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What Can the Service Delivery Indicator Surveys Tell Us about COVID-19 Preparedness?

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Abstract

To aid national and international efforts to support countries in enhancing their pandemic preparedness in the face of COVID-19, this paper draws from the World Bank's Service Delivery Indicator surveys to highlight key aspects of health service preparedness in Kenya, Sierra Leone, and Tanzania. The results of this analysis paint a highly variable picture. At least 10 percent of lower-level facilities in all three countries have inpatient care capacity, suggesting that these lower-level facilities could help absorb surges in patient flow. Less than half of the facilities in the three countries have a fixed or mobile phone and less than a third have internet access, suggesting a likely challenge in communication and timely sharing of essential information. Concerningly, less than half of the facilities have appropriate handwashing facilities for patients, with even lower rates in rural areas. Between 80 and 95 percent of the facilities have a thermometer to diagnose fever, but availability of a thermometer, stethoscope, and blood pressure cuff together is variable (ranging from almost 90 percent of the facilities in Tanzania to less than 65 percent in Sierra Leone). The paper concludes by highlighting key innovations for future surveys to improve measurement of pandemic preparedness.

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Introduction

The number of cases of the novel coronavirus 2019-nCoV (COVID-19) is increasing across low- and middle-income countries (LMICs), raising concerns about the ability of the health systems in these countries to mount an effective response and the potential direct and indirect health and economic impacts of the pandemic. Modeled predictions of the global impact of this pandemic suggest that demand for critical care will vastly exceed capacity in all countries, regardless of the mitigation scenario.[2] LMICs are at a disadvantage from the outset: from the supply side alone, it is well-documented that public spending in health is low, critical deficiencies in provision of high-quality routine care exist, and preparedness to respond to outbreaks is weak.[3] Given these considerations, it is anticipated that health system failure, in addition to lack of adequate care for severe cases of COVID-19, will exacerbate the degree of excess mortality in countries with already weak health systems.

The 2014 Ebola epidemic in Guinea, Liberia and Sierra Leone highlighted the importance of an effective national health system as the first line of defense against pandemics and the importance of health system resilience, that is, "the capacity of health actors, institutions, and populations to prepare for and effectively respond to crises; maintain core functions when a crisis hits; and, informed by lessons learnt during the crisis, reorganize if conditions require it."[4] Unfortunately, five years later, countries find themselves ill-prepared and vulnerable to the threat of pandemics and large-scale disease outbreaks, let alone able to move beyond a narrow preparedness agenda to build resilient health systems.

While the task of responding and adapting to health shocks in the face of the COVID-19 pandemic in LMICs appears daunting, a nuanced, evidence-based approach could inform targeting of interventions to address short-term demands, and in the process integrate pandemic preparedness and resilience as a part of overall strengthening of national health systems.

Background on pandemic preparedness and response

The objective of pandemic preparedness is to enable countries to swiftly mobilize resources to recognize and manage a pandemic. Adequate preparedness and effective response may help reduce transmission of the pandemic virus strain; decrease cases, hospitalizations, and deaths; maintain essential services; and reduce the economic and social impact of a pandemic.[5] Pandemic preparedness, however, is not a short-term or quick process. A detailed and comprehensive pandemic plan requires a multisectoral, whole-of-society approach to engage people and build the commitment needed for policy decisions.

Provision of essential health services is critical to minimizing morbidity and mortality during pandemics. In line with general health emergency preparedness planning, rational personnel management, optimal use of facilities, medical supplies and pharmaceutical products are important steps in ensuring that health services are effectively functioning and responding to emerging health challenges during pandemics. To achieve these, the World Health Organization guidance suggests focusing on 18 broadly defined tasks

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[2] Patrick GT Walker, Charles Whittaker, Oliver Watson et al. The Global Impact of COVID-19 and Strategies for Mitigation and Suppression. Imperial College London (2020), doi: https://doi.org/10.25561/77735

[3]CSIS Commission on Strengthening America's Health Security. Harnessing Multilateral Financing for Health Security Preparedness. CSIS Briefs. April 2019. Accessed on April 8, 2020. https://www.csis.org/analysis/harnessing-multilateral-financing-health-security-preparedness

[4] Kruk ME, Myers M, Varpilah ST, Dahn BT. What is a resilient health system? Lessons from Ebola. Lancet 2015;385:1910-2.

[5] World Health Organization. WHO checklist for influenza pandemic preparedness planning. 2005. Accessed April 8, 2020 https://www.who.int/csr/resources/publications/influenza/WHO_CDS_CSR_GIP_2005_4/en/

covering four thematic areas: health service facilities, personnel, supplies, and excess mortality (Appendix Table 1).

Evidence to aid such comprehensive planning, however, is scarce. For instance, globally there is a particular concern about health facility capacity for infection control and protection of health workers at the frontline of diagnosing and treating COVID-19. In absence of reliable, real-time data on these indicators, large-scale health facility surveys could be utilized to gauge health system preparedness in these matters. Likewise, health service delivery assessments (such as the Service Availability and Readiness Assessment (SARA),[6] Service Provision Assessment (SPA)[7] and Service Delivery Indicator (SDI) survey[8]) can also help measure overall system strength for maintaining core functions while absorbing surge cases, and resilience to withstand shocks during pandemics.

Background on the SDI surveys

Service Delivery Indicator (SDI) surveys generate nationally representative data on the quality of education and health services. The indicators enable governments and citizens to identify gaps and track progress within and across countries over time. They transform the way quality of social sector services is measured, and in so doing, how countries develop policies and design interventions to improve health and education outcomes around the globe.

The SDI program is a product of a partnership between the World Bank Group, the African Economic Research Consortium (AERC) and the William and Flora Hewlett Foundation. Since the inception of the initiative in 2010, 24 surveys have been completed in 12 countries in Africa, capturing the health and primary education service delivery experience of more than 500 million people. The surveys have been extended not only in Africa but around the globe: data collection for the first SDI surveys in Latin America, East Asia/Pacific, and South Asia is currently underway.

Information available through health SDI surveys is not readily or reliably available through routinely collected administrative data even when they exist. In some countries with weak health systems, health management information systems (HMIS) capacity is severely lacking, if not absent altogether. SDI health survey data can fill the evidence gap in such scenarios. In particular, the health SDI surveys focus on three key areas:

> *(i) Providers' knowledge:* Are health care providers accurately diagnosing and treating common health conditions, adhering to clinical guidelines?
>
> *(ii) Providers' effort:* Are health care providers present at their facilities during their shifts? Are there enough staff available to see all patients?
>
> *(iii) Inputs:* Do health facilities have the equipment (e.g., medicines, infrastructure, supplies) and resources they need to deliver high-quality care? Are providers receiving adequate on-the-job training?

[6] Service Availability and Readiness Assessment (SARA) https://www.who.int/healthinfo/systems/sara_methods/en/

[7] SPA Overview https://dhsprogram.com/What-We-Do/Survey-Types/SPA.cfm

[8] Service Delivery Indicators https://www.sdindicators.org/

Given their comprehensive nature, the survey results can provide an overall health system diagnostic, shedding light on the system's ability cope with and recover from unexpected shocks, such as the COVID-19 pandemic.

The three most recently completed health SDI surveys are from Kenya, Sierra Leone, and Tanzania. Kenya's survey is the largest to date, with a sample of 3,094 facilities, and was conducted between March and July 2018. Of the sampled facilities, 1,781 are public and 1,313 are private. The survey team observed 13,026 workers for absenteeism and assessed 4,430 health workers for competence using patient case simulation. The data collected are representative of the 47 counties, facility location (urban/rural areas), facility ownership (public/private), and level of facility (first level hospital/health center/dispensary and clinic).

The SDI survey in Sierra Leone was conducted between January and April 2018 and consists of a sample of 547 health facilities, 501 public and 46 private facilities. The survey team observed 1,700 workers for absenteeism and assessed 818 health workers for clinical competence. The data collected are representative of the 14 districts, facility location (urban/rural), facility ownership, and level of facility (hospital/health center/health post).

The survey in Tanzania took place between August and September 2016 and is comprised of a sample of 400 health facilities, which included 273 public and 127 private facilities. The survey included an assessment of 2,093 health care workers for absenteeism and 563 for clinical competence. The data collected are representative at the national level and by location (Dar es Salaam, other urban areas, and rural areas).

Each of these three surveys adheres to a core set of questions that are standardized across all SDIs, ensuring international comparability of results. However, in response to specific country contexts and policy interests, the surveys also have questions that differ. This report presents the results from analyzing data from these three most recent surveys (from the last five years) to examine the SDI survey's capacity to date to surface insights on COVID-19 preparedness in these three contexts. Because of country-specific differences in the surveys, the availability of pandemic preparedness–related indicators varies slightly by country. The calculations use survey weights to generate nationally representative estimates for each country.

International pandemic guidelines and the SDIs

The World Health Organization (WHO) offers an extensive set of guidelines relating to pandemic preparedness, covering a wide range of topics from international cooperation and national governance to maintenance of essential services at the community or health facility level. The Joint External Evaluation (JEE), for example, takes a whole-of-government, multisectoral approach to assessing country capacity to prevent, detect and rapidly respond to public health risks occurring naturally or due to deliberate or accidental events.[9] In the recent years, responding to the potential of an influenza outbreak, the WHO has developed specific guidelines relating to influenza pandemic preparedness.[10] Given the present context of the COVID-19 pandemic, this set of guidelines is most relevant (in the absence of guidelines of

[9] Joint External Evaluation Tool and Process Overview. Geneva: World Health Organization; 2016. Licence: CC BY-NC-SA 3.0 IGO.

[10] World Health Organization. WHO checklist for influenza pandemic preparedness planning. 2005. Accessed April 8, 2020 https://www.who.int/csr/resources/publications/influenza/WHO_CDS_CSR_GIP_2005_4/en/

this scope for COVID-19 specifically) for assessing the level of and supporting national health systems to further bolster their preparedness during the pandemic.

Guidance for health systems, highlighted in this WHO manual, centers on the objective of minimizing morbidity and mortality caused by the pandemic by ensuring that health services are kept functioning for as long as possible. Of the 18 tasks identified across the four categories for maintaining essential health services, the most recent SDI surveys provide some evidence to support planning for seven tasks concerning procurement, coordination and management related to health facilities, personnel, and supplies (Appendix Table 1). The existing SDI data do not inform any activities related to management of excess mortality resulting from the pandemic.

For instance, the SDI data allow estimation of numbers of health care workers by professional group at the facility level, which can be extrapolated to gauge availability at the national, provincial or local level. These data can also inform coordination of patient flow between health care facilities by providing insight on resources available across facilities, including provision of emergency transport and seamless communication. Furthermore, the SDI can shed light on availability of basic, yet critical, medicine, equipment and supplies for infection prevention, treatment and control, especially during respiratory pandemics. These include availability of a functioning thermometer, stethoscope and sphygmomanometer for diagnosis and monitoring; unexpired antibiotics for treatment of patients; and personal protective equipment like gloves and masks to protect frontline health care workers. This report delves into the details of what can be learned about these pandemic preparedness indicators from the SDIs.

Ready or not? Findings from the SDIs on facility preparedness for a pandemic situation

The demand for health care increases unexpectedly and usually exponentially during disease outbreaks and pandemics. The same is true for COVID-19. Leading epidemiological models indicate that despite stringent suppression measures, the spread of COVID-19 will overwhelm most health care systems. Careful planning involving systematic assessment of the capacity of available facilities, and their utilization for treating and supporting patients based on the severity of the case, is crucial for ensuring effective delivery of routine care and for serving the additional demand for care, including timely referral and hospitalization. The SDI survey offers useful insight for this planning by providing data that are not reliably available through administrative sources. The sections below describe findings from three SDI surveys on pandemic preparedness, as defined by the WHO guidelines described above.

Hospitalization capacity

In the current pandemic, evidence from high-income and high-capacity countries indicates that the demand for hospitalization due to severe cases far outpaces health system capacity. Once a surge in infection is noted, low- and middle-income countries are likely to face a similar, if not a worse, mismatch of supply with demand. In such a scenario, it may be helpful for health authorities and planners to assess and identify health facilities, particularly non-hospitals, that could temporarily be used for inpatient care. The SDI survey indicates that many non-hospitals have hospitalization capacity, including 14% of non-hospitals in Kenya, 11% in Sierra Leone and 17% in Tanzania. However, it is worth noting here that the survey in Kenya indicates that only slightly over 50% of facilities have the capacity to diagnose and treat chronic obstructive pulmonary disease (COPD), a proxy for overall capacity to manage respiratory diseases (Appendix Table 2). As expected, this is higher in hospitals than in non-hospitals (Appendix Table 3) and is worse in rural areas where the percentage of facilities that can diagnose and treat COPD is 14 percentage points lower than in urban areas (Appendix Table 4). Relatedly, these data also indicate that only about

one in every four facilities in Kenya has treatment guidelines for chronic respiratory diseases.

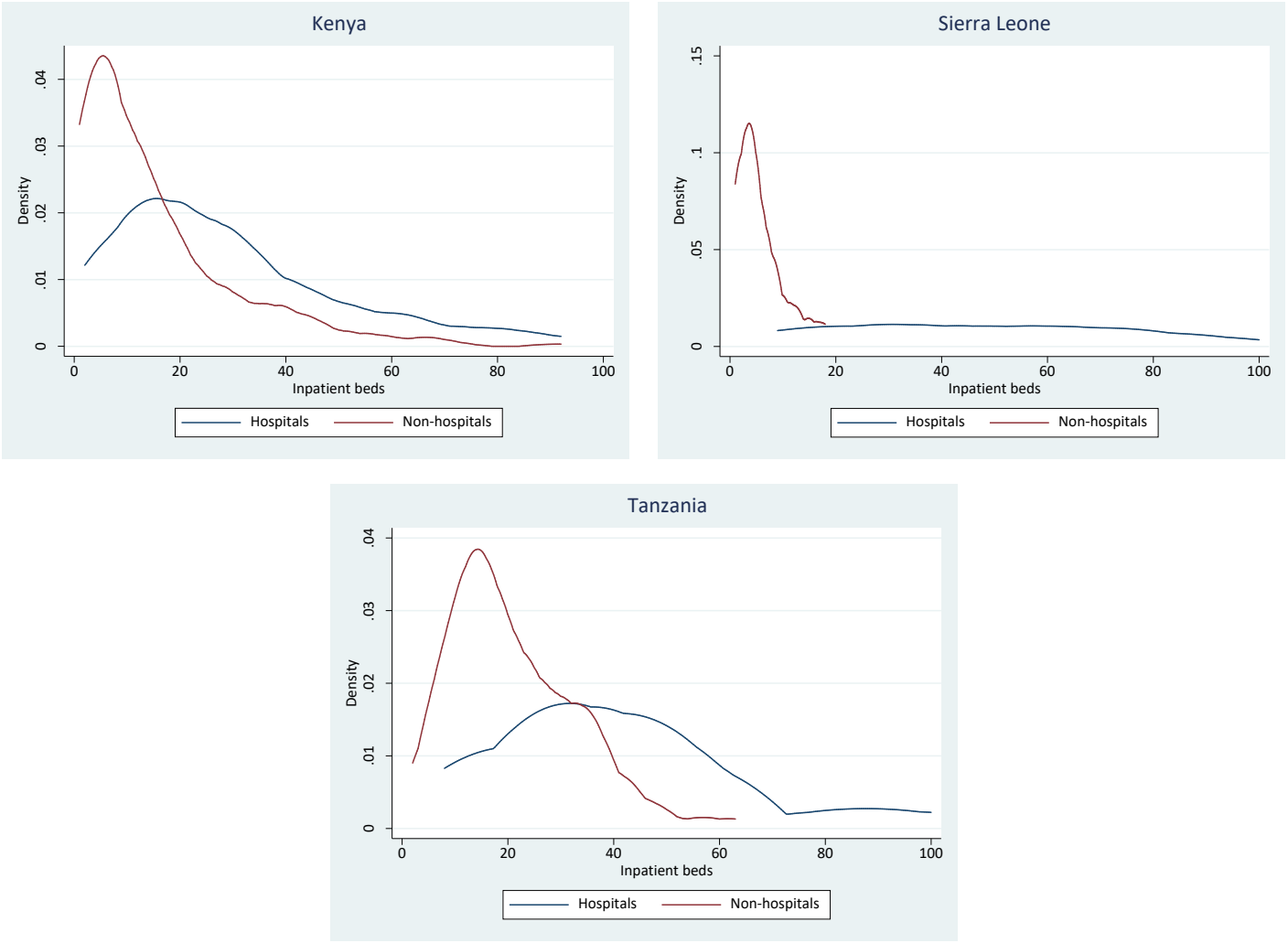
Inpatient bed capacity

Beyond just a binary indicator of hospitalization capacity, the number of beds available for hospitalizing sick patients during a pandemic is a key metric of facility bandwidth to absorb surges in patient flow. With COVID-19, facilities worldwide have been pushed beyond capacity in terms of adequate inpatient beds,[11] so understanding baseline capacity may help inform allocation strategies in emergencies. The average number of inpatient beds in hospitals is 85 in Tanzania, 46 in Sierra Leone and 19 in Kenya. As expected, lower-level facilities have far fewer inpatient beds (an average of three in Tanzania, one in Kenya, and less than one in Sierra Leone) (Appendix Table 3).

Figure 1 displays the distribution of inpatient beds, which indicates wide variation in counts of beds across both levels of facilities, but particularly for hospitals. The designation of a facility (as a hospital or non-hospital) does not necessarily relate directly to inpatient bed count. Because blanket assumptions about inpatient bed capacity cannot be made based on facility level designation, nuanced analysis is required in developing strategy around patient flow between facilities. In line with the finding that some lower-level facilities have hospitalization capacity, these bed counts indicate that some lower-level facilities (particularly in Kenya) may be a significant source of additional inpatient beds. In theory, since many countries have protocols in place to manage COVID-19 cases in selected hospitals only, these beds could be reallocated to these hospitals, or, if adequate equipment, supplies, and personnel are available at these lower-level facilities, these facilities may be able to absorb some of the surge of COVID-19 inpatients that would otherwise go to hospitals.

[11] Phua, J et al. "Intensive care management of coronavirus disease 2019 (COVID-19): challenges and recommendations". https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(20)30161-2/fulltext

Figure 1: Distribution of inpatient beds* by facility type (hospital vs. non-hospital) in Kenya, Sierra Leone, and Tanzania

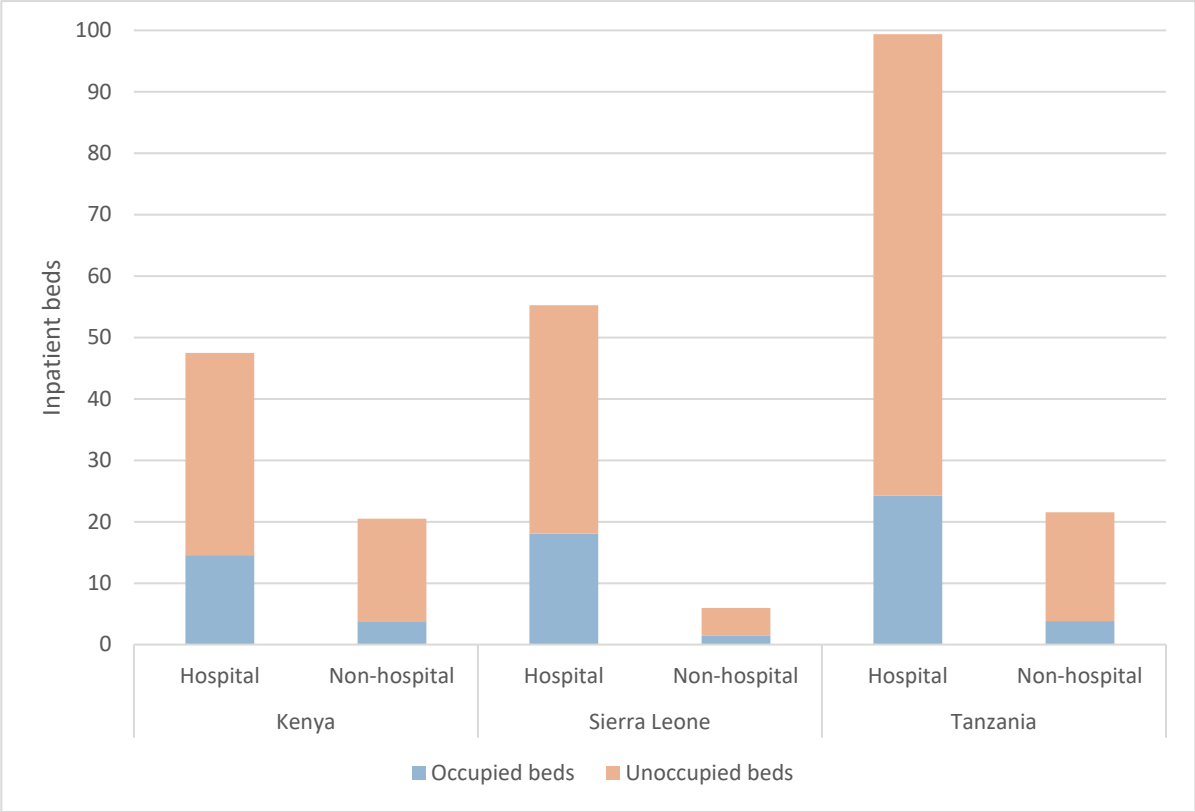


* For clearer visualization, the x axis has been truncated at 100 beds for these figures, but all three distributions of hospital beds have a long right tail

While simple bed counts are one measure of bandwidth, inpatient bed occupancy rates are a de facto metric of surge capacity. Specifically, the inpatient bed occupancy rate indicates whether facility beds are full under normal circumstances, which can begin to shed light on the extent to which the facility can accommodate more inpatients during a pandemic. Combining information from the SDI on the number of inpatient beds in the facility with information on the number of inpatient bed-days spent in the facility over the past three months (Appendix Table 2) yields such an estimate of the occupancy rate. Overall, occupancy rates of inpatient beds in facilities are low: at the national level, estimates from Sierra Leone suggest a 30% occupancy rate of inpatient beds, 20% for Tanzania, and 22% for Kenya. Figure 2 converts these estimates into average numbers of occupied and unoccupied beds in a given facility on a given day. While the sample of hospitals from Tanzania includes only 26 facilities, there may be an average of 70 empty of the nearly 100 inpatient beds. Encouragingly, these numbers of "unoccupied inpatient beds" are high across the board, particularly among hospitals. This suggests that facilities have bandwidth to

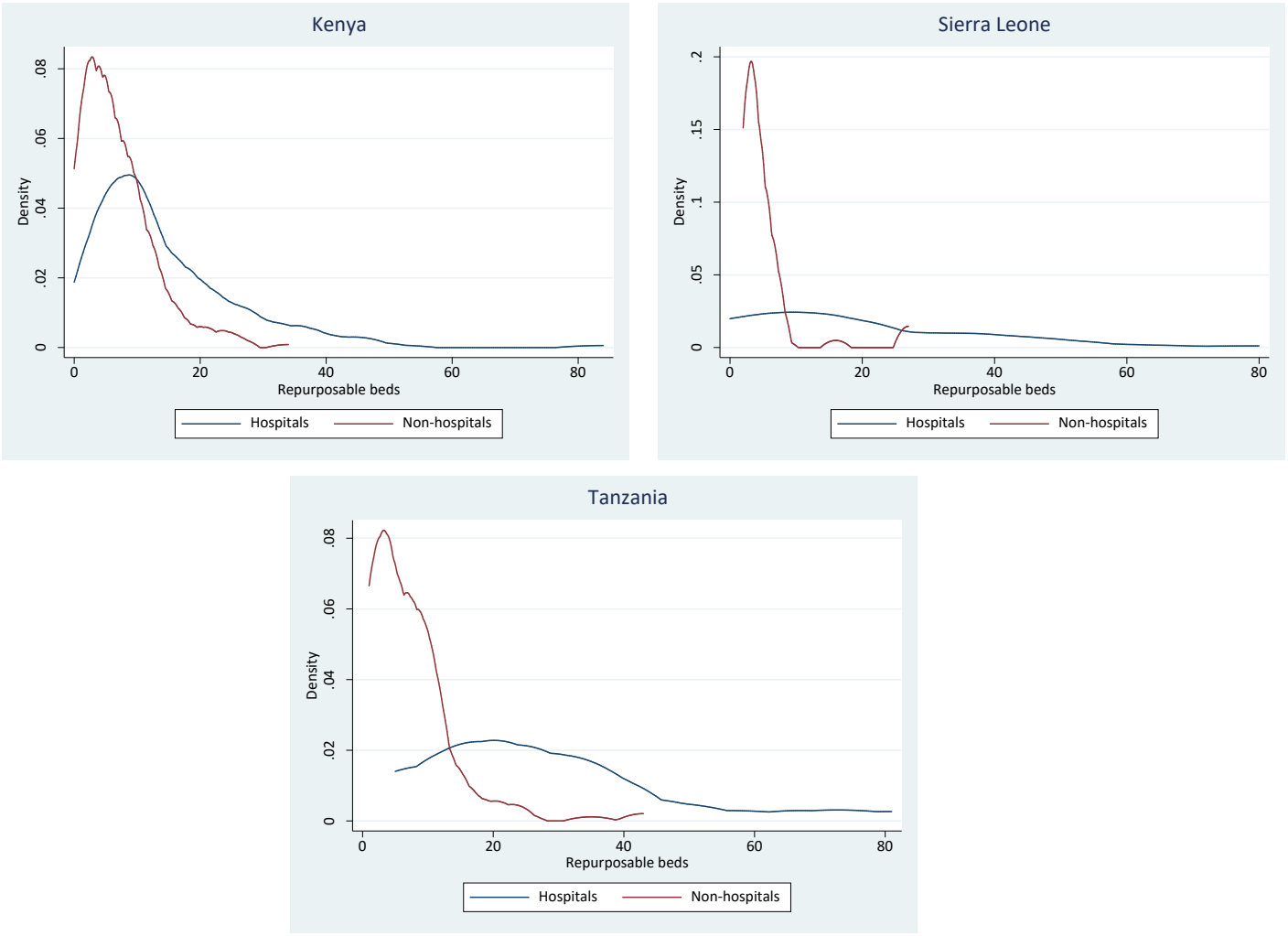
accommodate at least some amount of surge in patients, though it is not possible to assess whether it will be enough given the extent of expected COVID-19 hospitalizations. In addition, isolation beds and intensive care unit (ICU) capacity are particularly important in the context of COVID-19, but this information is not available in the SDI surveys.

Figure 2: Counts of unoccupied inpatient beds by facility type (hospital vs. non-hospital) in Kenya, Sierra Leone, and Tanzania



In an emergency, other beds in the facility (such as unused examination beds, maternity beds, etc.) could theoretically be repurposed for use as inpatient beds to accommodate high inpatient load. As shown in Figure 3, hospitals in particular may have large numbers of beds that could potentially be used for COVID-19 inpatients, for example. An average hospital in Kenya has 14 beds that could potentially be repurposed, while this number is even higher elsewhere, 19 in Sierra Leone and 27 in Tanzania. Importantly, these crude estimates do not account for the need to maintain utilization of some beds for maternity and other crucial uses. However, they also provide an estimate of the extent to which hospitals may be able to reallocate to utilize their existing capacity.

Figure 3: Distribution of beds* that could potentially be repurposed by facility type (hospital vs. non-hospital) in Kenya, Sierra Leone, and Tanzania



* For comparison with the above figure, health facilities with more than 100 inpatient beds are once again excluded

Availability of medical staff

Adequate numbers of trained medical staff in facilities are paramount to ensure that patients receive necessary care during a pandemic, and to limit frontline health care provider burnout.[12] While the optimal mix of doctors, nurses, and other health care providers is unknown[13] (and will likely depend on facility characteristics, patient volume and characteristics), information on human resources to address a pandemic is crucial for planning and resource allocation. A preferred metric for assessing provider availability is the provider-to-patient ratio, however, the current data do not allow such estimation as in- and out-patient volume during the pandemic period is likely to be different than that from the non-

[12] Dewey, C. "Supporting Clinicians During the COVID-19 Pandemic". *Ann Intern Med*. 2020 Mar 20. https://annals.org/aim/fullarticle/2763592/supporting-clinicians-during-covid-19-pandemic

[13] Forgacs, I. "The required number of physicians: is it an optimal figure?" *Cah Sociol Demogr Med*. 2002 Apr-Sep;42(2-3):269-82. https://www.ncbi.nlm.nih.gov/pubmed/12078328

pandemic period and therefore is unknown.

However, SDI data can provide information on counts of medical staff at facilities, including breakdowns by cadre of provider. In particular, the data from Kenya indicate that the average hospital has a total of 34 health workers on staff; approximately three of whom are doctors, four are clinical officers, 16 are nurses, and the remainder are other types of health care workers (such as community health workers or medical assistants) (Table 1). A typical lower-level facility in Kenya has an average of five total medical providers; a doctor is unlikely to be on staff and nurses are the most common type of provider. A typical hospital in Sierra Leone has more than 46 medical staff, the vast majority of whom are nurses (and only about two of whom are doctors). In lower-level facilities in Sierra Leone, health care providers ranking lower than nurses are the most common cadre of staff available. Perhaps as expected, hospitals have more staff than non-hospitals, and more higher-level providers (doctors and clinical officers) than non-hospitals. While it is not possible to comment on whether these provider counts are optimal, these data are crucial for understanding potential areas of human resource constraint or flexibility.

Beyond counts of providers, adequate health worker education and training is required to ensure that appropriate care is administered to patients. Encouragingly, across all countries and levels of facilities, the numbers of providers with post-secondary education or higher is far greater than the numbers of health workers with secondary or primary education (Table 1).

Table 1: Total medical staff (cadre and education) by facility type (hospital vs. non-hospital) in Kenya, Sierra Leone, and Tanzania

	Kenya		Sierra Leone		Tanzania*	
	Hospitals	Non-hospitals	Hospitals	Non-hospitals	Hospitals	Non-hospitals
Total medical staff	34.21	5.20	46.63	6.54	111.47	8.97
Medical staff cadre						
Doctors	2.55	0.10	1.72	0.01	4.56	0.43
Clinical Officers[±]	4.27	0.83	-	-	5.26	1.26
Nurses	15.53	2.42	27.05	1.19	17.49	2.67
Other	11.86	1.85	17.86	5.35	13.06	3.93
Medical staff education[++]						
Primary	0.21	0.04	0.61	0.56	2.34	1.07
Secondary	1.68	0.55	10.32	1.72	22.28	4.82
Post-secondary	32.25	4.59	35.07	3.97	15.71	2.40

*Breakdowns by cadre and education were unavailable for facilities with over 50 medical staff in Tanzania so the counts of doctors, clinical officers, nurses, and other (and counts of staff with different levels of education) are only available for facilities with 50 or fewer medical staff. However, the counts of total medical staff include these larger facilities (Tanzania has 35 facilities with more than 50 medical staff, which increase the averages of total medical staff from 40.37 for hospitals and 8.29 for non-hospitals to the 111.47 and 8.97 reported in the table above).

[±]Clinical Officers were not a medical staff cadre in Sierra Leone

[++]Provider education was missing for 1.1% of the sample resulting in the sums of the categories of education equaling less than the total number of medical staff

Importantly, the estimates presented here on the counts of health providers at facilities represent a theoretical maximum of total medical staff available. High rates of provider absenteeism (most of which is excused – such as for trainings and meetings) have been documented repeatedly in previous SDI reports. The estimates presented here assume that, in the case of a pandemic, health care workers could set aside other professional commitments to provide urgent care to patients. These estimates also represent an

upper bound of staff counts in that they assume that all health workers would be available at the facility to attend to patients at all times.

The ratio of health care providers to inpatient beds can shed light on how human resources align with other facility capacity measures. Nurse-to-patient ratios, for example, are highly variable even in the United States, where state-level laws require different ratios for different types of care, but these ratios may vary from 1:1 to 1:6.[14] SDI data from Kenya, Tanzania, and Sierra Leone indicate that the number of health workers per inpatient bed ranges between one and two providers per bed across all three countries. While this metric makes the dramatic assumptions that all health care workers on staff at the facility are in the facility at the same time and are all available (and trained) to attend to an inpatient bed, this crude provider-to-bed ratio gives a sense of the bandwidth of facilities in an all-hands-on-deck scenario.

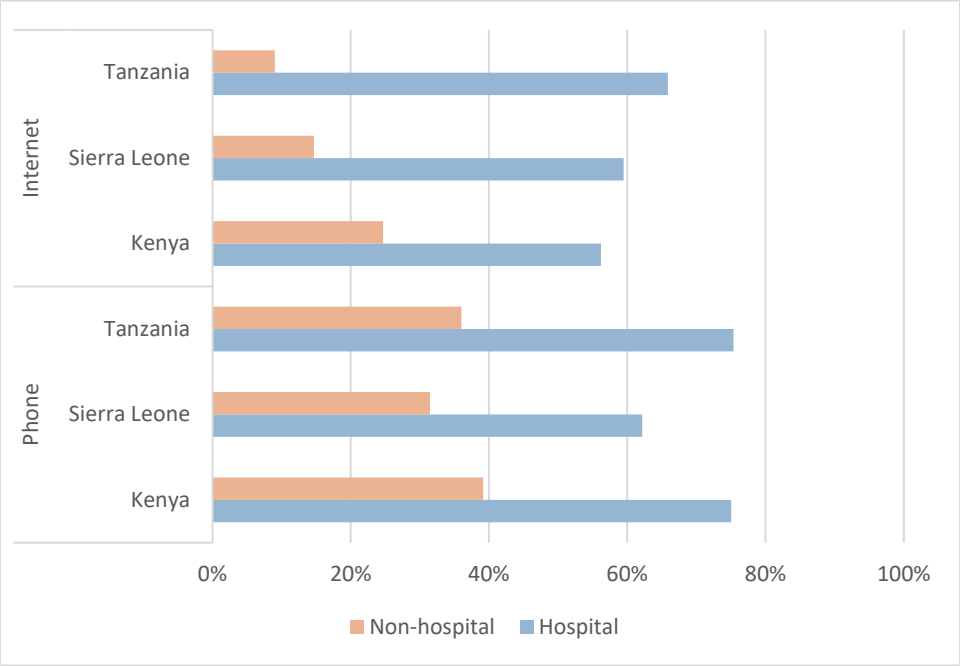
Effective communication and coordination

Effective channels for sharing information with the community, local authorities and across various levels of health facilities are essential for coordinating care and for ensuring seamless flow of information and patients between facilities to optimize the use of limited resources. For instance, during pandemics, especially at the peak of transmission, it is important to not overwhelm emergency departments or hospitals (which may be perceived as offering enhanced services) for cases that can be managed elsewhere. Relatedly, severe cases requiring specialized care should be transferred to higher level facilities along with necessary medical history, if the first point of contact with the health system happens at a lower level facility. Likewise, outpatient services should be limited and provided in a way to reduce possible exposure and further transmission. Additionally, access to timely information from local authorities regarding evolving guidance and safety recommendations and dissemination of such information to patients and communities can also happen through the health facilities. Therefore, all facilities, regardless of their location or level of care offered, should at the minimum, have access to a functioning phone and preferably in today's world, access to the internet.

Do health facilities in Kenya, Sierra Leone and Tanzania have access to a minimally adequate level of communication tools to coordinate clinical care and health service plans with local authorities and neighboring health facilities? The SDI surveys provide insight on the availability of a functional telephone, either a fixed or mobile phone and a functioning computer with internet access. These data indicate that only between 33% and 43% of facilities across all three countries have a functioning fixed or mobile phone. Similarly, access to a functioning internet connection is poor across all countries, with less than 30% of facilities with internet access. Across all three countries, availability of a functioning phone or internet is poorer in lower-level facilities compared to hospitals, as shown in Figure 4, and poorer in facilities in rural as opposed to urban areas. This has potential implications for care coordination between lower-level facilities and hospitals, with the risk of overcrowding in the latter or challenges in initiating appropriate linkages to care from the former.

[14] Lippincott Nursing Education. "The Importance of the Optimal Nurse-to-Patient Ratio". November 10, 2016. http://nursingeducation.lww.com/blog.entry.html/2016/11/10/the_importance_ofth-GCAE.html

Figure 4: Proportion of facilities with access to minimally adequate communication tools by facility type (hospital vs. non-hospital) in Kenya, Sierra Leone, and Tanzania



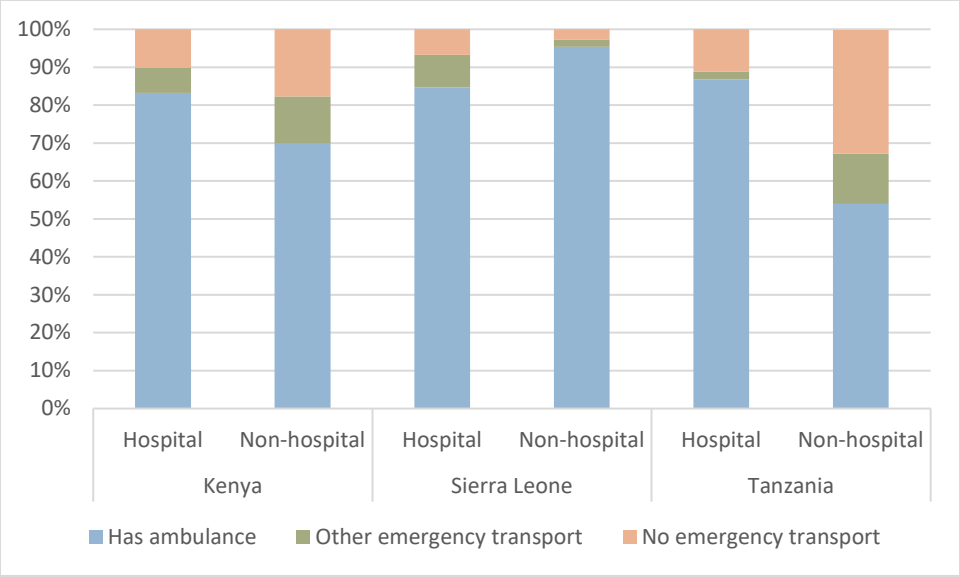
Emergency transport capacity

In the case of an emergency, rapid transportation of a patient to a better-equipped referral center may be needed. Emergency transport is ideally provided by an ambulance, which is equipped with life-saving supplies and equipment and can accommodate limited medical care en route. However, when an ambulance is not available, other facility-sponsored emergency transport (such as an official vehicle or repurposed facility utility van, for example) can be a stopgap. Where no emergency transport is available (or where patients are responsible for their own emergency transport), this increases the likelihood that a severely sick patient may not receive timely care at the level of facility required.

Are ambulances available at facilities in Kenya, Sierra Leone, and Tanzania to transport patients? Overall, the SDI data indicate that 95% of facilities in Sierra Leone have an ambulance on call at the facility; followed by 71% in Kenya, and 55% in Tanzania. It is worth noting, however, that 14% of facilities with an ambulance in Sierra Leone did not have fuel for the ambulance available on the day of the survey; the same is true for only 7% of facilities in Kenya, but 41% in Tanzania. While systematic lack of fuel is not captured in the survey, these data do suggest that a facility's ambulance may be unusable from time to time due to an empty tank. In Tanzania, 32% of facilities report that no emergency transport is available, followed by 17% of facilities in Kenya, and only 3% in Sierra Leone. This implies that some facilities may face challenges in operationalizing emergency referrals during a pandemic.

Figure 5 shows that in Sierra Leone, an ambulance is most commonly available at lower-level facilities as opposed to hospitals. In contrast, in Kenya and Tanzania, an ambulance is more likely to be available in a higher-level facility (Appendix Table 3). This type of information can potentially provide relevant insight in designing optimal ambulance dispatch systems during a pandemic.

Figure 5: Availability of emergency transport* by facility type (hospital vs. non-hospital) in Kenya, Sierra Leone, and Tanzania



* "Other emergency transport" arrangements include other official vehicles, private vehicles or another mode of emergency transport.

Availability of WaSH and acceptable waste disposal

Availability of appropriate water, sanitation, and hygiene (WaSH) facilities is critical for infection prevention and control, especially in health care settings. Hand hygiene (hand washing) and appropriate waste segregation and disposal, for instance, are critical for both patient and health care worker safety. By the end of the 2018 Ebola epidemic, the rate of infection among health care workers was several folds higher than that of general population, partly owing to lack of robust infection prevention and control measures in place in the health facilities.[15] How do health facilities in Kenya, Sierra Leone and Tanzania fare in terms of WaSH arrangements?

The evidence from the SDI surveys is worrisome. Disquietingly, less than half of the facilities across these three countries have appropriate handwashing facilities for patients, with fewer rural facilities compared to their urban counterparts equipped with this basic amenity (Figure 6). Disaggregating by facility ownership, these data indicate that 65% of public facilities and 42% of private facilities in Kenya lack appropriate handwashing arrangements for patients (Appendix Table 5). Over 70% of facilities in all three countries have access to an improved water source; however, between 20% and 30% of facilities have experienced water interruptions in the last three months. This evidence highlights the need to address existing gaps in the health system and to offer context-specific guidance for infection prevention and control during pandemics.

Availability of toilets, especially gender-segregated ones, is important in any environment, and especially important for inpatient care. Not only are improved toilet facilities imperative for infection prevention, but also, gender-segregated facilities promote women's safety and may increase comfort with (or even

[15] World Health Organization. Health worker Ebola infections in Guinea, Liberia and Sierra Leone: Preliminary Report. World Health Organization, 2015. https://www.who.int/hrh/documents/21may2015_web_final.pdf

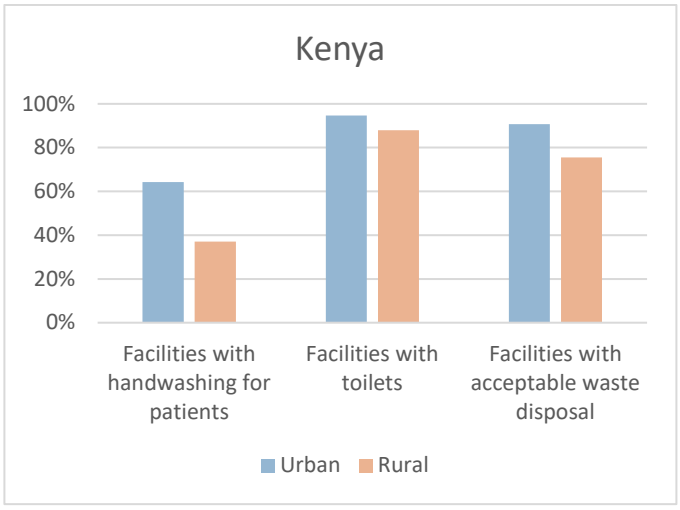
enable in the first place) an inpatient stay.[16] Rural facilities in Kenya and Sierra Leone are particularly lacking in this domain compared to their urban counterparts. For example, in Kenya, on average there are seven functioning inpatient toilets in urban facilities compared to four in rural facilities (Appendix Table 4). While this difference could be signaling an underlying difference in the patient volume served by urban and rural facilities, what remains concerning is that only slightly over half of facilities in rural areas have gender-segregated inpatient toilets.

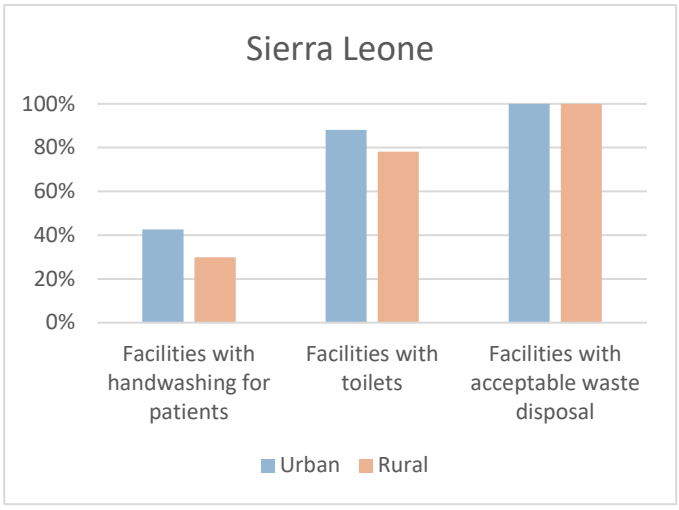
Acceptable waste disposal practices[17] are relatively common across all countries, although Kenyan facilities, especially in rural areas, could benefit from interventions for improvement. Tanzania and Sierra Leone, respectively, with over 90% and 100% of facilities with appropriate waste disposal practices, indicate the possibility of ensuring effective practices despite limited resources.

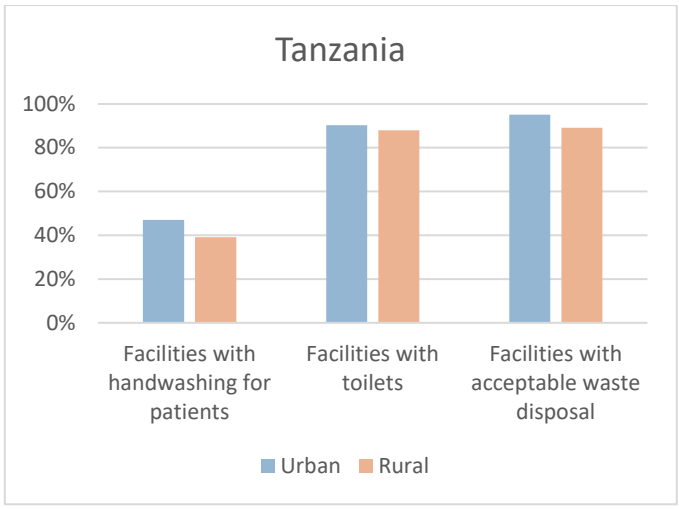
[16] UNICEF. "Gender-Responsive Water, Sanitation and Hygiene: Key elements for effective WASH programing". March 2017. https://www.unicef.org/gender/files/Gender_Responsive_WASH.pdf

[17] Acceptable waste disposal methods include open burning in a pit or protected ground, placed in covered pit or pit latrine, placed in pit or protected ground, off-site removal (with protected storage) and one or two chamber incinerators. This definition is from WHO's "Better Health Care Waste Management: An Integral Component of Health Investment" (2005).
https://apps.who.int/iris/bitstream/handle/10665/119762/dsa515.pdf?sequence=1&isAllowed=y

Figure 6: Percent of facilities with handwashing facilities, toilets, and acceptable waste disposal by urban/rural location in Kenya, Sierra Leone, and Tanzania



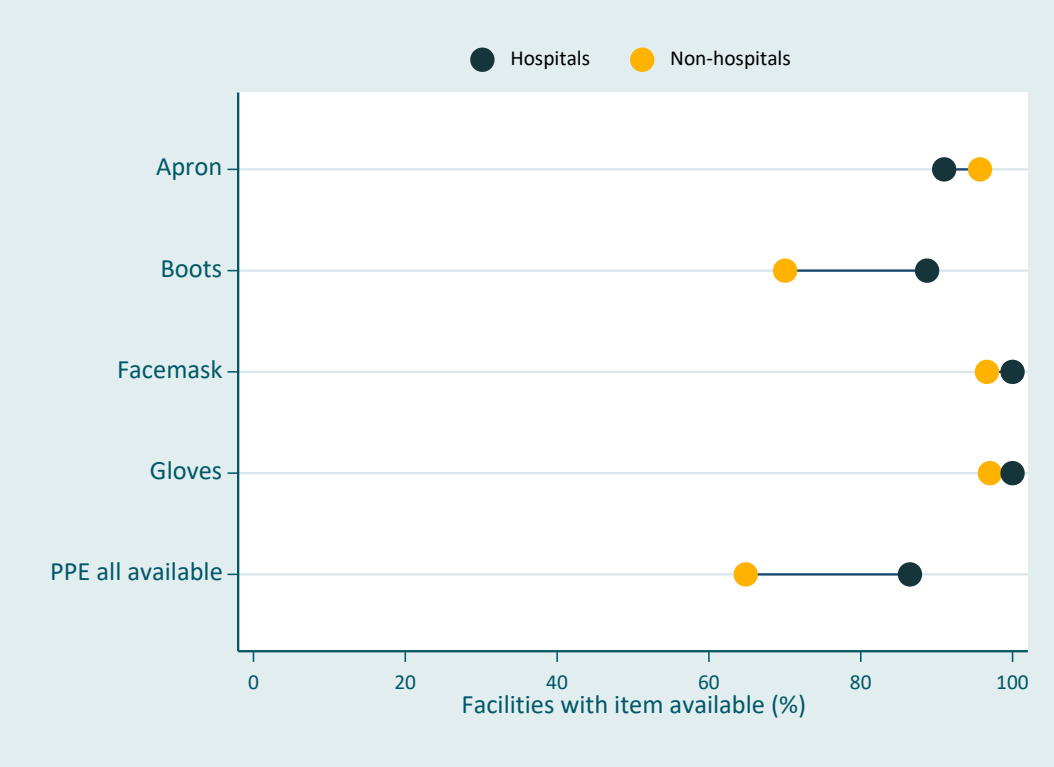




Availability of personal protective equipment

Personal protective equipment (PPE) is imperative to ensure that health care workers are protected during a time of high risk. As described previously, health workers and health facility staff experience high rates of exposure to disease during a pandemic, and PPE can help protect them from infection. While information on protective eyewear and face shields is not available, the Sierra Leone SDI collected data on availability of disposable gloves, apron, face mask, and protective boots. Encouragingly, disposable gloves, face mask, and apron were each available in more than 95% of facilities. Protective boots were less common, occurring in just 71% of facilities. All four pieces of protective equipment were present together in only 66% of facilities. Figure 7 shows that the average availability of these four PPE items varies based on facility level, most notably for boots. Notably, the Sierra Leone survey occurred in 2018, following the West African Ebola epidemic in 2013-2016. The high rates of PPE ownership may be partly attributable to the epidemic response there and PPE availability may be lower in other African countries that have not experienced a recent similar event.

Figure 7: Availability of personal protective equipment in facilities in Sierra Leone by facility type (hospital vs. non-hospital)



Importantly, the SDI (like other large-scale health facility surveys) does not collect information on the depth of stocks of equipment and supplies. A facility will be recorded as having disposable gloves even if only one pair is available. Given the breadth of the survey, counting stocks of supplies is infeasible; however, it also means that the estimates of availability described here do not necessarily reflect adequate supply. In addition, stocks to address surges in demand for equipment and supplies may not be stored in the facilities, so even if gaps in availability at the facility-level were measured comprehensively, this would not necessarily imply a shortage at the national level.

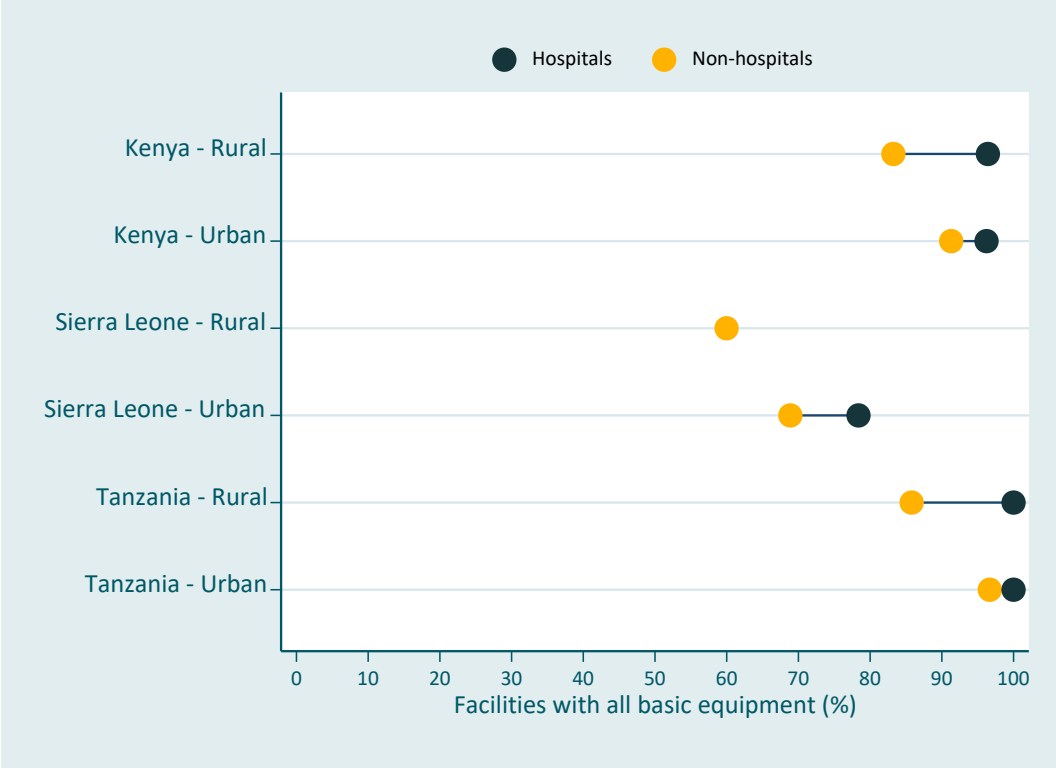
Availability of basic medical equipment

Availability of key medical equipment is imperative to ensure that adequate triage, diagnosis, and treatment can be provided during a pandemic. Three pieces of basic equipment (thermometer, stethoscope, and sphygmomanometer) are crucial to, among other activities relevant to COVID-19, diagnose fever, examine for respiratory symptoms, and identify the risk factor hypertension, respectively. Any health facility, regardless of level, should have these three pieces of basic equipment available.

In general, availability of basic equipment is high but imperfect. Specifically, in Kenya and Tanzania, over 90% of facilities have a functioning thermometer, while only 80% in Sierra Leone do. Across all three countries, over 90% have a functioning stethoscope. Only 77% of facilities in Sierra Leone have a functioning sphygmomanometer, but over 90% of facilities in Kenya and Tanzania do. Taken together, 89% of facilities in Tanzania have all three items of basic equipment; 87% do in Kenya, and only 63% do in Sierra Leone. However, Figure 8 shows that, perhaps as expected, the probability that all three of these basic items is available depends on facility level (hospital or lower level) and urban or rural location

(Appendix Tables 3 and 4). Across the board, hospitals are more likely to have all pieces of equipment, regardless of urban/rural location.

Figure 8: Availability of at least one functioning thermometer, stethoscope, and sphygmomanometer by facility type (hospital vs. non-hospital) and urban/rural location* in Kenya, Sierra Leone, and Tanzania



* Sierra Leone sample did not have any rural hospitals, and therefore a single dot for the "Sierra Leone – Rural"

Beyond the availability of basic equipment, the SDI also reports on facility capacity for sterilization, which is needed to ensure that equipment and reusable supplies are clean and do not spread infection. For instance, in Kenya, sterilization[18] is available in 87% of hospitals but only 72% of non-hospitals.

Availability of treatment supplies

Indicators from the SDI survey can paint a broad picture of availability of treatment supplies for a pandemic. While there are no widely recommended treatments for COVID-19, some emerging evidence suggests that chloroquine and azithromycin may promote virologic cure.[19] The three SDI surveys analyzed for this exercise did not collect information on chloroquine availability at facilities (though older surveys did, when chloroquine was more commonly used for malaria treatment) but did collect information on availability of azithromycin. The SDI surveys are unique in that they require that enumerators verify the availability of unexpired medicines by visual inspection rather than asking facility employees to simply report availability. Azithromycin was available and unexpired in 37% of facilities in Tanzania, 32% in Kenya,

[18] Sterilization is defined as the presence of an autoclave, an electric boiler/steamer, an electric dry heat sterilizer or a non-electric dry heat steamer/sterilizer.

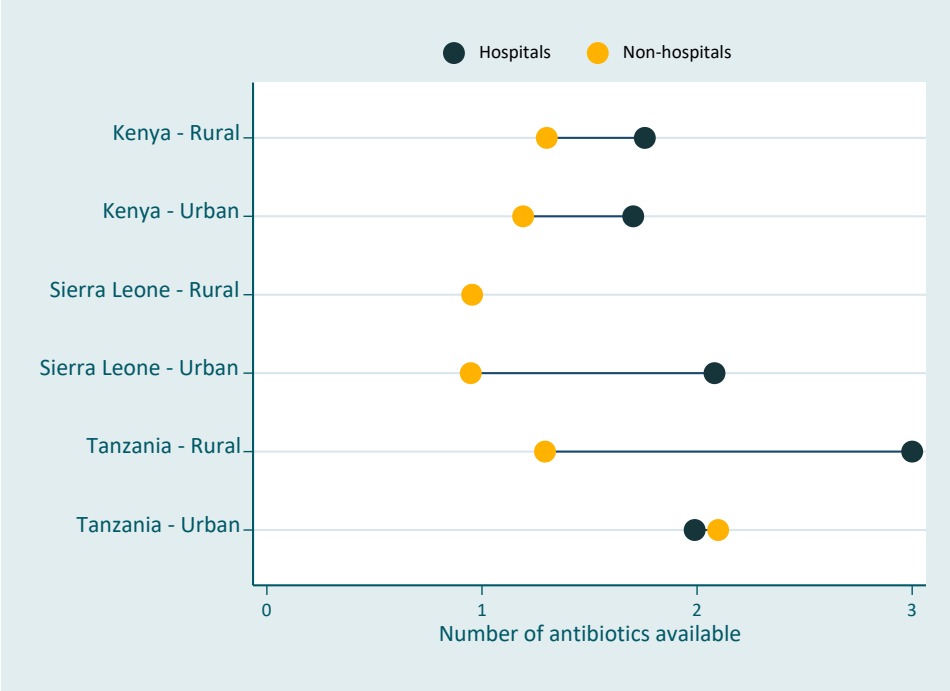
[19] Gautret, Philippe, et al. "Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial." *International Journal of Antimicrobial Agents* (2020): 105949.

and 11% in Sierra Leone. These low values suggest that large-scale utilization of azithromycin as a COVID-19 treatment would be difficult without substantially increasing stocks in facilities.

While antibiotics (other than potentially azithromycin) are not viable treatments for COVID-19, examining a composite indicator of availability of any of a wide range of antibiotics (amoxicillin, azithromycin, ampicillin) in the facility can serve as a proxy for availability of key medicines more broadly. Encouragingly, over 90% of health facilities in Kenya had at least one of these three common antibiotics and over 80% in Sierra Leone and Tanzania, however, it was rare for a facility to have all three. Figure 9 indicates that the availability of all three of these antibiotics is highly variable, with most of the variation coming from differences in availability between hospital and lower-level facilities (as opposed to urban/rural location) (Appendix Tables 3 and 4).

Information on other relevant treatment equipment and supplies (such as oxygen cylinders, pulse oximeters, etc.) is not available from recent SDIs, and as described above, the depth of stocks is also unknown. While this could be estimated based on direct observation or patient exit interviews, for example, the frequency of utilization of equipment, supplies, and medications is also not quantified.

Figure 9: Availability of amoxicillin, azithromycin, ampicillin by facility type (hospital vs. non-hospital) and urban/rural location* in Kenya, Sierra Leone, and Tanzania



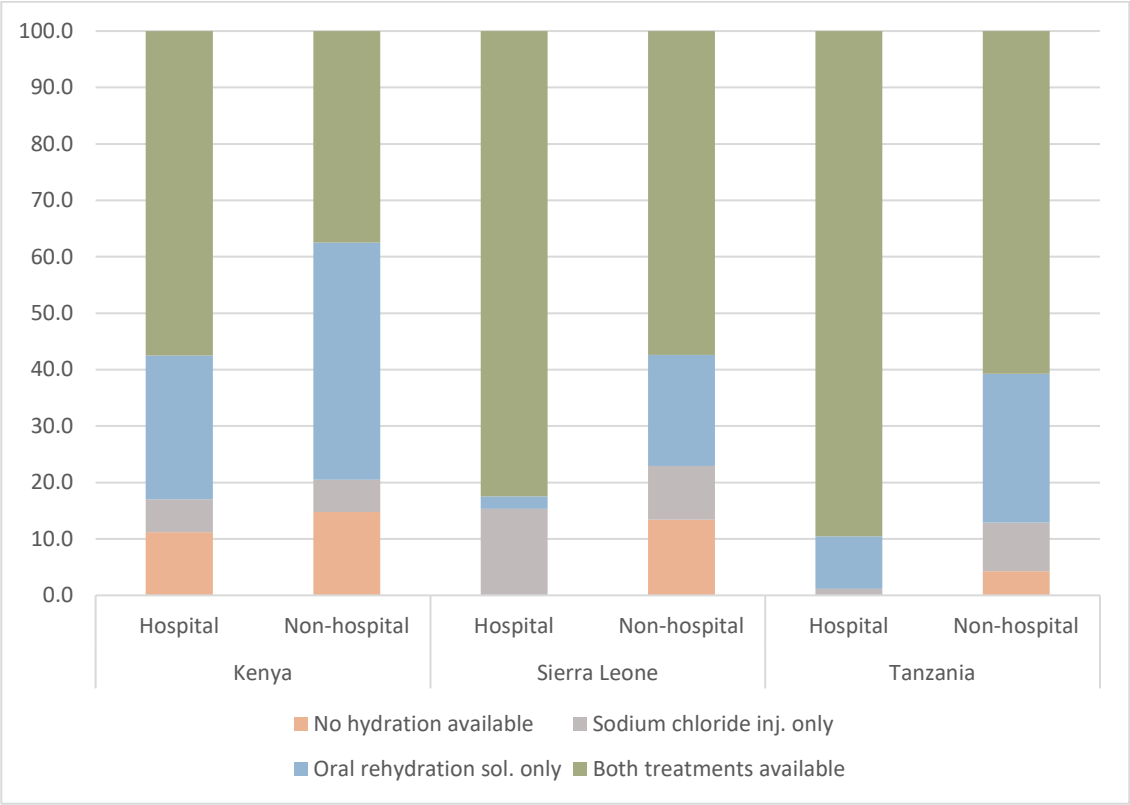
* Sierra Leone sample did not have any rural hospitals, and therefore a single dot for the "Sierra Leone – Rural"

Given that treatment options for both children and adults with COVID-19 often include ensuring adequate hydration,[20] it is prescient to examine availability of rehydration supplies. For children, Oral Rehydration

[20] Kritz F and Huang P. "Coronavirus Symptoms: Defining Mild, Moderate, and Severe." March 13, 2020. https://www.npr.org/sections/goatsandsoda/2020/03/13/814691018/coronavirus-symptoms-defining-mild-moderate-and-severe and World Health Organization. "Seasonal Influenza: Key issues for case management of severe disease." 2011. http://www.euro.who.int/__data/assets/pdf_file/0020/153380/flu_case_management.pdf%3Fua%3D1

Solution (ORS) and for adults, sodium chloride injections, are viable rehydration treatments. The survey results indicate that 62% of facilities in Tanzania, 58% in Sierra Leone, and 39% in Kenya have stocks of both. Figure 10 indicates that hospitals are more likely than lower-level facilities to stock both types of rehydration treatment. ORS is more commonly available than sodium chloride injections, and lower-level facilities are more likely to stock only ORS than are hospitals (Appendix Table 3). The relatively low availability of these basic rehydration treatments is concerning not only from a COVID-19 preparedness standpoint, but also for readiness to treat diarrhea and other common conditions that manifest with dehydration.

Figure 10: Availability of rehydration supplies by facility type (hospital vs. non-hospital) and urban/rural location in Kenya, Sierra Leone, and Tanzania



During a pandemic, supply chain functionality is important to ensure that needed stocks of equipment, supplies, and medicines are available in facilities under conditions of high utilization. The Kenya SDI captures some information along these lines. For instance, 62% of facilities in Kenya reported that the average time between ordering new supplies and receiving them is more than two weeks. During emergencies, a more efficient supply chain may be required.

As mentioned previously, large facility surveys like the SDI do not collect information on available stocks of medicines and treatments (a facility will be recorded as having the medicine even if only one tablet is available). It is therefore not possible to say whether, for example, facilities identified as having a supply of azithromycin would have adequate stock to meet rising demand.

Summary: Interpretation of results

In sum, the SDI surveys from Kenya, Sierra Leone and Tanzania identify some strengths of the existing health system along with some areas for improvement. For example, the potential repurposing of lower-level facilities and available resources for inpatient care during the current pandemic can inform resource allocation strategies at national and sub-national levels. Assessing the availability of a variety of resources, from number of medical personnel to availability of medical supplies, can help prevent and preemptively address potential challenges such as facility overcrowding, health care worker safety, burnout and psychological well-being, and supply chain management for essential medicines and medical supplies. Likewise, while the importance of handwashing for infection prevention is made salient across the globe and citizens are urged to repeatedly wash their hands throughout the day, a concerningly large proportion of health facilities across these three countries lack appropriate handwashing facilities for patients. These humbling statistics compel policy makers to reevaluate priorities for health system strengthening, during and beyond the pandemic period.

While SDI survey data fill some important gaps in the evidence base, the available data do not paint a comprehensive picture of preparedness and some critical chasms persist. For instance, as has been noted previously, a binary indicator for availability of personal protective equipment is a useful starting point for assessing preparedness, but not knowing the stockpile of supplies limits the scope of targeted, evidence-based action. Furthermore, these surveys were not designed for collecting comprehensive information on pandemic preparedness, and as a result, information on key aspects of preparedness is missing. As described in previous sections and illustrated in Appendix Table 1, SDI indicators could be mapped to only seven of 18 items identified in the WHO guidelines for health services pandemic preparedness planning. For example, SDI data lack any information on management of excess mortality, an emerging challenge even for high-resource health systems in this current pandemic. Collectively, the strengths and the limitations of the existing large-scale health facility surveys in assessing pandemic preparedness signal the pressing need to reflect on the future of health service delivery measurement, especially in light of the future threat of large-scale disease outbreaks or other public health emergencies.

Health service delivery measurement: The future

More and better measurement is required to inform resource allocation and response

Comprehensive measurement to understand pandemic preparedness is paramount to inform resource allocation and pandemic response strategies. Up-to-date information on facility capacity, including referral systems and transport, coordination, and communication; health service personnel; and availability of key supplies, including PPE, medicines, and backup stockpiles, is needed to identify facilities that can safely and effectively deliver care in a pandemic. Identified high-capacity facilities can both serve as models for others and potentially as treatment/referral centers as part of a national preparedness strategy. Conversely, facilities with inadequate pandemic preparedness need to be identified so that they can either be supported with additional resources for retooling, or only utilized in a manner befitting their capacity.

Beyond preparedness to address acute, pandemic-related care needs, information on facility capacity to continue to provide normal services and to recover from pandemic-related strains is also a key part of comprehensive preparedness. Specifically, extreme pressure on curative services during the pandemic peak periods could result in disruption of essential preventative services and curative services for health problems other than COVID-19. Survey data like that from the SDI could help identify services and platforms that require reinforcement and reorganization, so that health systems are prepared to respond effectively to population needs overall, and not just those related to the pandemic.

High-quality health facility–based measurement is crucial for World Bank COVID-19 operations

Facility preparedness and response is integral to addressing current and future pandemics and is a key feature of the World Bank's response to COVID-19. Specifically, the World Bank's COVID-19 Strategic Preparedness and Response Program (SPRP) Multiphase Programmatic Approach (MPA)[21] suggests 11 Project Development Objectives (PDO) indicators[22] (plus 12 more Intermediate Results Indicators) for inclusion, the majority of which require facility-based measurement. For example, assessing both baseline (before the operation) and endline availability of diagnostic and treatment inputs in facilities, or the numbers of acute health care facilities with isolation capacity (PDO indicators two and three) requires reliable and objective health facility data. A clear picture of project implementation and impact can only be achieved by high-quality data collection.

Current measurement tools are not adequate

Unfortunately, current internationally used health facility assessment tools are not designed to comprehensively measure pandemic preparedness. Specifically, the SDI, SARA, and SPA are the three most widely used globally comparable health facility surveys, sponsored by the World Bank, World Health Organization, and USAID, respectively. The ability of the SDI to shed light on pandemic preparedness is discussed in depth above; importantly, 11 of the 18 WHO-recommended items are not captured in the SDI (Appendix Table 1). Similarly, while the SPA survey typically contains more information on PPE availability than the SDI (and recent work[23] documents what can be learned from recent SPA surveys about preparedness to protect health workers from COVID-19), it does not collect information on any more of the 18 domains. For example, no information is available on backup human resources for surge capacity, triage or ambulance dispatch systems, or continency plans or drills.[24] Even the SARA, which is considered the most comprehensive of the three surveys in terms of covering inputs (such as equipment and supplies), does not, for example, ask about respirators/ventilators, mortuary handling (i.e., body

[21] Task Team Guidance on Preparing IPF Financed Project PAD under the COVID-19 Strategic Preparedness and Response Program (SPRP) using the Multiphase Programmatic Approach https://worldbankgroup.sharepoint.com/sites/wbunits/opcs/Knowledge%20Base/PAD%20Guidance%20Sample%20for%20IPF%20Projects%20under%20the%20Global%20MPA.pdf

[22] As of April 6, 2020: (1) Country has activated their public health Emergency Operations Center or a coordination mechanism for COVID-19. (2) Number of designated laboratories with COVID-19 diagnostic equipment, test kits, and reagents. (3) Number of acute health care facilities with isolation capacity. (4) Number of suspected cases of COVID-19 reported and investigated per approved protocol. (5) Number of diagnosed cases treated per approved protocol. (6) Personal and community non-pharmaceutical interventions adopted by the country (e.g., installation of handwashing facilities, provision of supplies and behavior change campaigns, continuity of water and sanitation service provision in public facilities and households, school closures, telework and remote meetings, reduce/cancel mass gatherings). (7) Policies, regulations, guidelines, or other relevant government strategic documents incorporating a multisectoral health approach developed/or revised and adopted. (8) Multi-sectoral operational mechanism for coordinated response to outbreaks by human, animal, and wildlife sectors in place. (9) Coordinated disease surveillance systems in place in the animal health and public health sectors for zoonotic diseases/pathogens identified as joint priorities. (10) Mechanisms for responding to infectious and potential zoonotic diseases established and functional. (11) Outbreak/pandemic emergency risk communication plan and activities developed and tested.

[23] Gage and Bauhoff. "Health Systems in Low-Income Countries Will Struggle to Protect Health Workers from COVID-19". Blog post. Published March 31, 2020. https://www.cgdev.org/blog/health-systems-low-income-countries-will-struggle-protect-health-workers-covid-19

[24] Measure DHS Service Provision Assessment Survey Inventory Questionnaire https://dhsprogram.com/pubs/pdf/SPAQ1/INVENTORY_06012012.pdf

bags), or stocks of PPE (only on whether a least one pair of disposal latex gloves or one gown/apron is available, etc.).[25] In sum, no major survey exists, at present, that collects adequate information on facility pandemic preparedness, which reflects a clear blind spot in standard measurement tools.

Innovations to further the measurement agenda

To address these gaps, the SDI Team and partners from within and outside of the World Bank have undertaken several innovative lines of work. First, in the immediate term, the data from the health SDI surveys done to date (in nine countries in Sub-Saharan Africa) can serve as sample frames for rapid phone surveys to collect additional information on COVID-19 preparedness. Not only does the SDI collect contact information for facilities (allowing for rapid re-contacting of the sample), but also, only a limited set of phone survey questions would be required to supplement the broad set of items from the SDI to generate a comprehensive view of pandemic preparedness.

Second, for the longer term, pandemic preparedness experts from the GPs and the SDI Team have developed a novel pandemic preparedness/disaster response module for inclusion in future SDIs. This module is visible in Appendix 6 and aims to fill the gaps described above in the current tools. Specifically, the module includes a more comprehensive set of questions on infrastructure, equipment, and supplies needed in the case of a pandemic (including PPE and infection control items), in addition to questions on preparedness plans/guidelines, drills, and trainings. An earlier version of this module was piloted in Bhutan (in preparation for that country's first health SDI) in January. The team welcomes feedback on this module (please see Appendix 6 for additional details). In addition, future iterations of the SDI will include questions for health care providers (based on the Brief Resilience Scale[26]) to assess their ability to cope with external shocks, such as natural disasters and pandemics.

[25] SARA Reference Manual
https://www.who.int/healthinfo/systems/SARA_Reference_Manual_Chapter2.pdf?ua=1

[26] Smith, B.W., Dalen, J., Wiggins, K. *et al.* The brief resilience scale: Assessing the ability to bounce back. *Int. J. Behav. Med.* **15,** 194–200 (2008). https://doi.org/10.1080/10705500802222972

Appendices

Appendix Table 1: WHO recommended items for health service pandemic preparedness planning and corresponding SDI indicators from Kenya, Sierra Leone or Tanzania

	WHO recommended items	Relevant indicators in current SDI*
Health service facilities		
1	Define the levels of health-care facilities where patients should ideally be treated during a pandemic situation, and assess the availability of these facilities (primary, secondary and tertiary referral, including emergency and intensive care unit capacity).	Facility level and ownership, hospitalization capacity; Chronic respiratory illness management capacity; Availability of regular and backup electricity; Appropriate water, sanitation and hygiene facilities
2	Develop detailed regional and facility-level plans for providing health services during a pandemic, including the type of care to be delivered at the specific levels and types of health-care facilities.	Relevant indicators not available in current surveys
3	Determine triage and patient flow between health-care facilities at various levels, and develop mechanisms for coordinating patient transport and tracking/managing beds, such as central bed registries, call centers and a centralized ambulance dispatch.	Facility operation hours and patient volume; Availability and occupancy rate of in-patient beds; Protocol for sick patient triage; Availability and functionality of ambulance or other emergency transport services
4	Determine potential alternative sites for medical care. Possible sites could include schools, gymnasiums, nursing homes, day-care centers or tents in hospital grounds or at other sites.	Relevant indicators not available in current surveys
5	Coordinate clinical care and health service plans with bordering local authorities to avoid migration to centers where enhanced services are perceived to exist.	Geolocation of the facilities (which can be used to estimate travel distance to the nearest city); Availability of functional radio, internet access, fixed or mobile phone and intercom
Health service personnel		
6	Estimate the numbers of health-care workers by professional group at the level appropriate for the country (national, provincial, local).	Clinical and non-clinical staff availability, clinical personnel education level and cadre
7	Determine sources from which additional health-care workers could be recruited, for instance among those who have retired or who have changed careers.	Relevant indicators not available in current surveys

8	Develop a set of health-care roles for which volunteers may be suitable, and discuss this with professional organizations and associations.	Relevant indicators not available in current surveys
9	Identify organizations that may be able to provide volunteers, and define a protocol for deciding on their suitability for designated roles outside their area of training and competence.	Relevant indicators not available in current surveys
10	Develop protocols for accepting and training volunteers for defined health-care roles. Ensure that liability, insurance and temporary licensing issues for retired health-care workers and volunteers are addressed.	Relevant indicators not available in current surveys
11	Consider the provision of psychosocial support targeted at health-care workers (clinical and laboratory) who may be occupationally exposed to the new pandemic strain virus.	Relevant indicators not available in current surveys
Health service supplies		
12	Assess the need and explore the options for stockpiling additional medical supplies, including personal protective equipment, and identify sources of additional supplies.	Availability of basic medical equipment and sterilization capacity; Availability of personal protective equipment; Medical supplies procurement and payment system
13	Determine a range of antibiotics that will be useful for treatment of influenza complications. Develop contingency plans for producing or buying increased supplies of these antibiotics.	Availability of select antibiotics (amoxicillin, benzylpenicillin, azithromycin and ampicillin)
14	Determine the level of care that might be provided in alternative healthcare facilities, and develop a contingency plan for providing these alternative facilities with the equipment and supplies adequate for the level of care that will be provided.	Relevant indicators not available in current surveys
15	Develop a strategy for the distribution of stockpiled supplies and medication.	Frequency of restocking essential medicine and supplies
Excess mortality		
16	Determine the maximum capacity for the disposal of corpses using culturally appropriate methods.	Relevant indicators not available in current surveys
17	Identify emergency capacity for storage of corpses before burial, where applicable.	Relevant indicators not available in current surveys
18	Ensure development and implementation of protocols for the safe handling of corpses, respecting cultural and religious beliefs.	Relevant indicators not available in current surveys

Appendix Table 2: Select SDI indicators from Kenya, Sierra Leone and Tanzania

	Kenya	Sierra Leone	Tanzania
Service availability			
Hospitalization capacity	0.18	0.14	0.19
Diagnose and treat COPD	0.56	.	.
Respiratory illness treatment guidelines	0.28	.	.
Inpatient bed capacity			
Number of beds in facility	8.87	6.82	11.36
Number of beds for hospitalization	3.05	1.92	5.99
Number of inpatient bed-days, last three months	193.24	104.91	142.82
Total medical staff	8.07	7.97	12.47[±]
Medical staff cadre			
Doctors	0.34	0.07	0.57
Clinical Officers[++]	1.17	-	1.39
Nurses	3.72	2.11	3.17
Other	2.84	5.79	4.24
Medical staff education[δ]			
Primary	0.06	0.56	1.12
Secondary	0.66	2.03	5.42
Post-secondary	7.33	5.08	2.86
Communication facilities			
Functioning fixed or mobile phone	0.43	0.33	0.37
Functioning internet connection	0.28	0.16	0.11
Emergency transport			
Ambulance available	0.71	0.95	0.55
Fuel available, if ambulance available	0.93	0.86	0.59
Other arrangements for emergency transport[+]	0.12	0.02	0.13
No arrangement for emergency transport	0.17	0.03	0.32
WaSH facilities			
Handwashing available for patients	0.46	0.34	0.42
Improved water available	0.95	0.84	0.74
Water supply interruptions, last 3 months	0.28	0.29	0.24
Toilet available	0.90	0.81	0.89
Number of functional inpatient toilets	5.35	3.21	5.72
Gender segregated inpatient toilets available	0.56	0.52	0.89
*Acceptable waste disposal method**	0.80	1.00	0.91
Personal protective equipment (PPE)			
Apron is available	.	0.96	.
Disposable gloves are available	.	0.97	0.94
Face mask is available	.	0.97	.
Protective boots are available	.	0.71	.
All PPE available	.	0.66	.
Basic equipment			
Thermometer is functioning	0.94	0.80	0.93
Stethoscope is functioning	0.97	0.92	0.97
Sphygmomanometer is functioning	0.93	0.77	0.95
All three basic equipment available	0.87	0.63	0.89
Antibiotics			
Azithromycin tabs/caps/oral available	0.32	0.11	0.37
Amoxicillin tabs/caps/oral available	0.91	0.8	0.81
Ampicillin powder available	0.08	0.08	0.38

Any antibiotic available	0.92	0.81	0.85
All antibiotics available	0.07	0.04	0.22
Rehydration			
ORS packet available	0.8	0.77	0.87
Sodium chloride inj. available	0.45	0.68	0.7
Has ORS and sodium chloride available	0.39	0.58	0.62
Neither ORS nor NaCl available	0.14	0.13	0.04

[‡]Breakdowns by cadre and education were unavailable for facilities with over 50 medical staff in Tanzania so the counts of doctors, clinical officers, nurses, and other (and counts of staff with different levels of education) are only available for facilities with 50 or fewer medical staff. However, the counts of total medical staff include these larger facilities (Tanzania has 35 facilities with more than 50 medical staff, which increase the averages of total medical staff from 9.37 to the 12.47 reported in the table above).

[++]Clinical Officers were not a medical staff cadre in Sierra Leone

[δ] Provider education was missing for 1.1% of the sample resulting in the sums of the categories of education equaling less than the total number of medical staff

*Acceptable waste disposal methods include: Open burning in pit or protected ground, placed in covered pit or pit latrine, placed in pit or protected ground, off-site removal (with protected storage) and one or two chamber incinerators.

[+]Other arrangements for emergency transport include other official vehicles, private vehicles or another mode of emergency transport.

Appendix Table 3: Select SDI indicators from Kenya, Sierra Leone and Tanzania, disaggregated by facility level (hospital versus non-hospital)

	Kenya		Sierra Leone		Tanzania	
	Hospitals	Non-hospitals	Hospitals	Non-hospitals	Hospitals	Non-hospitals
Service availability						
Hospitalization capacity	0.59	0.14	0.91	0.11	0.93	0.17
Diagnose and treat COPD	0.78	0.53	.	.	.	.
Respiratory illness treatment guidelines	0.56	0.24	.	.	.	.
Inpatient bed capacity						
Number of beds in facility	40.54	5.38	74.87	4.30	110.67	7.85
Number of beds for hospitalization	18.98	1.30	45.56	0.31	84.91	3.21
Number of inpatient bed-days, last three months	1157.53	87.22	1585.90	50.21	2095.94	81.73
Total medical staff	34.21	5.20	46.63	6.54	111.47	8.97
Medical staff cadre						
Doctors	2.55	0.10	1.72	0.01	4.56	0.43
Clinical Officers[++]	4.27	0.83	-	-	5.26	1.26
Nurses	15.53	2.42	27.05	1.19	17.49	2.67
Other	11.86	1.85	17.86	5.35	13.06	3.93
Medical staff education[δ]						
Primary	0.21	0.04	0.61	0.56	2.34	1.07
Secondary	1.68	0.55	10.32	1.72	22.28	4.82
Post-secondary	32.25	4.59	35.07	3.97	15.71	2.40
Communication facilities						
Functioning fixed or mobile phone	0.75	0.39	0.62	0.31	0.75	0.36
Functioning internet connection	0.56	0.25	0.59	0.15	0.66	0.09
Emergency transport						
Ambulance available	0.83	0.70	0.85	0.95	0.87	0.54
Fuel available, if ambulance available	0.97	0.91	0.91	0.78	0.99	0.57
Other arrangements for emergency transport[+]	0.07	0.13	0.09	0.02	0.02	0.13
No arrangement for emergency transport	0.10	0.18	0.07	0.03	0.11	0.33
WaSH facilities						
Handwashing available for patients	0.52	0.45	0.50	0.33	0.66	0.41
Improved water available	0.98	0.95	1.00	0.83	1.00	0.73
Water supply interruptions, last 3 months	0.28	0.28	0.18	0.29	0.15	0.24
Toilet available	0.96	0.89	0.85	0.81	1.00	0.88
Number of functional inpatient toilets	9.47	3.39	8.39	1.28	12.70	4.18
Gender segregated inpatient toilets available	0.75	0.47	0.66	0.47	1.00	0.87
*Acceptable waste disposal method**	0.89	0.79	1.00	1.00	1.00	0.91
Personal protective equipment (PPE)						
Apron is available	.	.	0.91	0.96	.	.
Disposable gloves are available	.	.	1.00	0.97	1.00	0.94
Face mask is available	.	.	1.00	0.97	.	.
Protective boots are available	.	.	0.89	0.70	.	.
All PPE available	.	.	0.86	0.65	.	.
Basic equipment						
Thermometer is functioning	0.98	0.93	0.85	0.79	1.00	0.93
Stethoscope is functioning	0.99	0.96	0.94	0.92	1.00	0.97
Sphygmomanometer is functioning	0.98	0.93	0.87	0.76	1.00	0.95
All three basic equipment available	0.96	0.86	0.78	0.62	1.00	0.89
Antibiotics						
Azithromycin tabs/caps/oral available	0.55	0.29	0.60	0.09	0.52	0.36

Amoxicillin tabs/caps/oral available	0.97	0.91	0.83	0.80	0.92	0.80
Ampicillin powder available	0.21	0.07	0.65	0.06	0.66	0.37
Any antibiotic available	0.97	0.92	0.85	0.81	1.00	0.84
All antibiotics available	0.19	0.05	0.42	0.02	0.40	0.21
Rehydration						
ORS packet available	0.83	0.80	0.85	0.77	0.99	0.87
Sodium chloride inj. available	0.63	0.43	0.98	0.67	0.91	0.69
Has ORS and sodium chloride available	0.57	0.37	0.82	0.57	0.90	0.61
Neither ORS nor NaCl available	0.11	0.15	0.00	0.13	0.00	0.04

[±]Breakdowns by cadre and education were unavailable for facilities with over 50 medical staff in Tanzania so the counts of doctors, clinical officers, nurses, and other (and counts of staff with different levels of education) are only available for facilities with 50 or fewer medical staff. However, the counts of total medical staff include these larger facilities (Tanzania has 35 facilities with more than 50 medical staff, which increase the averages of total medical staff from 40.37 for hospitals and 8.29 for non-hospitals to the 111.47 and 8.97 reported in the table above).

*Acceptable waste disposal methods include: Open burning in pit or protected ground, placed in covered pit or pit latrine, placed in pit or protected ground, off-site removal (with protected storage) and one or two chamber incinerators.

[+]Other arrangements for emergency transport include other official vehicles, private vehicles or another mode of emergency transport.

Appendix Table 4: Select SDI indicators from Kenya, Sierra Leone and Tanzania, disaggregated by location (rural versus urban)

	Kenya		Sierra Leone		Tanzania	
	Rural	Urban	Rural	Urban	Rural	Urban
Service availability						
Hospitalization capacity	0.15	0.24	0.06	0.31	0.11	0.36
Diagnose and treat COPD	0.51	0.65	.	.	.	.
Respiratory illness treatment guidelines	0.20	0.42	.	.	.	.
Inpatient bed capacity						
Number of beds in facility	6.68	13.57	3.33	14.89	7.16	20.18
Number of beds for hospitalization	1.99	5.33	0.05	6.24	2.53	13.29
Number of inpatient bed-days, last three months	72.26	453.07	45.63	242.16	64.95	308.65
Total medical staff	6.14	12.22	4.97	14.93	6.29[±]	25.47[±]
Medical staff cadre						
Doctors	0.12	0.83	0.00	0.22	0.18	1.40
Clinical Officers[++]	0.82	1.91	-	-	0.93	2.36
Nurses	2.94	5.38	0.42	6.02	1.84	5.96
Other	2.26	4.10	4.54	8.69	2.74	7.40
Medical staff education[δ]						
Primary	0.09	0.00	0.53	0.64	0.84	1.70
Secondary	0.70	0.59	1.45	3.35	2.92	10.67
Post-secondary	5.33	11.62	2.65	10.71	1.94	4.78
Communication facilities						
Functioning fixed or mobile phone	0.33	0.63	0.25	0.49	0.28	0.58
Functioning internet connection	0.18	0.50	0.13	0.25	0.06	0.22
Emergency transport						
Ambulance available	0.76	0.61	0.97	0.90	0.62	0.41
Fuel available, if ambulance available	0.90	0.97	1.00	0.84	0.53	0.78
Other arrangements for emergency transport[+]	0.08	0.21	0.01	0.05	0.12	0.15
No arrangement for emergency transport	0.16	0.19	0.02	0.04	0.27	0.43
WaSH facilities						
Handwashing available for patients	0.37	0.64	0.30	0.43	0.39	0.47
Improved water available	0.95	0.96	0.82	0.90	0.66	0.91
Water supply interruptions, last 3 months	0.25	0.32	0.27	0.33	0.28	0.16
Toilet available	0.88	0.95	0.78	0.88	0.88	0.90
Number of functional inpatient toilets	3.83	7.36	0.79	4.01	4.60	6.33
Gender segregated inpatient toilets available	0.53	0.60	0.51	0.53	0.91	0.88
*Acceptable waste disposal method**	0.75	0.91	1.00	1.00	0.89	0.95
Personal protective equipment (PPE)						
Apron is available	.	.	0.96	0.94	.	.
Disposable gloves are available	.	.	0.98	0.95	0.92	0.98
Face mask is available	.	.	0.96	0.98	.	.
Protective boots are available	.	.	0.68	0.78	.	.
All PPE available	.	.	0.63	0.71	.	.
Basic equipment						
Thermometer is functioning	0.91	0.98	0.78	0.84	0.91	0.97
Stethoscope is functioning	0.96	0.98	0.91	0.95	0.96	0.99
Sphygmomanometer is functioning	0.93	0.95	0.74	0.84	0.93	0.99
All three basic equipment available	0.84	0.92	0.60	0.70	0.86	0.97
Antibiotics						

Azithromycin tabs/caps/oral available	0.35	0.26	0.09	0.16	0.27	0.57
Amoxicillin tabs/caps/oral available	0.91	0.91	0.82	0.77	0.75	0.93
Ampicillin powder available	0.07	0.11	0.05	0.15	0.28	0.59
Any antibiotic available	0.93	0.91	0.83	0.77	0.80	0.95
All antibiotics available	0.05	0.10	0.02	0.09	0.12	0.43
Rehydration						
ORS packet available	0.81	0.77	0.76	0.81	0.85	0.92
Sodium chloride inj. available	0.52	0.31	0.72	0.59	0.67	0.76
Has ORS and sodium chloride available	0.45	0.29	0.62	0.49	0.58	0.70
Neither ORS nor NaCl available	0.12	0.21	0.14	0.09	0.06	0.01

[±]Breakdowns by cadre and education were unavailable for facilities with over 50 medical staff in Tanzania so the counts of doctors, clinical officers, nurses, and other (and counts of staff with different levels of education) are only available for facilities with 50 or fewer medical staff. However, the counts of total medical staff include these larger facilities (Tanzania has 35 facilities with more than 50 medical staff, which increase the averages of total medical staff from 17.12 for urban facilities and 5.69 for rural facilities to the 25.47 and 6.29 reported in the table above).

[++]Clinical Officers were not a medical staff cadre in Sierra Leone

[δ] Provider education was missing for 1.1% of the sample resulting in the sums of the categories of education equaling less than the total number of medical staff

*****Acceptable waste disposal methods include: Open burning in pit or protected ground, placed in covered pit or pit latrine, placed in pit or protected ground, off-site removal (with protected storage) and one or two chamber incinerators.

[+]Other arrangements for emergency transport include other official vehicles, private vehicles or another mode of emergency transport.

Appendix Table 5: Select SDI indicators from Kenya, Sierra Leone and Tanzania, disaggregated by facility ownership (public versus private)

	Kenya		Sierra Leone		Tanzania	
	Public	Private	Public	Private	Public	Private
Service availability						
Hospitalization capacity	0.15	0.22	0.10	0.50	0.13	0.36
Diagnose and treat COPD	0.51	0.62	.	.	.	.
Respiratory illness treatment guidelines	0.23	0.33	.	.	.	.
Inpatient bed capacity						
Number of beds in facility	7.74	10.17	5.40	23.15	8.15	19.92
Number of beds for hospitalization	1.94	4.34	1.17	10.56	3.46	12.76
Number of inpatient bed-days, last three months	154.23	238.31	75.66	442.06	125.73	189.05
Total medical staff	9.21	6.76	7.51	13.28	10.70[±]	17.20[±]
Medical staff cadre						
Doctors	0.36	0.32	0.03	0.47	0.39	1.06
Clinical Officers[++]	1.14	1.20	-	-	1.26	1.74
Nurses	4.48	2.83	1.66	7.29	2.83	4.09
Other	3.22	2.41	5.82	5.52	3.11	7.26
Medical staff education[δ]						
Primary	0.08	0.04	0.61	0.08	0.85	1.82
Secondary	0.75	0.56	2.02	2.14	4.61	7.57
Post-secondary	8.35	6.14	4.56	11.03	2.15	4.74
Communication facilities						
Functioning fixed or mobile phone	0.34	0.52	0.30	0.57	0.29	0.59
Functioning internet connection	0.17	0.40	0.14	0.43	0.06	0.23
Emergency transport						
Ambulance available	0.85	0.55	0.96	0.77	0.63	0.34
Fuel available, if ambulance available	0.87	0.98	0.91	0.80	0.56	0.73
Other arrangements for emergency transport[+]	0.03	0.22	0.01	0.14	0.13	0.13
No arrangement for emergency transport	0.12	0.22	0.02	0.09	0.24	0.53
WaSH facilities						
Handwashing available for patients	0.35	0.58	0.32	0.56	0.37	0.55
Improved water available	0.95	0.96	0.84	0.90	0.69	0.88
Water supply interruptions, last 3 months	0.28	0.28	0.29	0.24	0.31	0.08
Toilet available	0.88	0.93	0.81	0.87	0.87	0.93
Number of functional inpatient toilets	4.37	6.09	2.66	4.41	4.54	6.69
Gender segregated inpatient toilets available	0.50	0.61	0.58	0.40	0.78	0.99
*Acceptable waste disposal method**	0.73	0.89	1.00	1.00	0.89	0.98
Personal protective equipment (PPE)						
Apron is available	.	.	0.96	0.89	.	.
Disposable gloves are available	.	.	0.97	0.97	0.93	0.97
Face mask is available	.	.	0.96	1.00	.	.
Protective boots are available	.	.	0.69	0.87	.	.
All PPE available	.	.	0.65	0.77	.	.
Basic equipment						
Thermometer is functioning	0.90	0.97	0.79	0.88	0.92	0.97
Stethoscope is functioning	0.95	0.98	0.92	0.97	0.97	0.97
Sphygmomanometer is functioning	0.91	0.96	0.76	0.91	0.94	0.97
All three basic equipment available	0.82	0.93	0.61	0.82	0.87	0.97

Antibiotics						
Azithromycin tabs/caps/oral available	0.36	0.27	0.09	0.28	0.22	0.75
Amoxicillin tabs/caps/oral available	0.88	0.95	0.80	0.78	0.75	0.97
Ampicillin powder available	0.06	0.11	0.06	0.37	0.28	0.65
Any antibiotic available	0.90	0.95	0.82	0.78	0.80	0.98
All antibiotics available	0.05	0.09	0.02	0.26	0.08	0.58
Rehydration						
ORS packet available	0.82	0.78	0.77	0.80	0.86	0.92
Sodium chloride inj. available	0.57	0.31	0.68	0.70	0.69	0.72
Has ORS and sodium chloride available	0.48	0.29	0.58	0.56	0.61	0.64
Neither ORS nor NaCl available	0.10	0.20	0.14	0.06	0.06	0.00

[±] Breakdowns by cadre and education were unavailable for facilities with over 50 medical staff in Tanzania so the counts of doctors, clinical officers, nurses, and other (and counts of staff with different levels of education) are only available for facilities with 50 or fewer medical staff. However, the counts of total medical staff include these larger facilities (Tanzania has 35 facilities with more than 50 medical staff, which increase the averages of total medical staff from 7.59 for public facilities and 14.15 for private facilities to the 10.70 and 17.20 reported in the table above).

[++]Clinical Officers were not a medical staff cadre in Sierra Leone

[δ] Provider education was missing for 1.1% of the sample resulting in the sums of the categories of education equaling less than the total number of medical staff

*Acceptable waste disposal methods include: Open burning in pit or protected ground, placed in covered pit or pit latrine, placed in pit or protected ground, off-site removal (with protected storage) and one or two chamber incinerators.

[+]Other arrangements for emergency transport include other official vehicles, private vehicles or another mode of emergency transport.

Appendix 6: Draft pandemic preparedness and response survey module for SDI

This novel module has been developed by pandemic preparedness experts and an earlier version was piloted in Bhutan (in preparation for data collection for a health SDI in the coming year). Going forward, this information will be collected as part of standard health SDI surveys. The SDI Team welcomes feedback on this module (please send comments to Kathryn Andrews kandrews@worldbank.org).

Bhutan Health Service Delivery Indicators Survey 2020

Emergency Preparedness Module

EMERGENCY PREPAREDNESS AND RESPONSE SERVICES

Enumerator reads to respondent: Next, we have some questions about this facility's emergency preparedness and response services.

Number	Question	Response	Skip	Notes
1.	Does this facility have a 'Health Emergency and Disaster Contingency Plan' and/or 'Public Health Emergency Contingency Plan'? *(verify)*	Yes=1 No=2 Don't know=−96		In Bhutan, if the facility has a plan, it will automatically have all of the gov-required elements, so no need to ask about the components of the plan
2.	Has this facility allocated funds earmarked for emergency?	Yes=1 No=2 Don't know=−96		Preparedness
3.	Has this facility identified a surveillance focal point?	Yes=1 No=2 Don't know=−96		JEE- Real-time Surveillance
4.	In the case of an emergency, has this facility identified a risk communication focal point?	Yes=1 No=2 Don't know=−96		JEE-risk communication (emergency response)
5.	In the case of an emergency, has this facility defined protocols to communicate with other health facilities, affected communities and public?	Yes=1 No=2 Don't know=−96		JEE-risk communication
6.	In the case of an emergency, has this facility defined reporting protocols and relevant contacts for national and sub-national reporting?	Yes=1 No=2 Don't know=−96		JEE-reporting (emergency response)

Number	Question	Response	Skip	Notes
7.	Does this facility report cases/events according to the National Early Warning and Reporting System?	Yes=1 No=2 Don't know=−96		JEE- Real-time Surveillance
8.	Has this facility established mechanisms for real-time surveillance information exchange with other facilities and local authorities?	Yes=1 No=2 Don't know=−96		
9.	In the case of an emergency, are essential medicines stockpiled in this facility?	Yes=1 No=2 Don't know=−96		
10.	In the case of an emergency, are essential medicines accessible from medical buffer stores?	Yes=1 No=2 Don't know=−96		
11.	In the case of an emergency, does this facility have backup transportation and referral systems in place for continuity of essential health services?	Yes=1 No=2 Don't know=−96		
12.	In the case of an emergency, does this facility have access to backup human resources (health professional staff and other staff) for continuity of essential health services?	Yes=1 No=2 Don't know=−96		
13.	In the case of an emergency, does this facility have backup equipment (such as communication equipment, fuel, and generator) in place for continuity of essential health services?	Yes=1 No=2 Don't know=−96		
14.	In the case of an emergency, has this facility established a contingency plan to ensure temporary housing to health professional staff, other staff and their families?	Yes=1 No=2 Don't know=−96		
15.	Does this facility separate triage and waiting areas?	Yes=1 No=2 Don't know=−96		

Number	Question	Response	Skip	Notes
16.	Does this facility have a separate entrance for patients with a suspected contagious disease?	Yes=1 No=2 Don't know=−96		
17.	Does this facility have physical barriers (e.g., glass or plastic window) in the areas where patients will first present, such as the registration desk at the emergency department, or at the pharmacy window where medication is collected? *(verify)*	Yes, at all such places=1 Yes, at some but not all such places=2 No=3 Don't know=−96		
18.	Does this facility have designated sites for quarantine of patients with a suspected contagious disease?	Yes=1 No=2 Don't know=−96		Infection Control CAPI: skip q20 if q18==2
19.	Does this facility have designated site(s) for patient isolation?	Yes=1 No=2 Don't know=−96	2,-96>>21	Infection Control Isolation is for confirmed cases and quarantine is for suspected cases.
20.	Does the isolation site(s) of this facility have designated toilet(s) adjoining the quarantine/isolation site(s)? *(verify)*	Yes, adjoining the quarantine site(s)=1 Yes, adjoining the isolation site(s)=2 Yes, adjoining both the quarantine and isolation site(s)=3 No=4		Infection Control
21.	Are all patients' beds in this facility placed at least 1 meter apart? *(verify)*	Yes=1 No=2 Not applicable=-97		Infection control (contact and droplet precautions)
22.	Are patients' rooms adequately ventilated? *('Adequately ventilated' means natural ventilation with air flow of at least 160 L/s per patient or in negative- pressure rooms with at least 12 air changes per hour and controlled direction of air flow when using mechanical ventilation)*	Yes=1 No=2 Don't know=−96 Not applicable=-97		Infection control (airborne precautions)

Number	Question	Response	Skip	Notes
23.	Does this facility have SOPs for the transportation of infectious patients (within this facility and/or to another facility)?	Yes, within this facility=1 Yes, to another facility=2 Yes, both within and to another facility=3 No=4 Don't know=−96		Infection Control
24.	Does this facility have a system to track patients upon discharge?	Yes=1 No=2 Don't know=−96		Infection Control
25.	Does this facility have a system to track patient contacts and family in case it is required for infection prevention or control?	Yes=1 No=2 Don't know=−96		Infection Control
26.	Does this facility have a laundry facility?	Yes=1 No=2 Don't know=−96		Infection Control
27.	Are linens from patients appropriately washed and/or incinerated? *('Appropriate' means that linen is vigorously washed at high water temperatures with chlorine followed by mild acid)*	Yes=1 No=2 Don't know=−96 Not applicable=-97		Infection Control
28.	Are all surfaces in the patient care areas cleaned with disinfectants at least twice a day?	Yes=1 No=2 Don't know=−96		Infection Control
29.	Has this facility identified designated areas for patient overflow in case of emergency?	Yes=1 No=2 Don't know=−96		Management of surge capacity [JEE-preparedness]
30.	Has this facility identified secondary sites for the management of less severe cases?	Yes=1 No=2 Don't know=−96		Management of surge capacity [JEE-preparedness]

Number	Question	Response	Skip	Notes
31.	Has this facility identified designated area(s) for use as a temporary morgue?	Yes=1 No=2 Don't know=−96		Management of surge capacity [JEE-preparedness]
32.	Does the facility have protocols for the safe handling of corpses?	Yes=1 No=2 Don't know=−96		
33.	In the last 12 months, has this facility conducted any emergency preparedness and response mock drills or simulation exercises or tabletop exercises?	Yes=1 No=2 Don't know=−96		
34.	In the last 12 months, has this facility conducted a structural vulnerability assessment (e.g., seismic vulnerability assessment)?	Yes=1 No=2 Don't know=−96		
35.	In the last 12 months, has this facility conducted a fire drill?	Yes=1 No=2 Don't know=−96		

Other Modules

Questions on services, training, supplies, equipment, medicines, waste disposal, ambulances, and referral systems are asked in separate sections; we have extracted the *additional* (beyond the content of the SDI as discussed in this note) pandemic-related questions from other sections of the survey and listed them below.

INTENSIVE CARE UNIT

Enumerator reads to respondent: Next, we have some questions about the intensive care unit (ICU) at this facility.

Number	Question	Response	Skip	Notes
1.	How many ICU beds does this facility have?	|___|___|___| ICU beds Don't know=−96		

TRAININGS

Enumerator reads to respondent: Next, we have some questions about additional health professional staff trainings.

Number	Topic	1. In the last 2 years, how many health professional staff received training on this topic? Don't know=−96	Notes
1.	Field/applied epidemiology		
2.	Risk communication		
3.	Waste management		

EQUIPMENT AND SUPPLIES

Enumerator reads to respondent: Next, we have some questions about any equipment and supplies that the facility has.

Number	1. Please tell me if the following are available in this facility today. Yes, at least one observed=1 >> 3 Not available=2		2. What is the main reason it is not available? Indented but not received=1 Not indented and so not received=2 Not required at this facility=3 No human resources to operate the equipment=4 Don't know=−96 Other (specify)_____=−99	3. *If applicable, verify that at least one of each item of equipment is functioning.* Yes=1 No=2	4. *if applicable, verify that at least one of each item of equipment has been calibrated (date for next calibration is in the future).* Equipment calibrated (date for next calibration is in the future)=1 Equipment not calibrated (calibration has expired)=2 No calibration information is available=3 Not applicable=−97 Other (specify)_____=−99	Notes
1.	Ventilator for respiratory support					
2.	Particulate respirator					
3.	Oxygen cylinder					
4.	Pulse oximeter					
5.	Swab sticks					
6.	Face shield					
7.	Head covering					
8.	Soap					
9.	Alcohol rub					
10.	Surface disinfectant					
11.	Detergent for washing linens					
12.	Specimen shipping containers					
13.	Body bags					

GUIDELINES

General instructions for the enumerator: This section requires that the enumerator directly observe whether various guidelines/standards are available at the facility. The respondent will need to escort the enumerator around the facility to complete this section. The presence of all guidelines must be verified by the enumerator's direct observation: if the respondent says that the guideline is available, but the enumerator is not able to observe it directly, the enumerator should mark that the guideline is 'Not available'. All the guidelines have a specific publication year; the enumerator must note whether each guideline available at the facility is from the most recent publication (year included in the name of the guideline). If an older version of the same guideline is available, the enumerator should mark 'Yes, but not most recent guideline'.

Enumerator reads to respondent: Next, we have some questions about the guidelines this facility has available. The guidelines all have a publication date and are often updated; we will look to see whether the guideline available at this facility is the most recent version or not.

Number	Guidelines	1. Is the following guideline available in the facility today? Yes, most recent guideline=1 Yes, but not most recent guideline=2 Not available=3 Don't know=−96 1,−96 >> Next Guideline	2. Why is the most recent guideline not available? Never received the guideline=1 Guideline has been lost=2 Did not know there is such a guideline=3 Don't know=−96 Other (specify)_____=−99	Notes
1.	National Early Warning, Alert & Response Surveillance (NEWARS) Guideline (2019)			
2.	Guideline on Risk Communication (2019)			
3.	Guideline on Vulnerability Assessment of Health Facilities (2018)			
4.	Guideline for Conducting Emergency and Disaster Simulations and Drills (2018)			
5.	Guidelines on Infection Control and Waste Management			