and the health system, overcrowding, poor quality, and the mental health impacts of social isolation across Spain, Canada, the United States, and Italy (Bernabeu-Wittel et al., 2020; Brown et al., 2020; Inzitari et al., 2020; Lombardo et al., 2020, 2021a).

Perspectives from health workers: Focus group discussions with health workers, held in March 2021, highlighted the wide-ranging impact of the pandemic on nearly every aspect of the health system. Hospital and intensive care nurses shared the impact of cancelled procedures on workflow and hospital capacity. Non-frontline providers, including physiotherapists, dentists, pharmacists, and primary care providers, shared the impact of business closures and restructured operations on their patients. For example, A provider described delaying more elective care:

1. "What we did was a lot of relocating non-imperiled care. We tried to maintain cancer care, but the "less important" care like spinal surgery, hip replacements, it was transferred or canceled to concentrate COVID patients in certain hospitals." – ICU nurse
2.

Disruption was experienced by providers across a broad spectrum, included dentists, increasing the possibility of health risks into the future.

"All [non-emergency] dentistry stopped in February […] by government directive. […] We missed 20M routine visits, and now have a serious impact on the backlog of treatment. Even now, we are only running at 45% capacity due to the PPE and social distancing requirements. There are concerns in the deterioration in oral health and late diagnosis of oral cancer. There are early indications that cancer patients are presenting later with worse outcomes. […] I am worried we won't ever return to previous capacity." – Dentist

While much of the disruption was driven by facilities shifting resources to COVID patients, patient fear also played a role.

"Patients that usually went to hospitals to pick up medication, there was a lot of public messaging to tell people not to go to hospitals or health centers unless it was really needed. It frightened people even when they needed to go. Some patients skipped hospital treatments, not wanting to pick up medication from the hospitals." – Pharmacist

2.4 Recovery signs

In many countries, **the initial decline and initiation of recovery tracks with the introduction and then lifting of "lockdown" policies.** In LMICs, campaign and seasonal-based services such as immunization and malaria bed-net distributions saw sharp drop offs in the early data of the pandemic but are experiencing a V-shaped recovery (Gavi, 2020; Gupta & Pearson, 2020). In contrast, routine health services such as maternal, newborn, and child health and screening (MNCH), treatment for non-communicable diseases, and aid to improve nutritional status could have longer-lasting impacts and are showing more variable signs of recovery.

***Table 2. Overview of recovery information by service and gaps** (only services with recovery information presented)*

Service	Summary of recovery
MNCH	Inpatient and outpatient MNCH services were impacted later in 2020 than immunizations but are experiencing a more sustained drop-off (UNICEF, 2020). There is no consistent global trendline for maternal health. Per HMIS data some countries improved institutional delivery from Q2 2020 to Q3 2020 while others worsened (UNICEF, 2020). In Q4 2020, many countries have continued to recover, but at a slower pace than for other services. Reductions are expected to continue into 2021 (UNICEF, 2021). Child pneumonia management showed little sign of recovery from Q2 to Q3 (UNICEF, 2020). In Q4, treatment for child pneumonia and diarrheal disease continued to show disruption. This is possibly due to a combination of factors including reduced reporting, increased handwashing, and reduction in service use (UNICEF, 2021).
RI	Reported recovery data for immunization varies by data source and country; however, the general trend is positive. 85% of Gavi countries show evidence of recovery, begining in June 2020 (2020); HMIS data indicates similar trends for Penta-3 coverage. However, ~ 50% are still reporting disruptions in demand, outreach services, and fixed sites as of March 2021 (Gavi, 2021). 46% of Gavi-supported countries have resumed delayed vaccination activities (2020). According to HMIS data from 48 LMICs, immunization services largely recovered by December 2020 (UNICEF, 2021). However, despite a recovery in the second half of 2020, the absolute number of children immunized in 2020 was lower in many countries due to the large initial declines from March to May 2020 and insufficent 'catch-up' from June to December 2020 (UNICEF 2021). Recovery of vaccination services tracks with the lifting of lockdowns and the restoration of global vaccine supplies, cargo flights, and shipments (UNICEF, 2020).
HIV, TB, malaria	Variable recovery for HIV/AIDS services for new patients; support for existing patients has stabilized in most countries (Low-Beer 2020, Global Fund 2020). Variable recovery of TB services for existing cases; V-shaped or U-shaped recovery in high burden recoveries for TB case notifications by June 2020 (WHO, 2020g). Although initially impacted more substantially than HIV or TB, malaria now reports less disruption (Global Fund, 2020). Campaigns, preventive chemotherapy, and insecticide treated net distribution have resumed in most countries (Global Fund, 2020; WHO Global Malaria Programme, 2020). However, there is a lack of data on potential recovery of routine malaria services at facilities (WHO Global Malaria Programme, 2020).

NTDs	NTD programmes expected to recover if the delay is less than one year. Populations facing schistosomiasis, trachoma, or visceral leishmaniasis are at the greatest risk (WHO, 2020f). Newly established programmes expected to revert to pre-treatment endemicity levels while advanced programs will see lower resurgence (WHO, 2020f).

2.5 Medium- to long-term impacts of service disruption

Low- and middle-income country impacts: Table 3 outlines modeled impacts of service disruption on mortality. Given the lack of updated modelling results on medium- to long-term impacts, we looked at the scenarios in the models developed at the early stage of the pandemic based on updated information on recovery. We reviewed which scenarios seem to be occurring and estimated the impacts. **The worst-case scenarios do not appear to be happening for most services and most countries;** however, the middle-case estimates do appear to be coming to fruition, particularly impacting child mortality (Table 3; for more details, see Annex 1).

A March 2021 risk-benefit analysis from the WHO used the Lived Saves tool (LiST) to model projected mortality from essential RMNCH services coverage disruption against projected mortality of COVID-19 infections due to increased transmission risk during service utilization in six countries. The analysis indicated that, "In all cases and for all services, the benefit of maintaining essential RMNCH services far exceeded the risks associated with additional COVID-19 infections and deaths" (WHO, 2021).

Table 3. Modeled impacts of service disruption on projected excess mortality

Service	Geography	Estimated mortality impacts – modeled
Malaria	Sub-Saharan Africa	Many countries have resumed seasonal campaigns and long-lasting insecticide treated nets (LLITN), but routine treatment services are still impacted; this is estimated to cause an additional 164,000 to 310,000 deaths between 1 May 2020 and 30 April 2021 (Sherrard-Smith et al., 2020)
HIV/AIDS	Sub-Saharan Africa	Impacts to HIV services for 50% of the population could cause a 1.06 times increase in HIV mortality over a one-year period (Jewel et al., 2020). This is possibly occurring.
Child Health	LMICs	253,500 additional child deaths could occur in May – Oct. 2020 with child health services coverage reductions of 9.8-18.5% and wasting increases of 10% (Roberton et al., 2020). The majority of LMICs saw coverage reductions in this range or worse from March to September, indicating this scenario could occur.
Maternal Health	LMICs	An estimated 12,200 additional maternal deaths could occur in May – Oct. 2020 due to decreases of 9.8-18.5% in childbirth interventions. Most countries with maternal disruptions fall within this threshold (UNICEF, 2020).
Nutrition	LMICs	Increases in wasting and coverage decreases of 25% for nutrition and health services may lead to 18,605 additional deaths in children under-5 (Headey et al., 2020). Many countries are within this coverage decrease for health services; however, nutrition and wasting changes are not available.

Finally, the COVID-19 pandemic has brought additional medium-to-long-term impacts for vulnerable groups, including:

Gendered impacts, both in service disruption and for health workers: Services for women are showing slower signs of recovery than services for children and the general population (UNICEF, 2020). The front-line health workforce, including nurses, community-based health workers, and long-term care/home health providers, is predominately female and has faced increases in mortality and mental health issues over the course of the pandemic.

Inequitable recovery that could exacerbate coverage differences between populations: Early analysis from Pakistan highlights potential inequities in service recovery. Catch-up outreach spurred immunization recovery, but more than 887,000 children remained missed. Children reached by catch-up immunization campaigns had more educated mothers, were more likely to be born at facilities, and had provided contact information to providers (PATH & the Bill & Melinda Gates Foundation, 2020). This experience highlights that recovery data may mask inequities in access across sub-populations, with catch-up campaigns leaving out the most vulnerable children.

High-income country impacts: There has been an increase in excess mortality in 2020, not all of which is directly attributed to COVID-19. In addition to undiagnosed COVID-19 deaths, it is possible that a percentage of excess mortality is due to postponed treatment of essential health services. The impacts of delays in medical care and economic consequences of COVID-19 will become more apparent as the pandemic continues, and this warrants further analysis (Morgan et al., 2020). At present, a study of 21 industrialized countries in Europe and the Pacific found a 23% increase in mortality unattributed to COVID-19 (Kontis et al., 2020). In the United States, only 66% of excess deaths from late January to 3 October 2020 are attributed to COVID-19 (Rossen et al., 2020), with Black and Latino populations seeming the largest increases (28.1% Black and 44.9% for Latinos) (Fredrick, 2021). Similar trends are being identified in LMICs[4], including Mexico, Colombia, Ecuador, South Africa, Brazil, Oman, Indonesia, Turkey, and Peru (P. E. Brown et al., 2020; *Covid-19 Data - Tracking Covid-19 Excess Deaths across Countries | Graphic Detail | The Economist*, 2020; Elyazar et al., 2020; Wahaibi et al., 2020), suggesting a global trend.

Additional consequences expected in HICs include postponement of cancer services and/or reduced cancer prevention services, consequences of postponing elective care, increase in suicides and violence, disruption in mental health programs, disruption in vaccinations, and possible longer-term health impacts as hospitals and health systems bear the financial costs of the pandemic (Ioannidis, 2020). These impacts are not immediately apparent from surveillance data but warrant longer-term research and tracking.

[4] Several of these articles were shared with the panel prior to peer review publication.

2.6 Impacts on the health system, focused on human resources for health (HRH)

The COVID-19 epidemic's impact on the health workforce includes a lack of PPE and essential equipment to protect health workers, the need for infection control, risk of discrimination and stigma against health workers, and mental health challenges (WHO, 2020I). In LMICs, these challenges are layered onto existing health workforce constraints, including personnel shortages, maldistribution, and misalignment of needs (WHO, 2020I).

Forty-nine percent of countries (n=105) self-reported "clinical staff redeployment to provide COVID-19 relief", and 29% of countries self-reported "insufficient staff to provide services" as supply side causes for essential service disruption (WHO, 2020a pg. 11). Clinical staff re-deployment was the third-ranked cause of service disruption across all countries (WHO, 2020a). In the Americas, 50% of countries (n=24) reallocated NCD staff to COVID-19 (PAHO, 2020).

Focus group discussions with health workers highlighted challenges in rapidly training non-critical care providers reallocated to support COVID-19 patient care. One ICU nurse explained: "From follow-up studies, in the first wave, there was a major frequency of care related injuries on the patients because of missed nursing care. It is obvious what the nurses have to do, and what happens when the nurses make mistakes [referring to non-ICU nurses seconded to support COVID-19 care]". Similarly, another ICU nurse explained, "But when crisis came and our capacity was hit, it [existing staffing] wasn't enough and human resources started trying to hire new nurses. Many new nurses came to the COVID area with a little or none experience. It was very difficult scenario because we [ICU nurses] were trying to explain things. So, we divided the activities to simple and non-simple, and the new nurses did simple procedures."

***Health worker infections and mortality*:** Mortality among the health care workforce not only contributes to early loss of life, but also could lead to human resource shortages. There is a lack of globally representative data on deaths of health workers due to COVID-19, with existing evidence focused on the early phase of the pandemic. A systematic review identified 152,888 infections and 1,413 deaths as of 8 May 2020 (3.9% of COVID-19 patients worldwide at that time). A disproportionate number of cases were in female (71.6%) and nurses (38.6%), while a disproportionate number of deaths were in men (70.8%) and doctors (51.4%) (Bandyopadhyay et al., 2020). 130 countries reported at least one health worker infection and 67 countries reported at least one death by 8 May 2020 (Bandyopadhyay et al., 2020). The largest number of infected health workers were in Europe and the Americas, particularly the United States (Bandyopadhyay et al., 2020). Since the data is from the early phase of COVID-19, this could reflect the outsized burden of COVID-19 in those regions at that time.

***Mental health consequences*:** In addition to the physical risk of contracting COVID-19, health workers have experienced mental health consequences. Twenty-four nursing associations worldwide have reported incidents of violence against nurses, and 20 associations indicated mental health distress of members (ICN, 2020a). Nurses are experiencing high levels of burnout, depression, and anxiety. The ICN has highlighted, "a global phenomenon of mass trauma […] complex and intertwined with various issues including persistently high workloads, increased patient dependency and mortality, occupational burnout, inadequate personal protective equipment, the fear of spreading the virus to families and relatives, an increase in violence and discrimination against nurses, COVID-19 denial and the propagation of misinformation, and a lack of social and mental health support" (ICN, 2020b). A July 2020 scoping review found that female health workers, nurses, and those in front-line roles are experiencing the highest rates of anxiety, depression, insomnia, and distress (Shaukat et al., 2020). A November 2020 systematic review found that mental health status was correlated with exposure to COVID-19 patients and to workload (Muller et al., 2020). These challenges could have negative consequences for the global nursing workforce (Box 2).

Box 2. Global Nursing Shortage
The WHO projects a global nursing shortage of 18M nurses by 2030 (WHO, 2020j). The ICN has raised concerns that COVID-19 could increase attrition in the global nursing workforce (ICN, 2020b).

Focus group discussions with health workers echoed similar themes, both from frontline providers and workers providing essential services. As much of the world's population looks to 'go back to normal', health providers continue to be under tremendous strain, suffering from the accumulated impacts of long hours, stressful working conditions, and increased patient acuity.

"Public health was always open, and we were working 16 hours a day for 7-8 months, non-stop. Working every day, even on Sunday, it is an incredible pressure. Almost inhumane. This is a pandemic that is requesting a lot from public health professionals and other health professionals working in direct response." --Medical resident and public health professional

"Rapid change of information and procedures was one of the biggest challenges. Now in the 2nd/3rd wave the change in information has slowed, but now we are faced with staffing shortages and exhaustion. Initially the show of support from the public was fantastic, but many nurses have now voiced their frustration of being forgotten and the healthcare system being abused. The general public is looking forward to getting back to "normal" and healthcare hasn't had a break, I think there may be long term effects of the exhaustion and fatigue that will manifest soon." – Nurse practitioner, critical care

"It has me stressed because I am in constant exposure to a moderate volume of patients and a lot of them have symptoms suggestive of COVID-19. I live with my mother, and it is a constant preoccupation for us. Masks sometimes break, and I have to switch to a new one. Wearing a mask has become part of my life, and I feel insecure without it."-- Doctor

***Nurses working in long-term care* facilities:** In the United States, most health worker infections are in long-term care facilities (Hughes et al., 2020). A survey of United States' health care workers highlighted limited PPE, financial impacts of procuring PPE on the market, reliance on crisis standards for re-using PPE and equipment, scarce testing, an inability to isolate potential cases due to bed shortages, and lack of guidance and support from state and federal governments; 64% of respondents worked in long-term care facilities (White et al., 2020). A similar study in Italy identified related challenges including difficulty

in referring patients, lack of beds to isolate suspected cases, and lack of personnel (Lombardo et al., 2021b).

Under-utilization of primary health care and community health workers (CHW) in countries with weak Primary Health Care (PHC) systems: Few countries have meaningfully engaged the primary health care system in the COVID-19 response; this includes overlooking the potential of primary care facilities to coordinate testing and underutilization of community workforces for engagement and surveillance (Rasanathan and Evans, 2020). Rasanathan and Evans (2020) argued that:

"Primary care services and CHW cadres in most countries still lack the capacity or the policy environment to be the fulcrum of the COVID-19 health service response. Primary care is thus not enabled to contribute substantively to outbreak surveillance and response or to undertake community-based care with sufficient confidence in infection prevention and control and effective referral mechanisms"

3. Protection and Recovery Efforts

The research team collected case studies from global organizations and drew upon the literature review to examine possible trends or patterns in countries' prevention and recovery efforts; however, existing evidence is limited (World Health Organization, 2020m). A key limitation of available evidence is the lack of outcome data, particularly with control groups, that would be needed to fully evaluate the effectiveness of these approaches. Therefore, the experiences highlighted represent an emerging evidence base, drawn from case studies, that highlights key adaptations to explore further. Support for data collection, aggregation, and knowledge translation mechanisms coordinated at the global level are required to support real-time learning on disruptions and effective mitigation strategies across countries (World Health Organization, 2020m).

3.1 Investing in the health workforce as the foundation of prevention and response

- In Europe, countries **rapidly developed policy responses to create health worker surge capacity**. Seventy-five percent of countries allowed early recruitment of health professionals finishing their formal training, 71% of countries asked health professionals to work additional hours, 46% have allowed retired personnel to re-enter the workforce, and 29% have allowed inactive personnel to re-enter the workforce (Maier et al., 2020). Other strategies included training volunteers for basic roles, utilizing military medical personnel, and recruiting foreign-trained professions not currently practicing (Maier et al., 2020). As health worker focus groups highlighted, it is essential for workforce 'surge capacity' policies to be coupled with new sufficient training, on-job support, and supportive supervision to maintain quality of care.
- In Liberia, a key lesson from Ebola was the importance of community health workers (CHWs) (Wiah et al, 2020). Liberia has **leveraged its CHW network for prevention, detection, and response during COVID-19**. Integration of infection prevention and control (IPC) for CHWs was emphasized, particularly while CHWs sustain essential primary health care services such as immunizations and community case management (Wiah et al, 2020). Protocols are available for CHWs to identify

symptoms in community members and enter information into community surveillance systems for timely detection (Wiah et al, 2020). Finally, CHWs are supporting contact tracing and home-monitoring of patients (Wiah et al, 2020).

- India's **Accredited Social Health Activists (ASHAs, a type of CHW) have been the nation's first responders**, both for COVID-19 prevention and to ensure continuity of health services. National data saw a decline in essential health service utilization in India during the lockdown, with ASHAs vital to boosting coverage once the lockdown was lifted (Role of ASHAs, 2020). To protect ASHA's in their front-line roles, the Ministry of Health & Family Welfare instituted new training programs, included ASHA's in the National Disaster Management Act which protects health workers from violence, and included ASHAs in a COVID-19 health insurance package for health workers (Role of ASHAs, 2020).

3.2 Targeted prevention approaches that maintained a focus on essential health services

- In Kenya, **targeted COVID-19 restrictions** were emphasized. This was coupled with efforts to mitigate negative impacts on the health system, including home-based malaria visits with community health workers, vaccine catch-up campaigns, and the use of telemedicine and phone-based consultations (Barasa et al., 2020). Rapid response teams conducted contact tracing and provided referrals to designated health facilities (Otto, 2020). Initial HMIS data indicates lower service disruption in Kenya than expected, although data quality may be poor (Barasa et al., 2020). Service disruption is correlated with COVID-19 cases at the country level (UNICEF, 2020).
- In the Philippines, **strengthening of referral networks** ensured the prevention of unnecessary visits to health facilities while attending to immediate health needs (Bayani & Tan, in press). Existing community health work force was mobilized to sensitize communities about COVID-19, provide surveillance, monitor home quarantines, provide contact tracing, and support health care needs of the community to minimize care disruptions (Bayani & Tan, in press).
- Countries with **well-developed infectious disease infrastructure from past epidemics** may have done a better job protecting essential services. In Singapore, a preexisting 330-bed purpose-built infectious disease management facility cared for COVID-19 patients, protecting other primary, secondary, and tertiary care facilities for non-COVID-19 patients (Chua et al., 2020).

3.3 Health systems adaptations to manage the dual challenge of pandemic response and health systems continuity.

- Sixty-five countries included in the Countdown to 2030 country list (n=119) had **enacted operational guidance and/or policies on service continuity** by September 30th (PATH, 2020). Maternal health, nutrition, and child health policies were enacted most frequently and largely focused on adaptation of existing service delivery with additional IPC measures (PATH 2020).
- After a second wave of COVID-19 infections threated to overwhelm designated hospitals, Japan instituted a primary health care **(PHC) gatekeeping system to manage patient inflow**. Local call centers were used to triage patients, assigning them to appropriate hospitals based on severity and possible COVID-19 status while encouraging mild or asymptomatic cases to stay home (Hamaguchi

et al., 2020). This kept suspected COVID-19 patients out of primary care offices (Hamaguchi et al., 2020).

- In the Philippines, the National HIV programme **decentralized delivery of ART from HIV facilities to rural health units for localized pickup** (WHO, 2020k). Delivery of HIV screening and prevention kits was facilitated for patients who registered for online HIV self-screening services (WHO, 2020k).
- Experience from Yemen indicates that **vaccination catch-up campaigns are feasible, even in humanitarian settings.** Catch-up campaigns for polio and diphtheria were instituted, with PPE, sanitizing, reduced crowding, and social distancing implemented (Ongwae et al., 2020). IPC measures comprised 4% of the cost of the campaign, illustrating feasibility (Ongwae et al., 2020).

4. Lessons learned for future pandemics – Minimizing disruptions to essential health services and protecting health workers

Based on this initial review, including disruption and recovery data, modeled impacts, country case studies, and impacts to human resources, three requirements have emerged: (1) better investments in health workforce, (2) health systems adaptations during the response that can emphasize service continuity and improve efficiency of service delivery in peace time, and (3) investments in foundational prevention systems to prevent essential health service disruptions. These lessons learned represent patterns or trends from this preliminary analysis and warrant future investigation for strategic investments before future pandemics.

4.1 Health systems must invest in, better prepare, and better protect their health workforce as the centerpiece of future health security.

- **A whole workforce approach to combatting COVID-19 is recommended** (Bourgeault et al. 2020). This can include task shifting, upskilling, and creating flexible or adapted staffing support ratios (Bourgeault et al. 2020). Lessons from Europe can guide rapid expansion of the health workforce. Guidance has been developed by the U.S. Centers for Disease Control for LMICs to engage in task shifting or task sharing to increase access to COVID-19 care while also maintaining essential services (CDC, 2020), and the WHO has developed interim guidance for all components of health workforce policy response (WHO, 2020l). These efforts must be coupled with increased focus on PPE, supportive policies for health worker safety and well-being, and adequate training for newly deployed staff to maintain quality. Strengthened and more detailed health workforce data is also required to support decision making and planning in real-time (World Health Organization, 2020m).
- **Response and preparedness should account for the important role of community health workers** that comprise a large percentage of the health workforce. Recommendations include ensuring CHWs are included in national quantification exercises for PPE, designating CHWs as essential workers, and maintaining or instating pay for CHWs during pandemics (Ballard et al., 2020).
- **Build upon infection prevention and control (IPC) measures developed for COVID-19 to build trust and better protect health workers.** IPC practices protect health worker safety while building trust

among communities that facilities are safe during outbreaks. Many countries have adopted new approaches to reduce crowding and prevent infections at facilities, including adoption of PPE, new sanitation practices, reconfiguration of patient flow in facilities, appointment scheduling, extended service hours, and shift work for health workers. These practices can be mainstreamed into clinical operations when relevant and rolled out quickly in the face of new outbreaks.

4.2 Build the evidence-base for emerging health systems adaptations that could improve health system resilience and pandemic response, as well as service delivery efficiency in peace time

- Examples of health systems adaptation described above suggest new ways of delivering essential health services during pandemics. They also have potential to help deliver services more efficiently during peace time. PATH developed a taxonomy of service delivery adaptations by (1) reviewing the WHO's Operational Framework on Maintaining Essential Health Services, country case studies, and PATH's Policy Tracker on essential services, and then (2) analyzing country responses and the existing evidence-base for each strategy. Their analysis including the following practices. Future health systems and pandemic preparedness work needs to build evidence bases of these practices and invest in promising approaches to re-shape health systems in the post-pandemic world.
    - **Reducing the need for facility visits to minimize the burden on health facilities:**
        - **Strengthen nascent telemedicine systems.** Telemedicine has been expanded to new population for HIV care (Global Fund, 2020), NCD care (WHO, 2020e), and MNS (WHO, 2020c), including in in lower-income settings. Remote consultations could be further supported to reduce the burden on health facilities, minimize overcrowding, and ensure continuity of care.
        - **Continue or initiate multi-month dispensing of essential medications and commodities**.
        - **Expand home visits** for medication delivery, monitoring, and screening.
    - **Reduce overcrowding of facilities:**
        - **Explore local primary health care-led triage systems** to direct suspected COVID-19 patients and routine health needs to appropriate facilities, with dedicated facilities managing COVID-19 patients to keep the general health system operational.

4.3 Effective "prevention systems" also protect essential health services

- **Invest in national data and surveillance systems, including at the subnational level.** Early data indicates wide subnational variation of disruption within countries, potentially correlated with COVID-19 prevalence (Gupta and Pearson, 2020b; UNICEF, 2020). Subnational data is required to identify specific communities with delayed recoveries and target supportive interventions. Improved local surveillance data, instead of an overreliance on global models without quality input data (Mishra et al., 2020), could have also supported more targeted early response policies.
- **Further evidence is needed on how to deploy "lockdown" policies effectively without impacting essential health service utilization.** Preliminary evidence indicates that drops in service utilization tracks with the introduction of "lockdown" policies in HICs and LMICs (Gupta and Pearson, 2020a;

Global Fund & Unite to Fight, 2020; Santoli et al., 2020). The leading cause of declines in service utilization in five countries was "health facility closed" (PATH & the Bill and Melinda Gates Foundation, 2020), and many countries self-reported the impacts of lockdown measures on decreases in presenting patients (WHO, 2020a). Keeping health facilities open during "lockdowns" emphases the importance of essential services to the population, while triage systems and strong testing infrastructure can keep pandemic patients out of routine facilities to protect health workers and reduce spread. Mass-communication and community engagement may be required to ensure households continue to seek care when needed, and policy implementation should ensure travel to health facilities is exempted from restrictions.

- **Ensure a focus on equity in response and recovery.** In an effort to rapidly increase coverage during the recovery, vulnerable and hard-to-reach populations may be left behind. Equity should remain at the forefront of response strategies, including campaigns, and service outreach strategies. Reshaping health system investments focused on these areas would require leadership, incentives, and strategic funds at national, regional, and global levels. **Revisiting measurement for health systems resilience and pandemic preparedness** based on further explorations of above areas, and **having a strong global mechanism** (e.g., pandemic preparedness/defense system, as partnership of existing agencies) with clear guidance and financing on health systems resilience investments may drive such changes.

In addition to key lessons for countries, this review highlighted two lessons for the global health community. (1) Data availability and quality continues to be relatively poor across countries. Continued investments in country-level data systems, coupled with coordination across international organizations could improve the quality of evidence. (2) Available evidence on country preparedness and adaptions is still emerging. Future research can assess the quality of this emerging evidence and intervention impacts. These investments would improve the ability to generate actionable, timely, and evidence-based lessons learned to protect health systems during future emergencies.

Annex 1: Detailed overview of modeled impacts and plausible scenarios occurring

Table A. Modeled impacts of service disruption on projected excess mortality

Service	Geography	Estimated impacts
Mortality impacts – modeled		
Malaria	Sub-Saharan Africa	Scenarios with the largest expected increased mortality were if long-lasting insecticide treated nets (LLITN), seasonal malarial campaigns, and treatment are interrupted (Sherrard-Smith et al., 2020); this initially occurred, but campaigns are now seeing signs of recovery. Data indicate that many countries have resumed seasonal campaigns and LLITN, but routine treatment services are still impacted; this combination of disruption is estimated to cause an additional 164,000 to 310,000 deaths between 1 May 2020 and 30 April 2021 depending on COVID-19 mitigation level (Sherrard-Smith et al., 2020)
HIV/AIDS	Sub-Saharan Africa	Health system impacts to HIV services (e.g., poor quality, overcapacity clinics, supply chain disruptions) for 50% of the population could cause a 1.06 times increase in HIV mortality over a one-year period (Jewel et al., 2020) A decrease in access to ART drugs could lead to an estimated 1.63 times increase in mortality in a one-year period (Jewel et al., 2020), but recent evidence suggests minimal disruption to ART (The Global Fund & Unite to Fight, 2020)
Child Health	LMICs	253,500 additional child deaths could occur in May – Oct. 2020 with child health services coverage reductions of 9.8-18.5% and wasting increases of 10% (Roberton et al., 2020). The majority of LMICs saw coverage reductions in this range or worse from March to September, indicating this scenario could come to fruition. No data was available for wasting changes during this period. 1,157,000 additional child deaths could occur in May - Oct. 2020 with coverage reductions of 39.3-51.9% and wasting increases of 50% (Roberton et al., 2020). A smaller number of countries are experiencing this level of coverage disruption, although wasting numbers are not available.
Maternal Health	LMICs	An estimated 12,200 additional maternal deaths could occur in May – Oct. 2020 due to decreases of 9.8-18.5% in childbirth interventions. Most countries indicating maternal health disruption appear to fall within this threshold (UNICEF, 2020). An estimated 56,700 additional material deaths could occur in May – October 20202 with a 39.3-51.9% decrease in childbirth interventions (Roberton et al., 2020). A small number of countries are experiencing this level of coverage decrease (e.g., Haiti, Bangladesh, potentially India and Pakistan) (UNICEF, 2020, PATH & the Bill and Melinda Gates Foundation).
Nutrition	LMICs	Per July 2020 modeling, expected economic impacts from COVID-19 are expected to translate to an approximate 14.3% increase in child wasting (Headey et al., 2020) Coupled with expected coverage decreases of 25% for nutrition and health services, modelers predicted, "128,605 (ranging from 111,193 to 178,510 for best- and worst-case scenarios) additional deaths in children younger than 5 years during 2020, with

		an estimated 52% of these deaths in sub-Saharan Africa" (Headey et al., 2020). Many countries are within this coverage decrease for health services; however, nutrition and wasting changes are not available. This scenario seems plausible for many countries.

Annex 2: The Impacts of COVID-19 on Essential Health Services and Human Resources for Health – Perspectives from the Global Health Workforce

1. Objectives

The goal is this study was to improve understanding on how global health workers experienced the COVID-19 pandemic and the impacts of the pandemic to their day-to-day jobs as health care workers. The study had four research questions:

1. How has COVID-19 affected the day-to-day work of the global health workforce in different country and care settings?
2. How did health workers cope with COVID-19 cases while also preserving other essential services?
3. How have health workers been (or not been) trained, equipped, and supported to work on or under COVID-19?
4. What would health workers suggest to national and international decision makers to train, equip, and support health workers for future pandemics?

2. Methods

From 23rd to 9th April 2021, we convened ninety-minute focus group discussions with a diverse group of 28 health professionals around the world who have been impacted by the COVID-19 pandemic[5]. Table 1 outlines the profile of participants.

Table 1. Participants in focus group discussions

Participants	Description and number		
By country	Switzerland (n=2) Sweden (n=2) Canada (n=3) Guyana Taiwan United Kingdom	United States (n=2) Netherlands Portugal (n=2) Dominican Republic Italy (n=2) Austria	Oman El Salvador (n=2) Malaysia (n=2) Nigeria (n=2) South Africa Suriname
By professional occupation	ICU Nurse in COVID-19 ward (n=14) ICU/ critical care Doctor (n=5)	Physiotherapist (n=2) Primary health care (n=2) Dentist (n=2)	Medical Resident Pharmacist Home health nurse 3.

Focus group discussions were recorded and transcribed in English. Transcripts were coded in NVivo and analyzed for key themes across health worker cadre and geography, identifying common experiences, challenges, and recommendations across the diverse sample of participants.

[5] Four participants sent written responses, and twenty-three participants participated in virtual focus group discussions.

3. Key Themes[6]

Despite a small sample size with a large diversity of participants, there was remarkable consistency and early saturation across participants in their experiences, challenges, and lessons learned. There was also a strong degree of consistency in experiences across high- and middle-income countries. However, key themes identified here are not meant to be broadly representative and should be taken in context of limited sample size.

Mental Health – a concern for the present and future

Initial fear of the virus among the health workforce, which has reduced over time.

The primary word used by health workers to describe the early days of the pandemic was 'fear'. 'Fear of the unknown' was a consistent refrain across health workers as they shared the initial response at hospitals, pharmacies, dentist offices, and primary care offices. Fear was primarily driven by the novel nature of COVID-19, lack of knowledge on risk and transmission, and concerns about the safety of family. However, initial systems failures – including an initial lack of evidence-based guidelines, shortage of personal protective equipment (PPE), sudden lockdowns that disrupted normal operations, and an overwhelming sense that facilities were unprepared – also contributed to health workers' fear. A volunteer ICU nurse reflects on the start of the pandemic: "*The fear was so intense, and it was traumatizing. Even though we had some training, it wasn't so sufficient and as a matter of fact, most of us had no experience in ICU, had no experience in infectious disease management. We just volunteered because we felt the nation needed our help*."

Immense mental and physical toll of the pandemic on health workers, leading to burnout.

The most salient theme across participants was burnout. Burnout was principally attributed to long working hours and more difficult working conditions, as well as frustration as 'the world returns to normal', while health workers continue to bear an outsized burden. Increasing patient acuity, constantly changing guidelines, and patient loss were also mentioned as contributing to burnout.

- Very long working hours with limited off days: All participants mentioned longer working hours because of COVID-19. In hospitals, normal shifts of four to eight hours have become 12 to 24 hour shifts with a reduction of days off and a practical elimination of leave days. One ICU nurse shared: "*But just the sheer exhaustion, and I can't even imagine having to work 24 hours* shifts [like another participant]*, like the 12-hour shift is plenty, and the most I limit myself to is four in a row, because after the fourth shift I just can't physically move anymore, and I'm mentally exhausted*." Health providers who are also involved in the public health response also expressed severe challenges. One participant explained: "*I work around 16 hours per day for 7, 8 months. Nonstop. I worked around 20, 30 Sundays. I don't know if I will have those holidays here. Until recently, I was working almost every day of the week and it's an incredible pressure. It's like it's almost inhumane*." Many participants expressed the importance of leave days to recover both physically and mentally from the toll of continued long shifts; however, few health workers have been able to take their leave days due to staff shortages. For essential service providers, catching up on patient backlog that accumulated from lockdowns and closures as facilities operated under reduced capacity limits, has also increased workload. Finally, new triage and PPE systems designed to reduce infection take additional time.

[6] Minor grammatical edits to quotes were provided to ensure intelligibility of the participant's reflections in this report.

- The outsized burden on health workers as 'normal returns': Many providers described a tension between the year-long burden of COVID-19 on the health system, which shows little sign of abating, and the increasing loosening of public health restrictions designed to manage infection rates. One ICU nurse explained: "*There is a great frustration among health care workers when we see people out sitting in restaurants, sitting close to each other, sitting on the bus going to work and no one has face masks, no one makes sure that there's a distance. This frustration has also been something to handle when the colleagues are crying because they're so exhausted, or our patients are dying in front of us, and we know that much can be done* [to reduce infections]".
  Many participants shared concerns about the long-term consequences of the pandemic's mental health toll. One ICU nurse reflected: "*I could see many signs of burnout, like a change of personalities. I think that there is a lot of more repercussion that in the last year we couldn't see, but we will see in the future, in this year or in another, because some elements of long times of work start to appear slowly."* Other participants were worried about the impact of working conditions on new health workers entering the profession. A dentist shared: "*Our nurses are not well paid and why would you want to do a dangerous, difficult job for very little money with all that stress? So, I think it will have a significant effect on workforce*."

Changing workforce processes – an ongoing challenge

Ever-changing guidelines led to confusion and increased the burden on health workers.

There was strong alignment across participants that the ever-changing evidence base and lack of practical guidelines created challenges for health workers, particularly in the early days of the response. One participant reflected: "*In the beginning of the pandemic, there was a lot of confusion. It was total chaos. Nobody knew. There were no guidelines. There was nothing*." As the pandemic progressed and countries experienced their first waves, ever-changing guidance created additional stress and workload on providers who were trying to make evidence-based decisions in the face of a novel pandemic. Many participants shared challenges with communication of new guidelines across levels of government, across the health system, and within health facility chains of command. Participants also highlighted the immensity of global research and proliferation of international and national protocols that were ever-changing and occasionally at odds. A participant shared: "*In the beginning no one knew what was right or wrong. The guidelines […] could change from the morning to one in the afternoon, which led to a lot of frustration, both from us frontline workers as well as all the managers. And this could also lead to people making their own decisions and not knowing what's really right*."

Many ICU nurse participants indicated that guidelines, along with practical experience, have now improved knowledge and processes on COVID-19 patient care. However, providers working on non-COVID-19 care expressed a continued gap in the evidence and its lack of practical application for particular professions. For example, a dentist remarked: "*There has been a huge amount of research done in dentistry – 5,000 articles on dentistry and COVID in one year which is unprecedented. Unfortunately, it's really not very good quality. So, we don't really know what we don't know still and that is proving a huge barrier with regard to guidance. So, some guidance is complete overkill, some of it may have gaps in it still and there's a huge variation in the views on how we should actually manage COVID. So, I think we're still miles away from a consensus."*

Staffing shortages led to a reallocation of professionals with limited training to COVID-19 care.

Many participants working in frontline COVID-19 care discussed efforts to create 'surge capacity' in COVID-19 units, whether through reallocating existing nursing staff or rapidly hiring new nurses. Across countries, 'buddy' or 'helper' nurses were assigned to assist more senior ICU nurses and given manageable supportive tasks. Many participants expressed that this additional capacity was positive in the long run; however, they also shared challenges with the initial scale-up of capacity. This included limited training, additional support required from ICU nurses to get new staff up to speed, and concerns about quality. One ICU nurse shared: "*We just had to have these people. It wasn't the same quality, and it was bigger effort for trained nurses to work with these unexperienced people, which also got an impact of the stress level of the experienced ones*." Two participants expressed the challenges of starting new COVID-19 wards and intensive care units from scratch, which created surge capacities but also challenges for health workers to quickly come together as brand-new teams with mixed levels of critical care experience. Although health workers rose to these challenges, they created additional on-job stressors.

Personal protective equipment (PPE) and other essential needs

Nearly all participants[7] indicated a shortage of PPE in the first two to four months of the COVID-19 pandemic, although all participants indicated that supply shortages have since reduced or been eliminated. Participants highlighted shortages of PPE in hospitals and frequent re-use or washing of PPE that was designated for one-time use. Many felt there was an outright absence of PPE in essential services (including dental offices, physiotherapy, primary care, and pharmacies) in the beginning of the pandemic. Lack of PPE was cited as a rationale for temporary closure of essential services. Additionally, participants in middle-income contexts expressed acute shortages of oxygen, ventilators, gloves, and other basic supplies including water and sanitation. Many expressed that health systems weaknesses are known to policy makers and senior leadership but have remained unaddressed, with the pandemic exposing acute gaps.

Now that supply has improved, concerns regarding PPE transitioned to two main themes. First, many private providers highlighted that they remained outside government procurement systems and were concerned about the very high costs of securing PPE to maintain operations. Second, many essential service providers (particularly dentists and physiotherapists) referenced a lack of evidence on current PPE standards, the adaptation of their services within current PPE protocols, and whether current PPE needs would continue indefinitely or abate as vaccinations increase.

Impacts to essential services and routine operations.

Hospital-based services: cancellation of 'non-essential' procedures and its trickle-down effects

All hospital staff indicated that their hospitals cancelled non-essential procedures, with variation on the types of services cancelled. One participant shared: "*We reduced 50% of our elective admissions, and mainly we only cater for urgent or semi urgent cardiac-related cases*", while another indicated: "*in the second wave […] cancer patients got a delay of their operation*s." Several participants remarked that balancing a backlog of 'non-essential' or 'elective' procedures with ongoing critical care is challenging. In the words of one participant: "*now they started the operations again, so now we have a lot of COVID patients and a lot of elective patients now so the patient flow on the ICUs is very high."* A doctor in a high

[7] Canadian and Suriname participants are the only exceptions.

disease burden area shared that 'non-essential' outreach services managed by the facility, such as community screening, remain cancelled because staff do not have the capacity to handle the influx of patients that may be identified with critical health needs.

These challenges have trickled down into all aspects of the health system. A doctor in a large referral hospital shared challenges in accepting referrals from rural hospitals and the impacts it has had on patient care: "*We had a lot of COVID patients, and our bed capacity decreased, so we could not receive the referrals from the rural hospitals. Not only for COVID, but also any advanced procedures including oncology care, ICU care, surgical issues, cardiovascular care. Patients were waiting for days to get a bed at the larger referral hospital when they normally would have been transported right away via helicopter. We do not have a study, but I am pretty sure mortality rose from diseases that could have been managed if patients had reached us in hours instead of days. This was beyond our control*."

Temporary closure of routine services: the impact of lockdowns

Essential service providers all indicated a disruption to their normal operations in the early days of the pandemic, although all have since returned at some capacity. A dentist shared: "*All dentistry ceased in February 2020. That was a government directive for all practices to close and not see patients face to face, partly due to a lack of protective equipment and the unknown infectivity at that point of the virus. Emergency dentistry was available for very serious cases in hospitals.*" A physiotherapist similarly remarked: "*The government allowed no one to go outside the house. So, we had to stop our practice, and we could only treat the people with emergency physiotherapy like elderly people that broke their leg*."

Concerns were raised from providers on the consequences of disrupted routine care. One dentist remarked: "*We missed 20 million routine dental appointments and, obviously, that has had a serious impact on the backlog of treatments that are now needed and even now we're only running at 45% capacity due to the fallow period needed, the PPE still being a problem in some areas and the social distancing requirement. So, we have particular concerns about a deterioration in oral health, a late diagnosis of oral cancer and we have some early indications that they are presenting later and in a more difficult position than would otherwise normally have been the case."*

In addition to cancelled appointments and temporary closure of facilities, many health providers felt that this signaled to patients that seeking health services was dangerous and that this resulted in declines in patient presentation. A community pharmacist reflected on the impact to her patients: "*Initially, we had our pharmacies closed and only interacted with the patient at the door. […] There was a lot of public messaging in order to tell people not to go to hospitals or healthcare centers unless it was really needed – and that meant that a lot of people were frightened about going to a hospital or healthcare center even when they needed to. So, we did have some patients skipping their treatments in hospitals or not wanting to go to hospital to get medication that they would usually get from the hospital.*" Another doctor remarked: "*One of the ways we prepared was by stopping all non-emergency procedures even chemotherapy which we thought could wait for a few weeks. The patients were delayed with care, but it also made patients very worried about coming to the hospital. Strokes, emergency department visits, have all decreased. Patients are coming in with very end stage disease*."

Impacts to future workforce – training, retention, and new hires.

Many participants shared concerns that COVID-19 was going to systemically impact health professions through delays in training, reduced retention, and a reduction of interest in the medical profession. Specific to medical education, concerns were raised about the inability of students to complete hands-on clinical training and potential impacts on quality of care. One participant, who is also an instructor at a medical institution, shared: "*The students have come back, and they've lost basically six months of their education, of their clinical education, the quality is not there. And of course, the school needs to keep on passing them along, because you've got another class coming behind them. […] But I really see that there's going to be a COVID year of students that are not as well prepared as they have been in the past*." A nurse manager raised concerns about drops in applications for positions, explaining: "*we have received many fewer resumes to apply for our new nurse staff, so I think probably some new graduates do want to wait for a year, to wait for half a year, to see how the COVID-19 pandemic goes away or not. So, we do have staff shortage a little more than before.*"

4. Lessons Learned for COVID-19 and future pandemics.

In addition to challenges, participants shared lessons learned from their facilities during the COVID-19 pandemic, highlighted in Table 2.

Table 2. Lessons learned during COVID-19.

Theme	Lessons Learned
Mental Health	Staff support groups with support from senior management. Staff counseling and hotlines available on-site. Welcome-back-to-work session for previously infected staff, to reduce stigma. Creating informal networks to share lessons learned and talk about experiences. Bonus leave days are appreciated, but systems need to be in place to take them.
Infection Prevention and Control (IPC)	Several participants mentioned that a positive consequence of COVID-19 has been increased attention and improved skills/management of IPC. Re-designing hospital infrastructure for improved patient triage and care. Grouping health workers into smaller, consistent teams to minimize the number of people who need to quarantine due to exposure can reduce staff shortages. New online trainings and compliance processes. Increased guidance on PPE donning and doffing and rational usage.
PPE	Increased use of data and quantification at a detailed level to manage stock. Expansion of both domestic and international suppliers. Improvements in rational use guidelines.
Facility Processes	Triaging systems for possible COVID-19 patients to reduce exposure, with separate infrastructure allocated to COVID-19 patients, probable patients, and routine care.
Facility Governance	Diverse and representative management committee for crisis management, including front-line voices. Weekly management meetings and step-down session for new protocols.
Training and education	Transition from in-person to online trainings were helpful for clinical staff and medical residents who have challenges balancing clinical duties with in-person education requirements.

Professional organizations	Participants of all backgrounds consistently mentioned professional organizations as 'stepping up' to support and advocate for health workers, as well as providing actionable and useful guidance.

5. Recommendations from the front-line

The resilience, expertise, and determination of health workers during COVID-19 remains laudable. Societies around the world have asked a tremendous amount from health workers – from intensive care nurses treating COVID-19 patients to essential service providers keeping routine services functional. Health professionals have risen to the challenge – rapidly adapting to a 'new normal,' working expanded hours in difficult working conditions, learning new skills, and maintaining standards in patient care. They have done this despite an initial lack of PPE, limited knowledge of the virus, fear of infection, and national responses that simultaneously celebrate health workers while scaling back public health measures to contain infections.

Recommendations from health workers on how the international community and national governments can best support them can be grouped into two broad categories: (1) improving conditions and support for health workers, and (2) broader adaptations on pandemic preparedness and response which, although not limited to the health workforce, have had an outsized impact on their ability to respond and maintain services.

Improving conditions for health workers

A common refrain, especially from nursing participants, was the need to improve overall working conditions. Participants shared specific recommendations including (1) improving the availability of PPE and supplies in emergencies to prioritize staff safety, (2) increasing manpower to manage workload and avoid persistent burnout, (3) improved staff support including days off, mental health services, and small tokens like providing meals, and (4) adapting facility infrastructure to be more conducive to workflow and staffing recommendations.

Framing by participants often emphasized that improving working conditions were important to continue attracting new talent to the medical profession and to prevent workforce attrition. As one participant explained: "*My fear is that some people will choose other careers after they've been seeing how overworked healthcare providers, frontline providers, have been throughout this last year*." On staff turnover, one participant shared: "*I know many of my nurse colleagues, they leave their work. They're falling apart mentally, physically, not healthy at all. We need to work to make this attractive, take care of each other, to take care of people and that's the responsibility I think we own together*." Additionally, participants shared concerns about brain drain from lower-income countries and impacts to health professionals living on work visas. In both cases, steps to improve working conditions, job security, and support for health worker's dependents is critical.

Health systems recommendations for pandemic preparedness and response

- **Improve ongoing systems for pandemic preparedness and response through continual training, guidelines, and institutionalization of processes**: The strongest recommendation was improved prevention and health systems readiness for future pandemics. Many participants argued that 'this won't be the last pandemic', and that continuous training, pandemic protocols, and pandemic management processes are needed *before* the next health emergency occurs. This recommendation echoes broader calls for ongoing national-level pandemic preparedness and country response plans, but it goes a step further to emphasize the importance of including front-line workers and health facility managers in preparedness simulations. It is critical that support to preparedness efforts include all aspects of the health system – from critical care to primary care – and all cadres of health professionals.
- **Stronger coordination and risk communications across levels of the health system, down to providers:** Strengthening international and national coordination systems was recommended. Internationally, participants expressed a desire to learn faster from the experiences of other countries to inform their own strategies and evolving patient care best practices. Nationally, clearer processes to develop and disseminate new evidence-based protocols and guidance were recommended. Inclusive communication processes across the health system were suggested to ensure that health providers are all up to date on the latest guidance, and that the public understands how and why processes change with the evidence to build trust.
- **Separation of science and politics:** A common refrain from many participants was the need to separate scientific evidence from political considerations. Health workers have borne an outsized share of COVID-19's burden on society and the consequences of pandemic policies, and a recognition of this impact is warranted. Similarly, many participants raised concerns about vaccine hesitancy and equity of vaccine distribution, and they recommended that lessons from the COVID-19 response be applied to strengthening vaccination campaigns.
- **Health workers need a seat at the table:** Health professionals have formed the backbone of COVID-19 responses and are the holders of considerable technical knowledge and implementation insight that is essential to guide pandemic preparedness, response, and recovery. Despite this, the health workforce is often relegated to implementing responses without a seat at the decision-making table. Professional or advocacy organizations were cited as critically important; however, it was noted that 'speaking for someone' was not the same as being able to speak directly. Those with frontline knowledge and experience are critical to understanding the full picture, from preparedness approaches to response and recovery strategies. Elevating health worker's experience and incorporating their voices into decision making was recommended for future pandemics.

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