COVID-19: Projecting the impact in Rohingya refugee camps and beyond

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Summary (300 words)

Background: COVID-19 could have even more dire consequences among refugees living in camps than in general populations. Bangladesh has confirmed COVID-19 cases and hosts almost 1 million Rohingya refugees from Myanmar with 600,000 concentrated in Kutupalong-Balukhali Expansion Site. Projections of the potential COVID-19 infection burden, epidemic speed, and healthcare needs in such settings are critical to inform preparedness planning.

Methods: To explore the potential impact of the introduction of SARS-CoV-2 in Kutupalong-Balukhali Expansion Site, we used a stochastic disease transmission model with parameters derived from emerging literature. We considered three scenarios with different assumptions about the transmission potential of SARS-CoV-2. We estimated the number and daily rate of infections, hospitalizations, deaths, and healthcare needs expected under each scenario.

Findings: A large-scale outbreak is highly likely after a single introduction of the virus into the camp across scenarios with 65-95% of simulations leading to at least 1,000 infections. Estimated infections range from 119-504 between low and high transmission scenarios in the first 30 days; and between 424,798 and 543,647 in 12 months. Hospitalization needs exceeded the existing hospitalization capacity of 340 beds after 58-139 days between the low and high transmission scenarios. Estimated deaths range from 1,647-2,109 between low and high transmission scenarios.

Interpretation: A COVID-19 epidemic in a refugee settlement may have profound consequences, requiring unrealistically large increases in healthcare capacity and infrastructure. Detailed and realistic planning for the worst in Kutupalong-Balukhali and all refugee camps worldwide must begin now. Plans should consider novel and radical strategies to reduce infectious contacts and fill health worker gaps while recognizing that refugees may not have access to national health systems. As global resources to fight this pandemic become scarce, displaced persons must not be forgotten.

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Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is responsible for hundreds of thousands of confirmed cases of COVID-19 globally to date. With growing concern about the global inability to control its spread, rapid preparation and planning are critical, particularly where this virus may have the greatest impact. More than 7.2 million people live in refugee camps and settlements worldwide, where high population density, limited water and sanitation infrastructure, and limited healthcare resources can create ideal conditions for the spread of infectious diseases.

Over 900,000 Rohingya refugees have sought refuge in Cox's Bazar, Bangladesh; the majority arrived after 2017 fleeing ongoing violence in Myanmar (Figure S1).[1] The Kutupalong-Balukhali Expansion Site has 23 congested settlements with nearly 600,000 persons.[2] With over 46,000 persons per km^2, this site could qualify as one of the densest cities on earth.[3] The refugees are at high risk for epidemics given the high population density, poor health status, and limited health services. With confirmed COVID-19 cases in Bangladesh due to local transmission and ongoing transmission in neighboring countries, the introduction of the virus into the Expansion Site is likely.

The health status of refugees has improved since 2017 but remains fragile. The latest crude and child mortality rates are below emergency levels, while global acute malnutrition remains high.[4] The site is served by five hospitals run by non-governmental organizations (NGOs) and foreign governments with a total of 340 hospital beds (5.7 beds per 10,000 population) and up to 630 hospital beds when needed (10.6 per 10,000 population).[5] There are 24 primary health care centers (1 PHC/25,000 persons) with numerous health posts, though the total number of functioning PHCs varies.[6,7] Outside of the refugee site, there are 910 beds available in Cox's Bazar district, including government, private, and NGO facilities for both the host community and refugees.[8,9] The district hospital, with a 250-bed capacity, typically treats between 400-600 inpatients daily; 50-60 of whom are estimated to be refugees.[9,10] It suffers from overcrowding with a bed occupancy rate over 200%, poor infection control, and inadequate hygiene protocol and waste management.[9,10] While it has six intensive care unit (ICU) beds available, the ICU is reportedly not functional.[11] There are an estimated 0.31 physicians and 0.12 nurses per 1,000 population in Bangladesh, far below the 4.5 skilled health workers per 1,000 population recommended by WHO.[12,13]

In this study, we aim to understand how SARS-CoV-2 might impact refugee camp populations, using the Rohingya refugees living in the Kutupalong-Balukhali Expansion Site as a case study. The primary aims of this analysis are to: 1) develop a baseline expectation of the possible infection burden, speed, and hospitalization capacity needed to respond to a COVID-19 epidemic; 2) use these findings to provide some recommendations to support ongoing preparedness planning by the Bangladesh government, United Nations agencies and other actors for a COVID-19 outbreak; and 3) apply lessons from this case study to refugees and other forcibly displaced persons globally.

Methods

We used a stochastic Susceptible Exposed Infectious Recovered (SEIR) model to simulate transmission in this population. We simulated epidemics under three potential scenarios with different values of the basic reproductive number, R_0 : 1) a **low transmission scenario** based on transmission levels in many of the Chinese provinces with elevated isolation and control practices and an R_0 similar to influenza (R_0=1.5-2.0)[14]; 2) a **moderate transmission scenario** that mirrors estimates in early stages of the outbreak in Wuhan, China (R_0=2.0-3.0)[15]; and, 3) a **high transmission scenario** where we assume that R_0 is increased by a factor of 1.65 (R_0=3.3-5.0) compared to estimates from open community settings, as was observed during the 2017 diphtheria outbreak.[16] The R_0 in each of these scenarios falls within the 95% confidence interval of the current range of estimates for COVID-19.[17] We assumed an Erlang distributed serial interval (time between the onset of symptoms in infector-infectee pairs) with a mean of 6 days (standard deviation = 4.2).[18]

The proportion of infections that result in severe disease was estimated using data from a closed population of contacts in Shenzhen, China, for which complete data on contact, age, test results, symptoms, and initial severity were available.[18] Using a Bayesian binomial model, we estimated the proportion of infections that were severe by 10-year age groups and then applied those estimates to the Kutupalong-Balukhali population to get an overall proportion of infections that will develop into severe disease in the specific population. These estimates do not account for differences in comorbidities, differing attack rates by age due to population mixing characteristics, or various other factors.

We assume that in this setting hospitalization would be limited to those with severe disease (defined as tachypnea (≧30 breaths/ min) or oxygen saturation ≤93% at rest, or PaO2/FIO2 <300, and/or lung infiltrates >50% of the lung field within 24-48 hours),[19] and not used as a means of isolation. Thus, we assumed the proportion hospitalized was equivalent to the age-adjusted severe disease proportion calculated for the population and applied this to incident infections from the model simulations.[18] We assumed 26.4% of severe cases would require intensive care and estimated deaths assuming a 10% case fatality risk rate among hospitalizations/severe disease. We conservatively did not account for potential increases in mortality when healthcare resources are exhausted. We assumed hospitalization occurs a median of 3.42 days after symptom onset (lognormally distributed, standard deviation=0.79),[18] hospitalized cases are discharged after a mean of 11.5 days (95% CI, 8.0-17.3), and deaths occur after a mean of 11.2 days (95% CI, 8.7-14.9).[14] Additionally, early reports from the outbreak in China indicate that mechanical ventilation was required by approximately 25% of patients with severe disease, while the remaining 75% required only oxygen supplementation.[19]

Findings

We found that a large-scale outbreak is highly likely in this population, even under the low transmission scenario, with 65% of the simulations producing an outbreak of at least 1,000 infections with a single introduction (Table 1) and increasing to 82% and 93% in the moderate and high transmission scenarios, respectively. On average, in the first 30 days of an outbreak following a single introduction, estimated infections range from 119 in the low transmission scenario to 504 in the high. One year after the start of an outbreak, and in the absence of any effective interventions (e.g., vaccination, quarantine) or behavior change, between 73% (95% CI, 62-81%) and 98% (95% CI, 96-99%) of the population will have been infected (low and high transmission scenario) (Table 1).

In all scenarios, we projected relatively slow growth at the beginning of an outbreak in this population (Figure 1), with limited numbers of infections and few, if any, hospitalizations and deaths during the first month (Table 2). However, this quickly changes once sufficient infections are in the population, with rapid increases and culmination of the outbreak within the year (Table 2, Figure 2). By the time the first hospitalization occurs, we expect 50 (95% CI, 1-197) individuals to be infected in the population under the low scenario, assuming homogeneous probability of infection by age. This increases to 72 (95% CI, 2-289) and 141 (95% CI, 3-502) in the moderate and high scenarios, respectively. When the first hospitalization occurs, we expect the virus to have been circulating in this population for an average of 38, 30, and 23 days under the low, moderate, and high transmission scenarios, respectively.

Adjusted for the age distribution in the Kutupalong-Balukhali Expansion Site, we estimated that 3.6% (1.2-9.3%) of infections in this population would result in severe disease and hospitalization. The maximum daily hospitalization capacity needed ranges between 4,192 (95% CI, 2,391-6,143) in the low transmission scenario and 11,567 (95% CI, 8,228-15,865) beds in the high (Table 1). Under the low transmission scenario, hospitalization needs exceeded the hospitalization capacity of 340 beds after 139 days (95% CI, 99-198 days) while in the high transmission scenario, this occurred after only 58 days (95% CI, 43-79 days; Table 1, Figure 3). Within 3 months of successful introduction, we estimated 16 (95% CI, 0-69) cumulative ICU admissions in the low transmission scenario compared to 4,469 (95% CI, 1,182-6,101) in the high transmission scenario (Table 2).

Assuming that 10% of severe cases result in death, which puts the infection fatality rate at 0.36% (95% CI, 0.12-0.93%), we estimated between 1,647 (95% CI, 1,331-1,951) and 2,109 (95% CI, 1,699-2,571) deaths from the low to high transmission scenarios (Table 1). In the high transmission scenario, the maximum number of daily deaths is reached on day 79, compared to day 121 and day 179 on average in the low and moderate scenarios, respectively (Figure 2).

Table 1. Overall impact of simulated outbreaks in Kutupalong-Balukhali Expansion Site, assuming no effective novel interventions or behavior change. *Total infections, total hospitalizations,* and total *deaths* represent the final cumulative counts after the simulated outbreak has run its full course, among simulations that resulted in outbreaks of at least 1000 infections. *Maximum daily incident* counts are the maximum incident counts of infection and hospitalization on a single day across the full outbreak, occurring at the outbreak's peak. We estimated the *daily hospitalization capacity* needed in beds using incident hospitalizations and assuming hospitalized individuals remain hospitalized for a mean of 11.5 days (95% CI, 8.0-17.3).[14] We estimated the largest number of beds needed at any time over the course the outbreak, which we report as the *maximum capacity needed.* From the daily bed capacity needed over time, we also estimate the day on which this capacity needed exceeds the existing capacity of 340 beds, which we report as the *day on which hospitalization need exceeds capacity*.

Transmission Scenario	**Probability of outbreak of >1000 infections after a single introduction**	**Total Infections† mean (95% CI)**	**Total Hospitalizations of Severe Cases† mean (95% CI)**	**Total Deaths† mean (95% CI)**	**Maximum Daily Incident Infections† mean (95% CI)**	**Maximum Daily Incident Hospitalizations† mean (95% CI)**	**Maximum Hospitalization Capacity Needed (in beds)† mean (95% CI)**	**Day on which Hospitalization Need Exceeds Capacity† ‡ mean (95% CI)**
Low (R0=1.5-2.0)	65%	459,968 (383,938-496,943)	16,481 (13,449-19,452)	1,647 (1,331-1,951)	8,873 (5,145-11,223)	700 (375-1,123)	4,192 (2,391-6,143)	139 (99-198)
Moderate (R0=2.0-3.0)	82%	543,637 (498,627-570,995)	19,424 (16,529-22,659)	1,945 (1,637-2,287)	16,509 (11,319-20,959)	1,200 (716-1,967)	7,264 (4,760-10,315)	85 (63-126)
High (R0=3.3-5.0)	93%	591,349 (582,107-596,832)	21,099 (17,166-25,534)	2,109 (1,699-2,571)	28,890 (24,093-33,266)	1,931 (1,207-3,135)	11,567 (8,228-15,865)	58 (43-79)

† *Among simulations with successful introductions that result in outbreaks.*
‡ *Current hospitalization capacity estimated to be 340 beds.*

Table 2. Cumulative infections, hospitalizations, intensive care unit admissions, and deaths at 1, 3, and 12 months following successful introduction of simulations where an outbreak occurs.

Transm-ission Scenario	**1 month**				**3 months**				**12 months**			
	Infections	*Hospital-izations*	*Intensive Care Unit*	*Deaths*	*Infections*	*Hospital-izations*	*Intensive Care Unit*	*Deaths*	*Infections*	*Hospital-izations*	*Intensive Care Unit*	*Deaths*
Low *(R_0=1.5-2.0)*	119 (105-134)	3 (2-4)	0 (0-1)	0 (0-0)	3,014 (153-13,692)	84 (3-364)	16 (0-69)	3 (0-15)	424,798 (382,725-476,302)	15,150 (13,014-17,551)	3,721 (3,198-4,317)	1,515 (1,285-1,773)
Moderate *(R_0=2.0-3.0)*	168 (101-391)	4 (0-11)	1 (0-3)	0 (0-1)	99,359 (975-419,741)	2,775 (20-13,442)	526 (4-2,737)	92 (0-567)	543,637 (498,627-570,995)	19,424 (16,529-22,659)	4,775 (4,040-5,585)	1,945 (1,637-2,287)
High *(R_0=3.3-5.0)*	504 (107-2070)	9 (1-38)	1 (0-5)	0 (0-1)	547,083 (289,130-595,983)	18,931 (7,184-24,990)	4,469 (1,182-6,101)	1,498 (137-2,412)	591,349 (582,107-596,832)	21,099 (17,166-25,534)	5,193 (4,246-6,325)	2,109 (1,699-2,571)

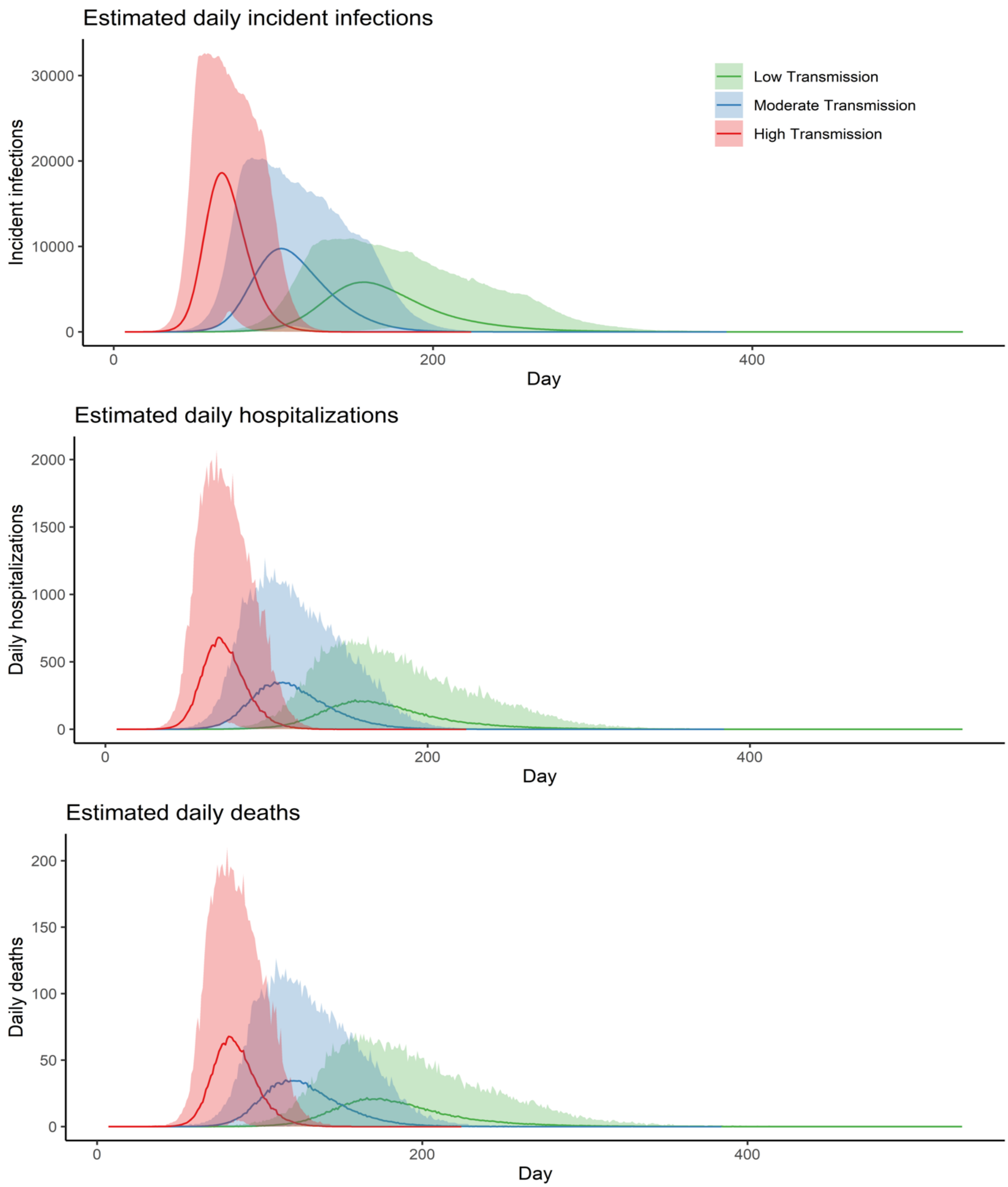

Figure 1. Simulated outbreak trajectories for Kutupalong-Balukhali Expansion Site camps under three transmission scenarios: low transmission (R_0 =1.5-2.0), moderate transmission (R_0=2.0-3.0), and high transmission (R_0=3.3-5.0). (A) daily incident infections of COVID-19, (B) daily incident hospitalizations, and (C) daily deaths under the three scenarios.

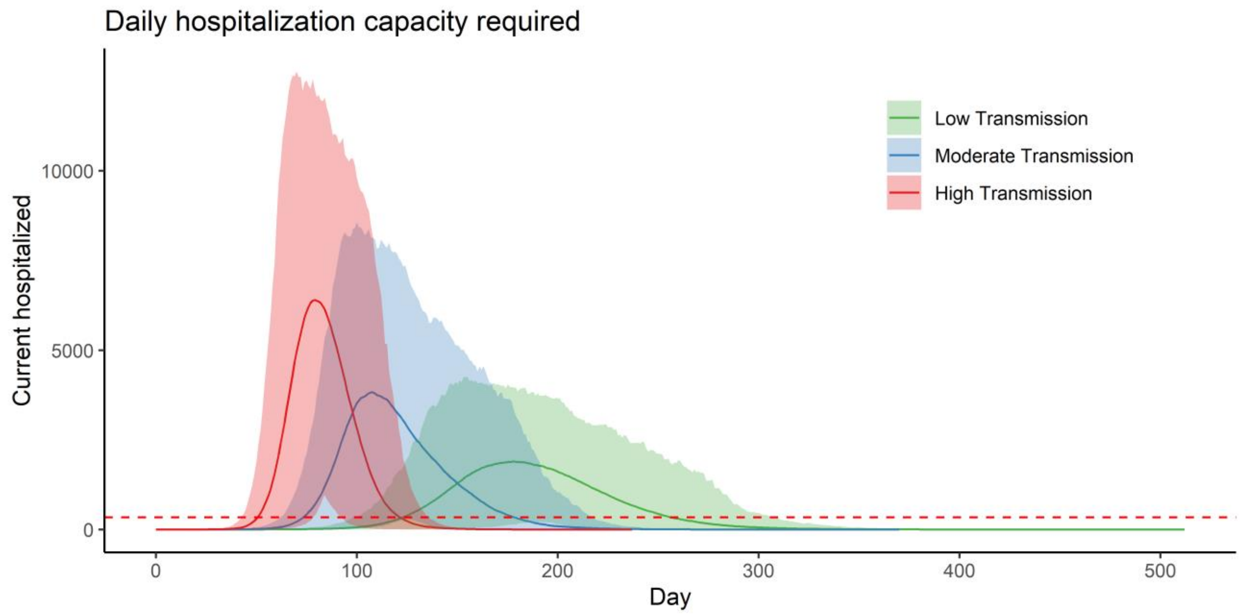

Figure 2. Hospitalization capacity requirements for an outbreak of SARS-CoV-2 in the Kutupalong-Balukhali camps, under three transmission scenarios: low transmission (R_0 =1.5-2.0), moderate transmission (R_0=2.0-3.0), and high transmission (R_0=3.3-5.0). The dashed red line represents the 340-bed surge capacity currently believed to exist in the population.

Discussion

The introduction of SARS-CoV-2 into the Kutupalong-Balukhali Expansion Site or any other large refugee or internally displaced persons (IDPs) camp or settlement is likely to have serious consequences and overwhelm existing health systems. Even when transmission rates were assumed to be similar to that of influenza (low scenario), the necessary hospitalization capacities far exceeded the available capacities for the refugees in the Expansion Site in most simulations. Recent experience with other infectious disease outbreaks shows that the transmission of SARS-CoV-2 will likely be more intense in contexts such as Kutupalong-Balukhali Expansion Site than in out-of-camp settings because of high population density, inadequate water and soap to maintain hygiene, limited ability to isolate infected individuals, and large household sizes.[16]

The younger demographic profile of the Rohingya camp population could reduce the overall rate of severe cases as compared with China or other upper-middle and high-income countries that have older populations. After adjusting for age, we estimate the overall severe disease rate among infections in this population (3.6%) to be approximately half that estimated for China (6.6% [95% CI, 3.7-10.4]). However, it is likely that co-morbidities such as malnutrition, concomitant diseases, and poor overall health status could cause more severe outcomes among these groups, which was not captured by our model.

Existing inpatient facilities in the camps are already operating close to full bed occupancy, and all scenarios show that they will be overwhelmed. Under current conditions, we expect this to occur within 2 to 4.5 months (58-139 days) of the first introduction of the virus, with cumulative hospitalizations reaching 84 to 18,931 in the first 3 months, depending upon the scenario; these numbers rise dramatically by 12 months. Current hospital bed surge capacity (630) as reported from the site may almost double the number of available beds, but even then, it only delays overwhelming the capacity by 3-10 days on average (Table S2). Furthermore, while we have focused on the health needs of severe cases, health centers will be flooded with patients with mild to moderate symptoms also seeking care.

While we were unable to find an accurate recent estimate of the human resources currently available in the camps (e.g., number of doctors, nurses, midwives), it is very likely that they will be inadequate to face a large influx of patients.Given the limited availability of skilled health workers and hospital beds in Cox's Bazar, it is unlikely that additional health care professionals within Bangladesh would be available. A surge of international health care workers could be considered, but this will be difficult given the high demands worldwide during the pandemic and existing travel restrictions. Furthermore, issues of introduction of the virus from expatriates into Bangladesh would need to be carefully addressed. A more likely strategy will be task shifting among existing health care workers, with physicians treating the most severe cases, nurses the less severe cases, and community health workers addressing mild infections. Such task shifting would require intensive training that needs to begin immediately. An examination of the "re-purposing" of people working in various capacities (e.g., teachers as schools are closed) needs to be undertaken to assess how they can be used to address this epidemic while ensuring integration and complementarity of the response. Prepositioning of personal protective equipment and comprehensive training that is constantly reinforced to reduce health care worker exposures is critical to avoid sickness and death among this cadre.

Given the limited number of beds for treating the predicted large number of severe COVID-19 cases in the Expansion Site, isolation through hospitalization, as is being done in other settings, will likely be very difficult. Alternative plans for the isolation of mild symptomatic infections are needed and are currently being discussed with the government of Bangladesh to help control such an outbreak, as was done during the 2017 diphtheria outbreak. Cholera treatment centers and diphtheria outbreak centers that are currently on standby are a low hanging fruit for repurposing. Setting up inclusive and accessible temporary hospitals to triage mild cases in these populations will require significant support and coordination by the government, UN agencies, and NGOs and may be limited by physical availability of land. Therefore, detailed advanced planning of healthcare capacities, triage procedures, and isolation strategies need to be finalized and shared widely as soon as possible.

Novel and previously untried strategies for social distancing and quarantine need to be considered. While culturally difficult and requiring socialization, isolating people over 60 years of age and those designated medically vulnerable together in certain designated areas of the camp may need to be considered. One possibility could be sub-sector-level isolation, where 50-100 high risk people could be grouped together in existing areas of the camp where they are already located.[20] Consistent monitoring of fever and other symptoms combined with appropriate testing, if sufficient tests become available, will be an integral part of this strategy. Such an isolation approach would require sufficient resources to provide comprehensive care (e.g., food and supportive services) for isolated community members. Since physical distancing will be extremely difficult, the use of facemasks among those most at risk, and possibly the whole population could be considered if there are eventually sufficient global supplies. Rapid and creative solutions for improving hand hygiene, such as the installation of a multitude of handwashing stations and distribution of hand sanitizer combined with communication campaigns, will be needed. Access to accurate and consistent health information will be critical, as already rumors and misinformation have spread among Rohingya refugees about COVID-19, partly due to camp-wide restrictions on the internet and telecommunications.[21] In the future, the use of people who have recovered from COVID-19 infections will need to be considered after more data become available as to their ability to become re-infected and transmit to others, as was done with Ebola survivors.[22]

The three scenarios show varying degrees of increased mortality. Mortality due to COVID-19 is dependent upon various factors, particularly access to hospitals with ICUs and ventilators. Currently, there is only one facility with few mechanical ventilators in the camps and one facility with less than 10 ICU beds and no ventilators. Therefore, it is likely that mortality rates due to COVID-19 will be significantly higher here than in settings where nationals or refugees have such access. Reportedly, the ICUs and ventilators are not functioning in the district hospital in Cox's Bazar, and thus access to health care facilities to treat severe cases of COVID-19 may be equally challenging for nationals. Mortality in

Kutupalong-Balukhali Expansion Site is currently comparable to estimates for Chittagong division and nationwide, and are below emergency levels. However, the scenarios show a significant increase in mortality, ranging from 1,515 deaths (2.5/1,000/year) to 2,109 deaths (3.5/1,000/year) at 12 months due to COVID-19 alone; this does not take into account expected deaths that would have occurred during this time as well as increased deaths due to other illnesses that are untreated due to the outbreak.

As in other major epidemics where healthcare capacity and access to it is already limited, major outbreaks like this can easily disrupt an already precarious health system.[23] Diversion of these limited health resources from existing health services, including vaccination, obstetrical care, and emergency care, may cause an increase in mortality due to disease that could normally be treated by the health system; this occurred in the Ebola outbreak in West Africa where more people died from malaria than Ebola, and in Eastern DRC, where more people died from measles than Ebola.[24,25] Such an increase in non-COVID-19 mortality is particularly concerning with the upcoming monsoon season in Bangladesh.

There are several limitations to this study. We are using a mass-action model, which tends to overestimate the size of outbreaks since populations are generally not closed and well mixed. However, due to population density and often closed nature of refugee camps, transmission in these settings has been shown to act more closely to theory. Additionally, the current evidence on the natural history and key epidemiological properties of COVID-19 reflect the interactions of the SARS-Cov-2 virus with non-displaced populations. Population structure and population health can lead to widely different burden of disease with no modifications to the virus. With the particular demographic characteristics and health status of refugee populations, like this one in Cox's Bazaar, we need to be cautious when developing guidance based on previously estimated properties of SARS-CoV-2/COVID-19. Clinical surveillance, laboratory confirmation, and documentation are key to generating new evidence specific to this population and potentially generalizable to other refugee settings. Thus, we used the existing data that were available from documents and personal communications.

While we are focused here on the possible impact of SARS-CoV-2 on the Kutupalong-Balukhali Expansion Site, most of these findings are applicable to other refugee and IDP camp-like situations. While governments' preparedness and response plans for COVID-19 may mention forcibly displaced populations, it is the details or lack of, that must be examined. The Inter-Agency Standing Committee recently released interim guidance for scaling up the COVID-19 response in camps and camp-like settings that highlights inclusion, protection, and readiness; and has since developed preliminary multi-sectoral preparedness and response plans.[26] This guidance, which applies the WHO guidance on COVID-19 preparedness and response[27] to populations in humanitarian crises, should be acknowledged in government and humanitarian agency decision-making.

Clear and detailed COVID-19 plans that explicitly state how existing programs will be adapted according to their context need to be developed and shared immediately. For example, different methods of food and fuel distribution will need to be undertaken that address social distancing issues. Potential consequences that isolation and other adaptive programming may cause, such as an increase in intimate partner violence, physical and sexual abuse among unaccompanied minors and other vulnerable groups, and mental health issues must be planned for in a concrete manner. Such adaptive programming will be an iterative process, as these are exceptional circumstances, and we will all have to learn by trying different approaches and then to document the results. A portal should be established by UNHCR and the global health cluster, led by WHO, to document how such adaptive programs for refugees and IDPs are being undertaken in different contexts.

The scenarios presented in this study focus on camp-like settings where refugee populations are relatively accessible, and health services are available and generally free. However, the majority of refugees reside outside of camps, often in urban contexts.[28] For these populations, availability, access, cost, and quality of health services vary by host government policies. These refugee populations are also particularly vulnerable to the serious consequences of pandemics as targeted responses among a dispersed group of refugees, and equity in health service delivery is very difficult to achieve.

During exceptional times, it is not unreasonable for governments to take extraordinary measures to protect their citizens; in fact, that is what is expected of governments. Therefore, while difficult for governments to state openly at this point, it is likely that most countries will restrict access to their hospitals to nationals only, particularly when there are large numbers of refugees in the same geographical area. We are already seeing governments closing their border to non-nationals, and in some cases, not allowing people to seek asylum.[29] Such a predicament leaves refugees and other non-nationals, such as undocumented migrants, in an extremely precarious position. During a pandemic, there will be limited support by countries to establish field hospitals with ICU capabilities for refugees in camp-like settings, as they will be occupied with addressing their own national response. Unfortunately, there is no simple recommendation as to how to address this life and death issue. However, we believe it is important to acknowledge the likelihood that host countries' hospitals will be closed to refugees in most camp-like settings, and consequently, COVID-19 preparedness and response plans should proceed on realistic scenarios.

Finally, refugees face discrimination and are often falsely accused of spreading disease. The widespread rise of populism combined with anti-migrant and anti-refugee sentiments that we are observing globally provides a hostile environment that could be exacerbated by a pandemic. We are concerned that the COVID-19 pandemic, while completely unrelated to being a refugee, could be used as an excuse to take retribution against refugees, as well as other vulnerable groups such as IDPs and undocumented migrants. Such retribution could take many forms, including restricting or stopping asylum seekers, which is currently occurring, the closure of camps, and forced repatriation (refoulement, which is against refugee law), all used in the name of public health. Not only would this be morally wrong, it would jeopardize the effectiveness of containment and mitigation measures, as pandemics require planning and responses that do not discriminate by nationality and protect the health of the global population.

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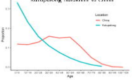
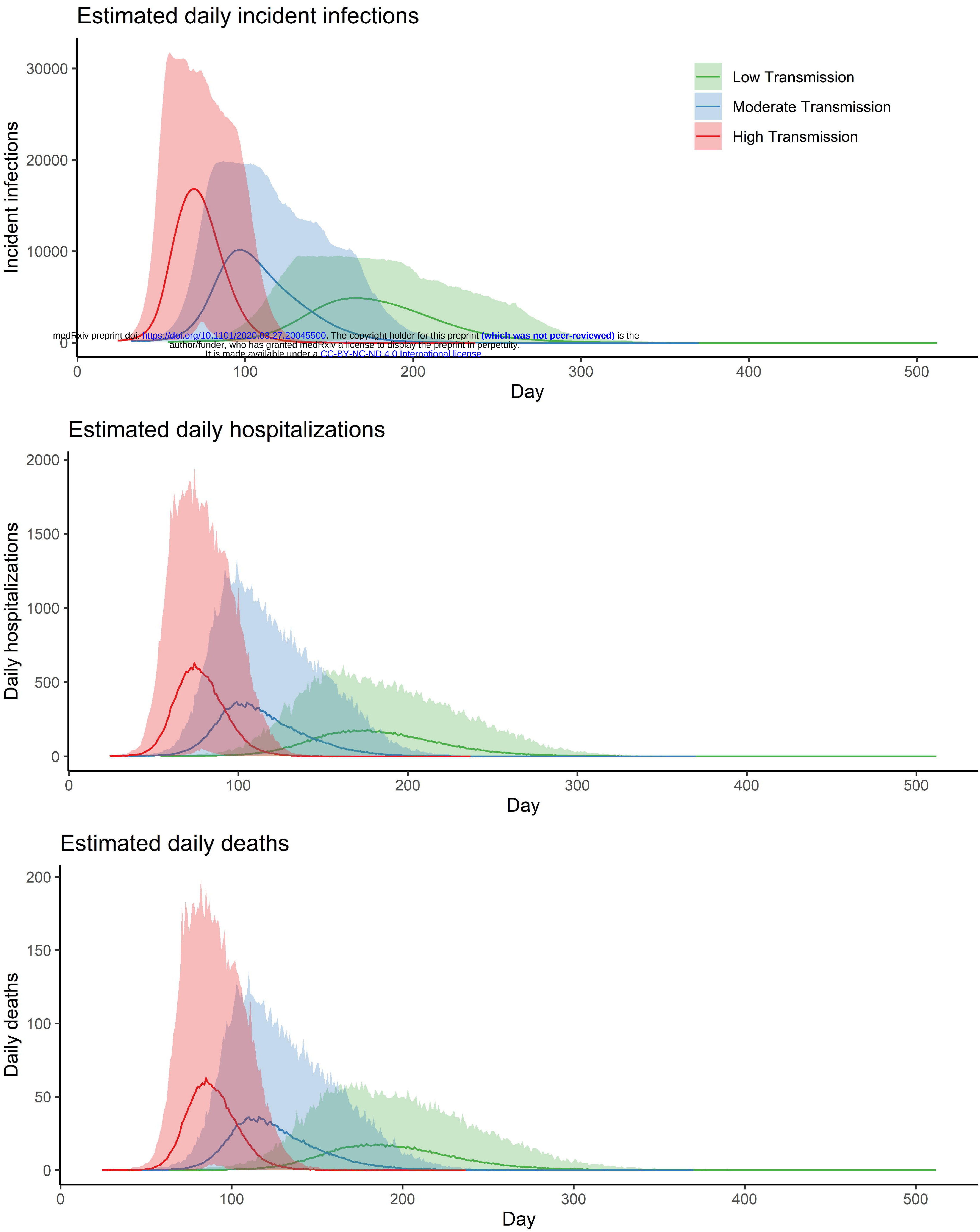
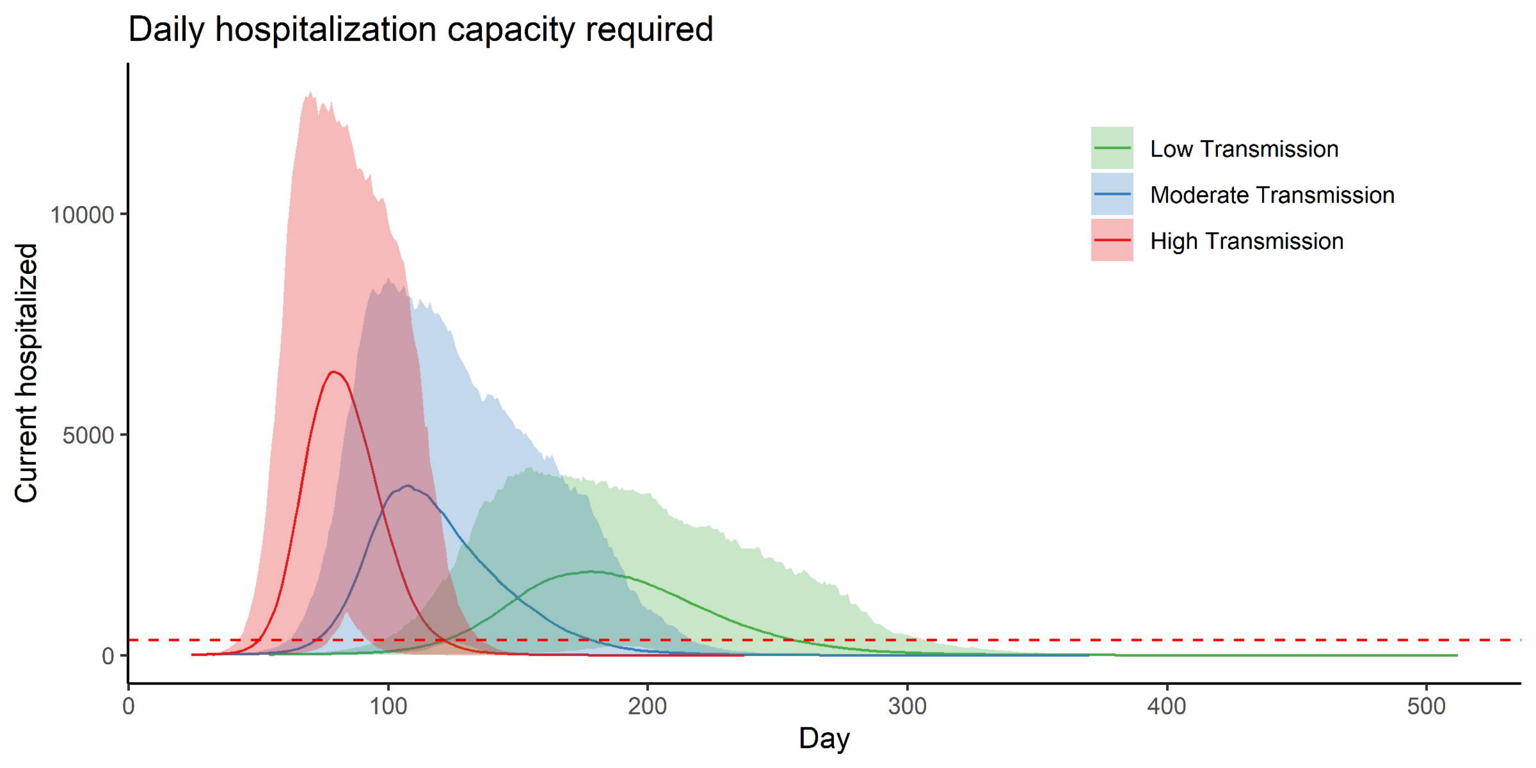
Kutupalong-Balukhali expansion site
Cox's Bazar, Bangladesh

population:	596,000
density:	46,000/km^2
hospitals:	5
hospital beds:	340
beds/1000 pp:	0.57

Age distributions,
Kutupalong Balukhali vs China




Estimated daily incident infections
Incident infections
Day
Low Transmission
Moderate Transmission
High Transmission
Estimated daily hospitalizations
Daily hospitalizations
Day
Estimated daily deaths
Daily deaths
Day


Daily hospitalization capacity required
Low Transmission
Moderate Transmission
High Transmission
Current hospitalized
10000
5000
0
Day
0
100
200
300
400
500